FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

DEPARTMENT OF BUSINESS INFORMATICS AND OPERATIONS MANAGEMENT
OPERATIONS RESEARCH & SCHEDULING RESEARCH GROUP

BUFFER MANAGEMENT METHODS FOR PROJECT CONTROL

ANNELIES MARTENS

5 JUNE 2018

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» STUDY 1

» STUDY 2

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» CONCLUSIONS

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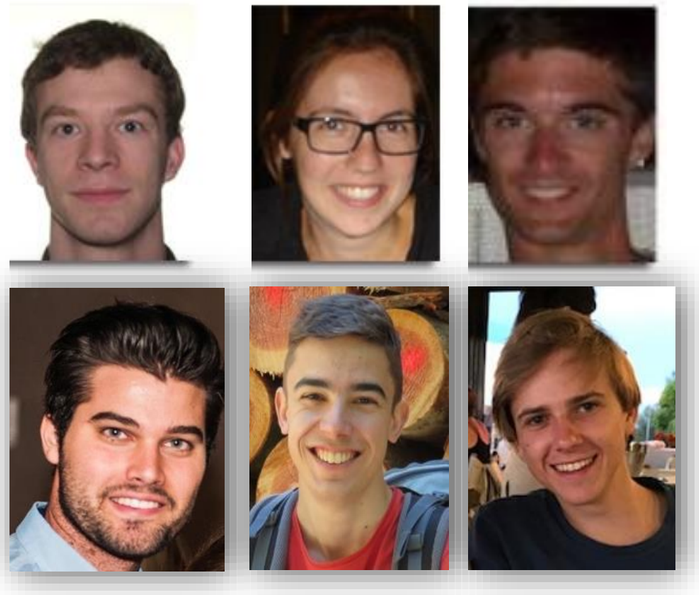
CHAPTER 1 - INTRODUCTION

ORAS - OPERATIONS RESEARCH & SCHEDULING RESEARCH GROUP

MARIO VANHOUCKE

THE TEAM



RESEARCH TOPICS

- » project management
- » project planning
- » project control
- » contracting

RESEARCH AWARDS

- » Research Collaboration Fund Award (2007) - PMI Belgium
- » IPMA Research Award (2008) - IPMA

PHDS

- » 10 PhDs
- » recent defense (18/05) ➔ postdoc

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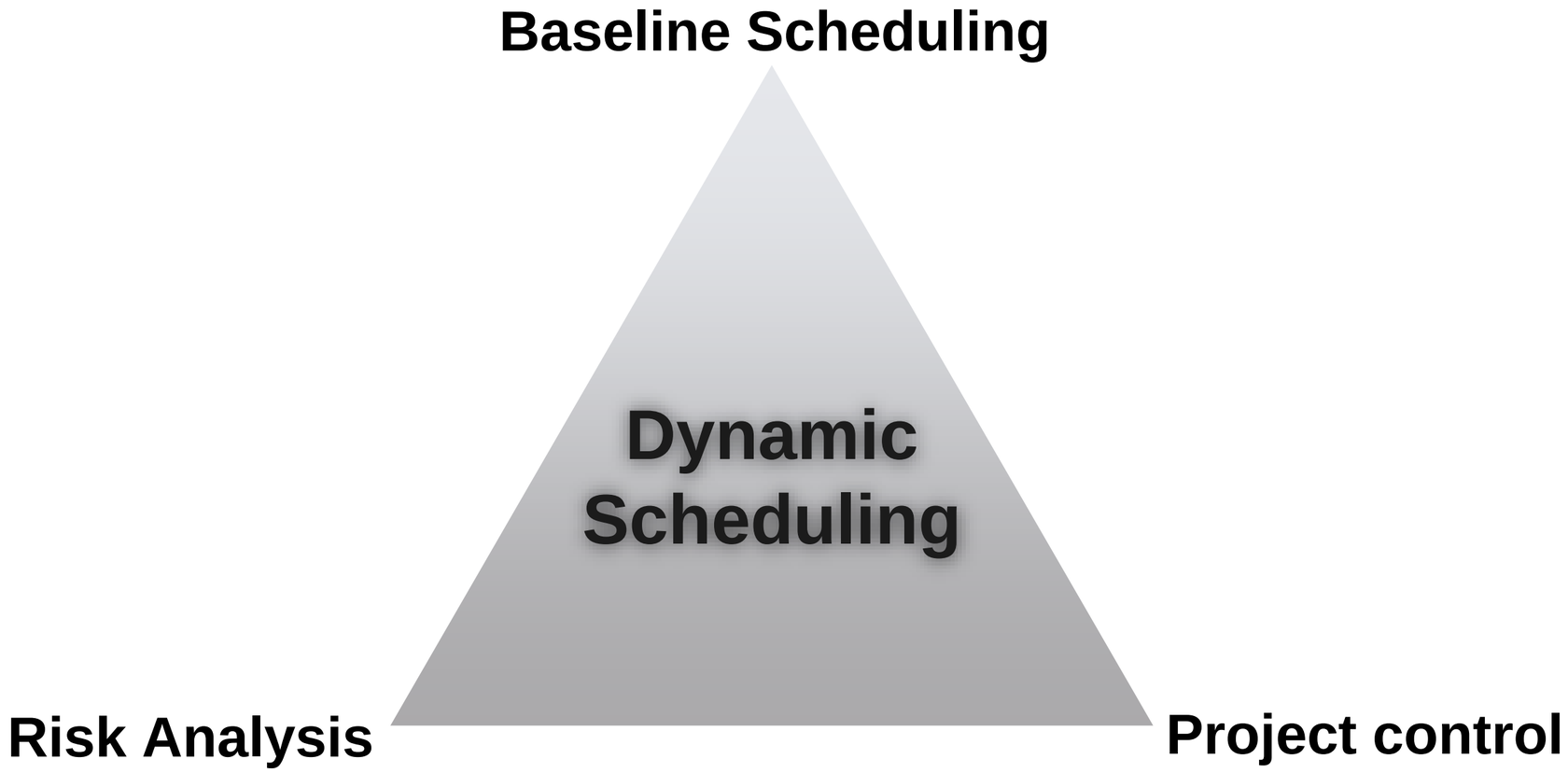

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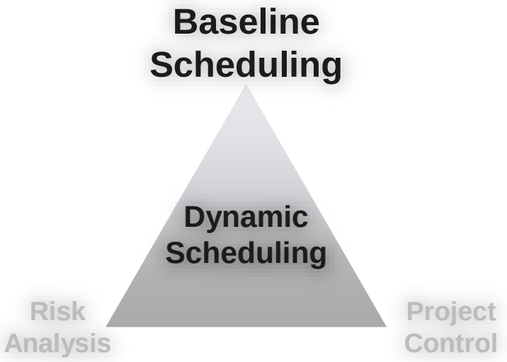

time

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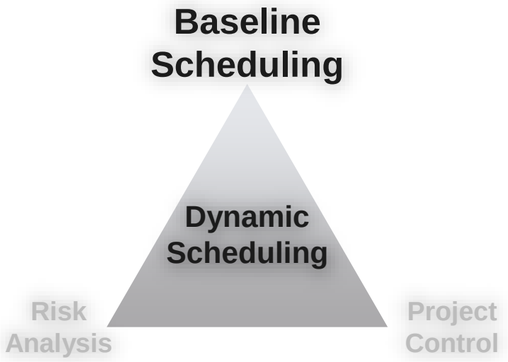

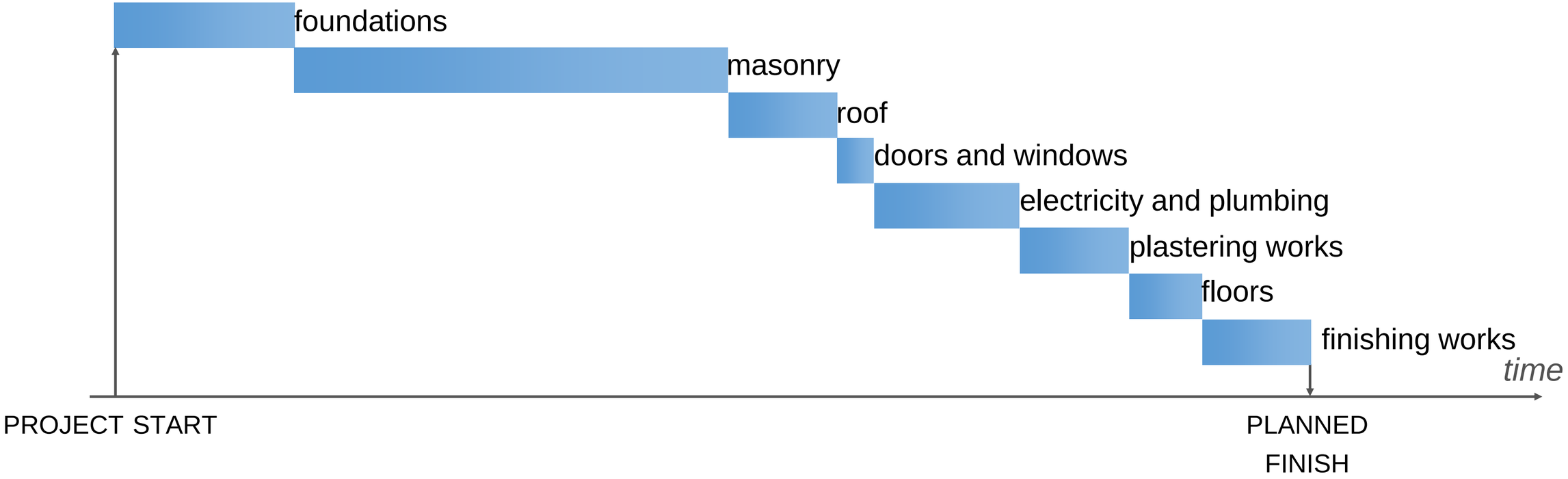

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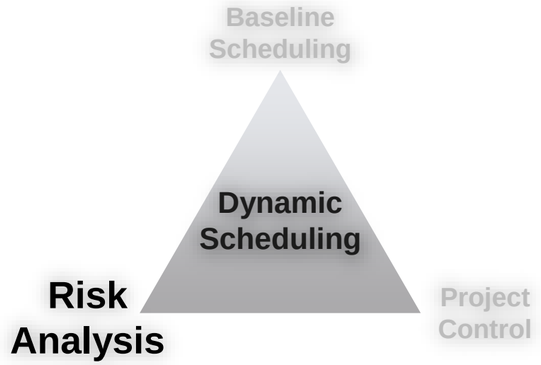

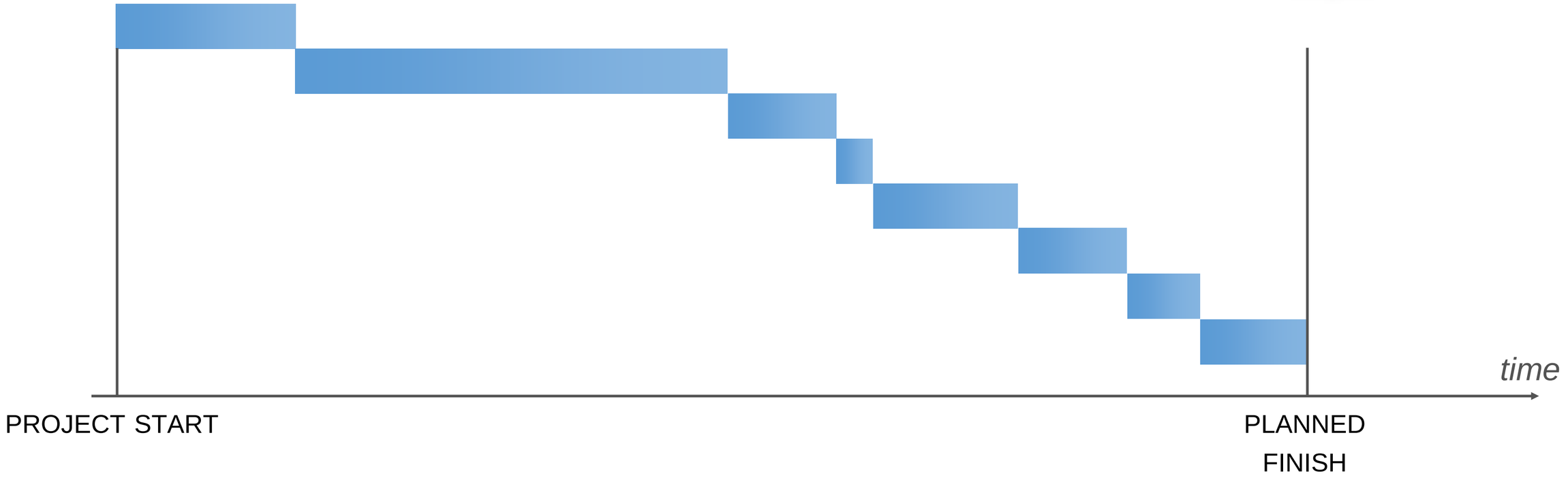

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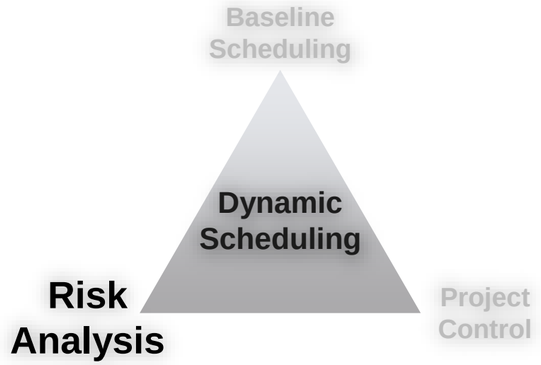

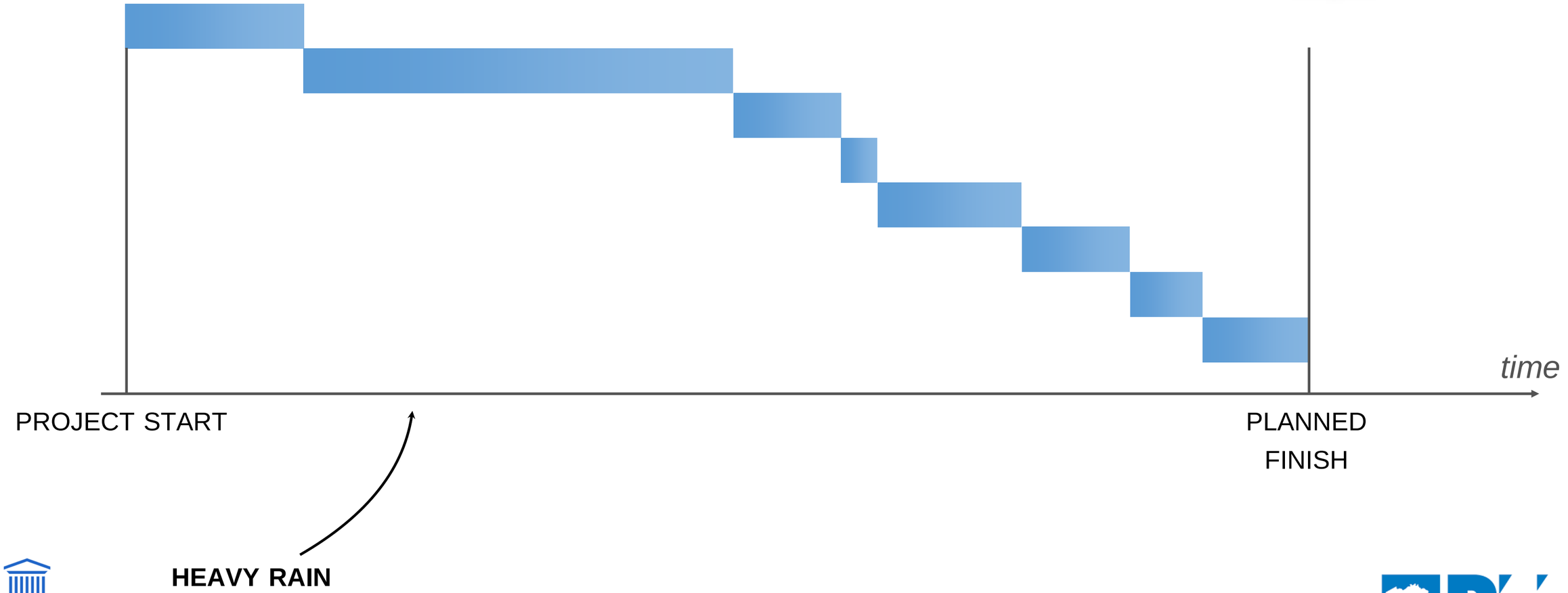

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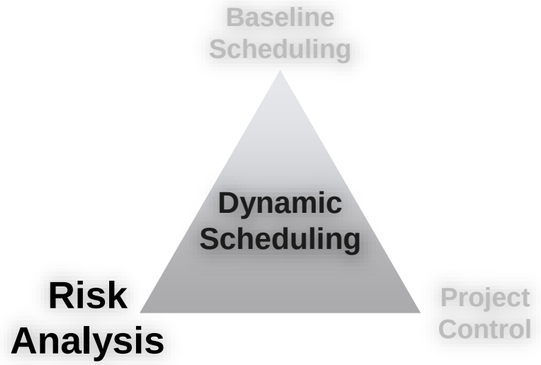

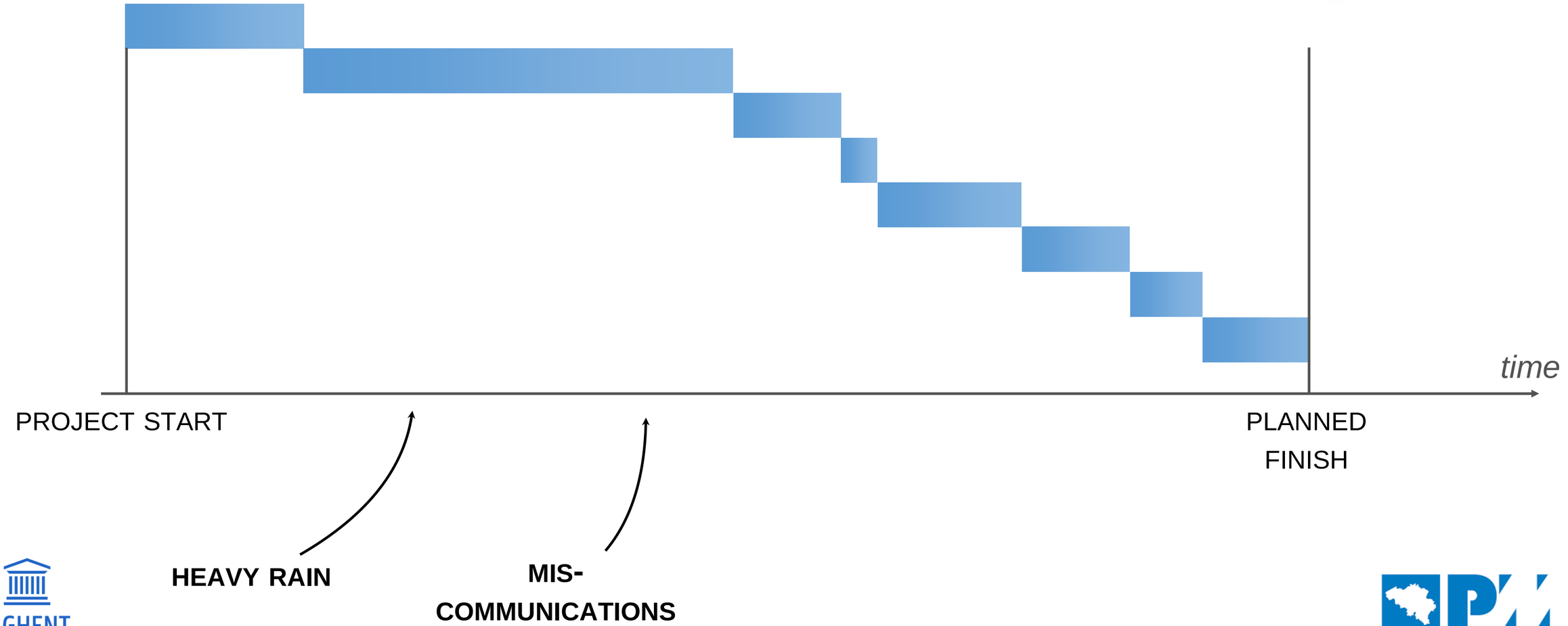

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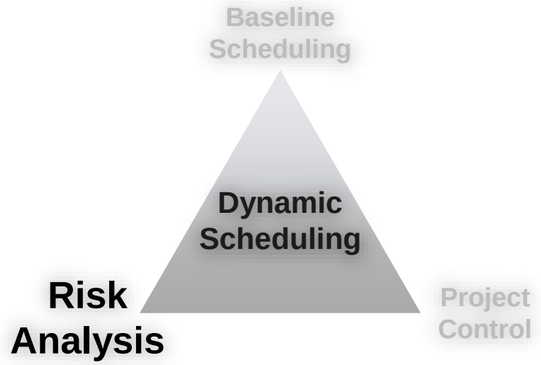

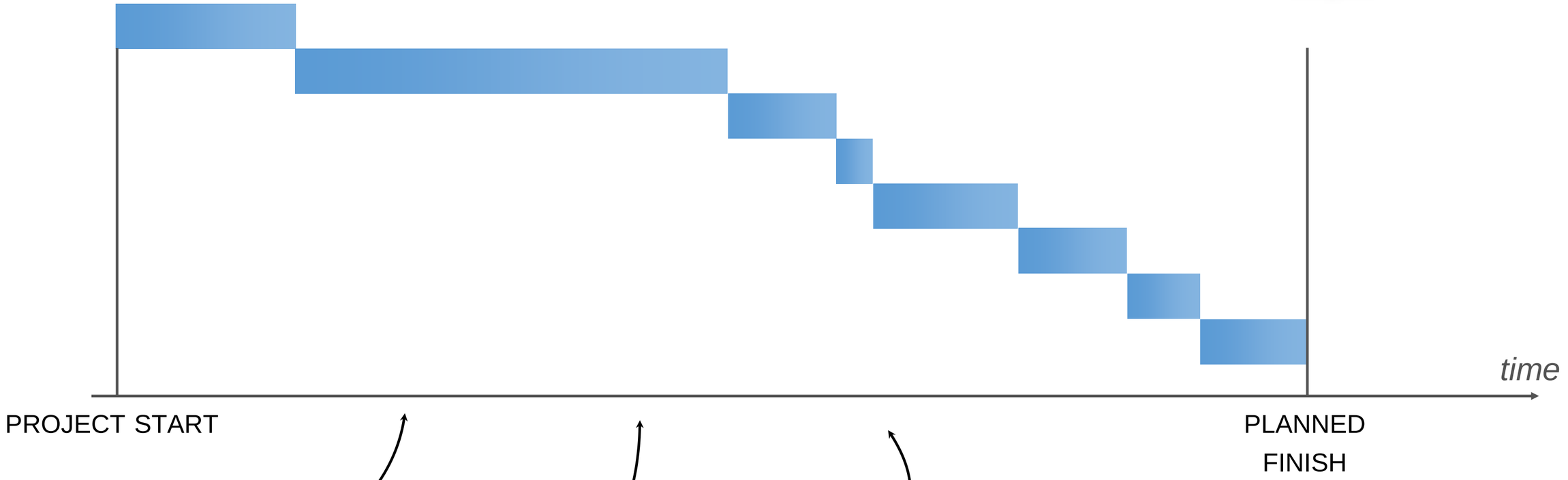

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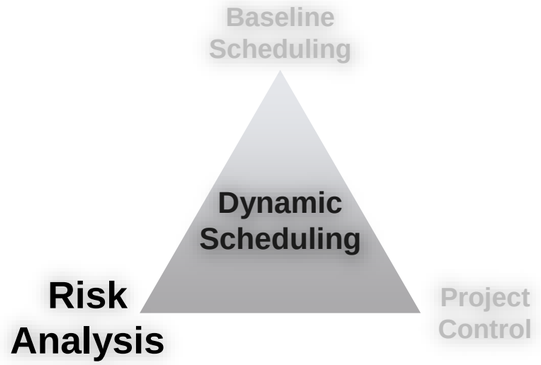

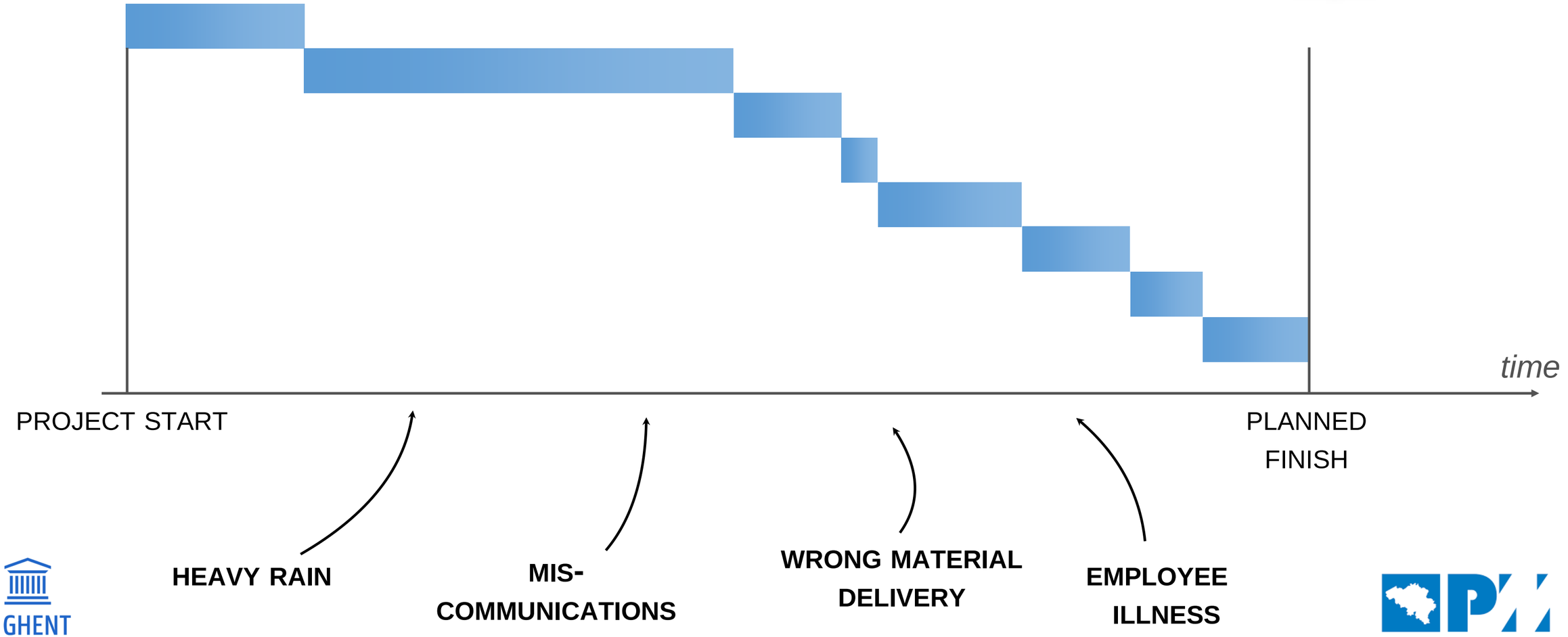

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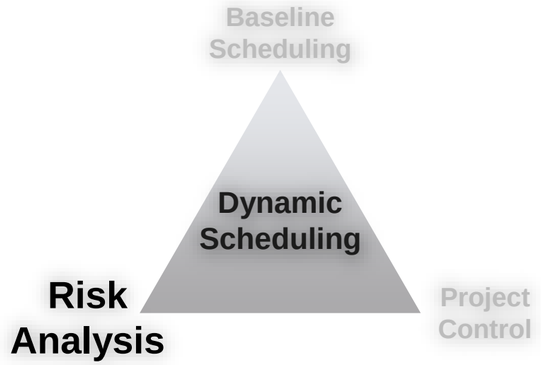

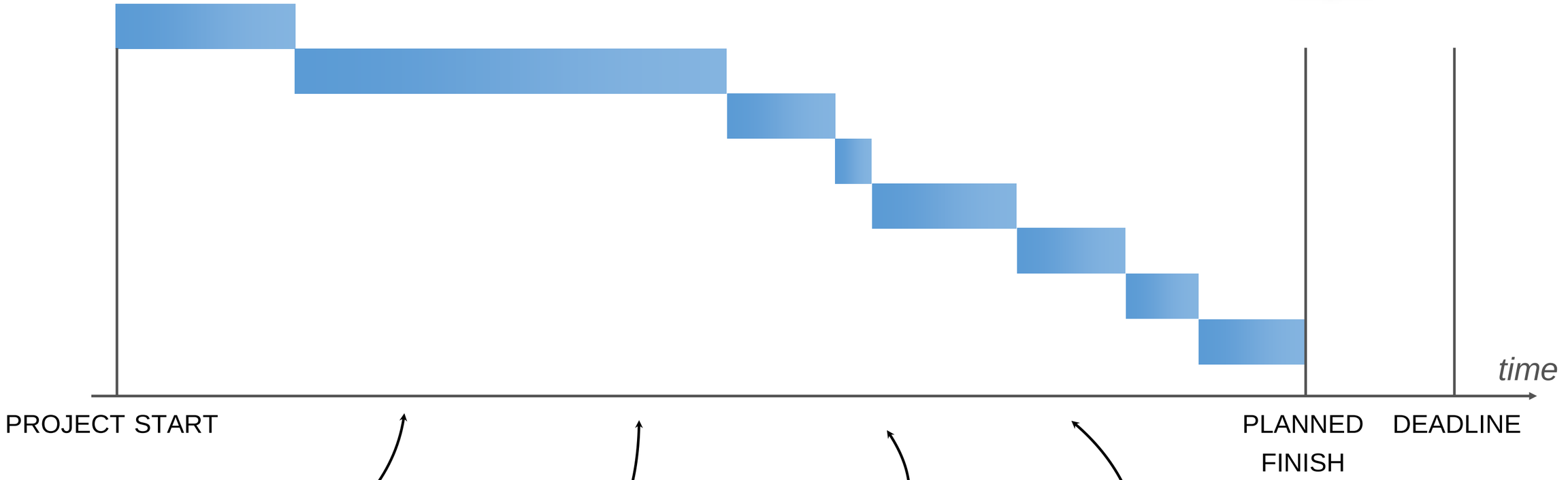

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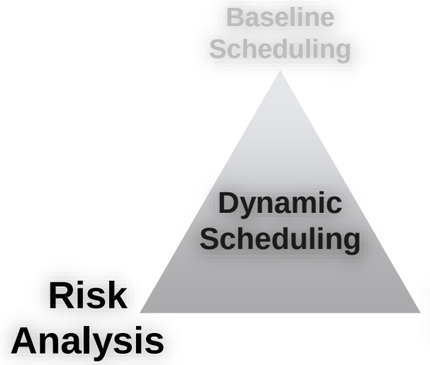

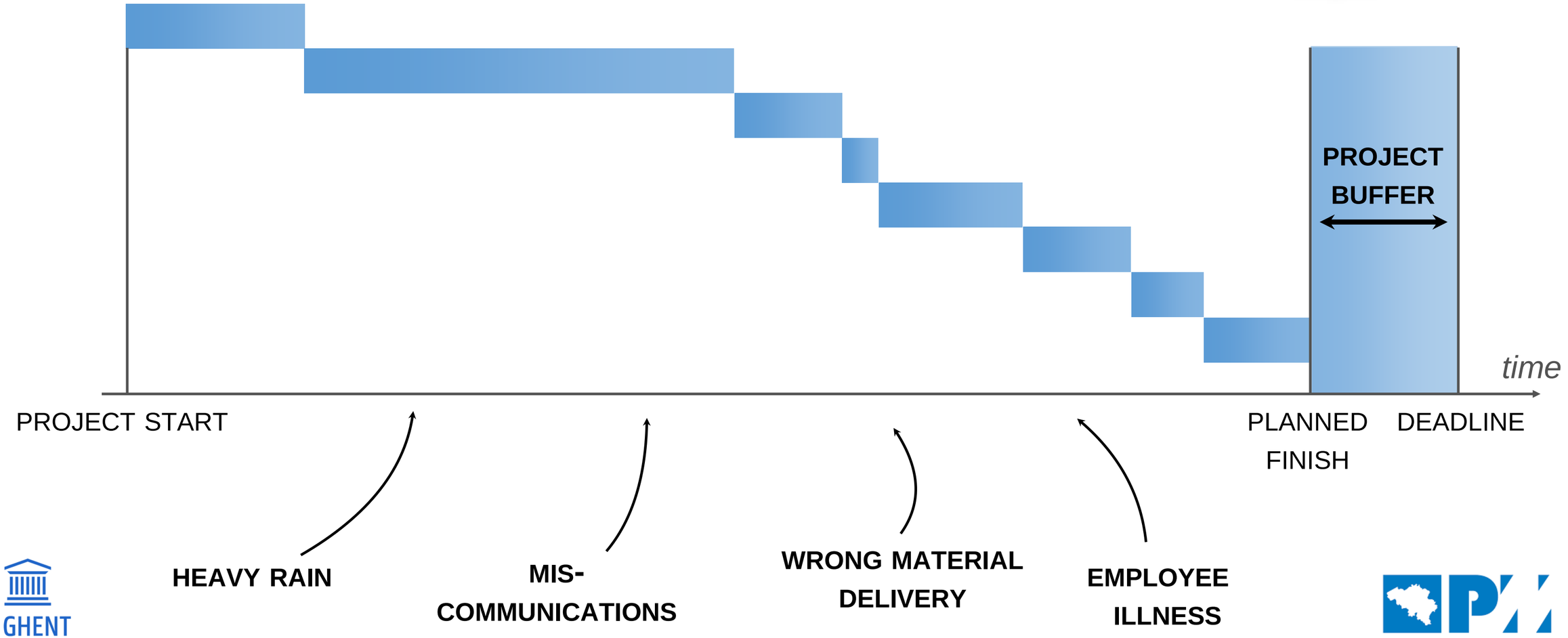

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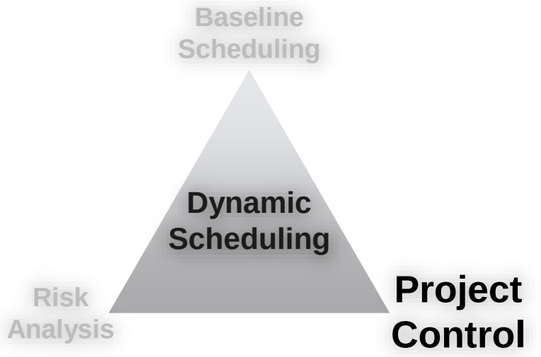

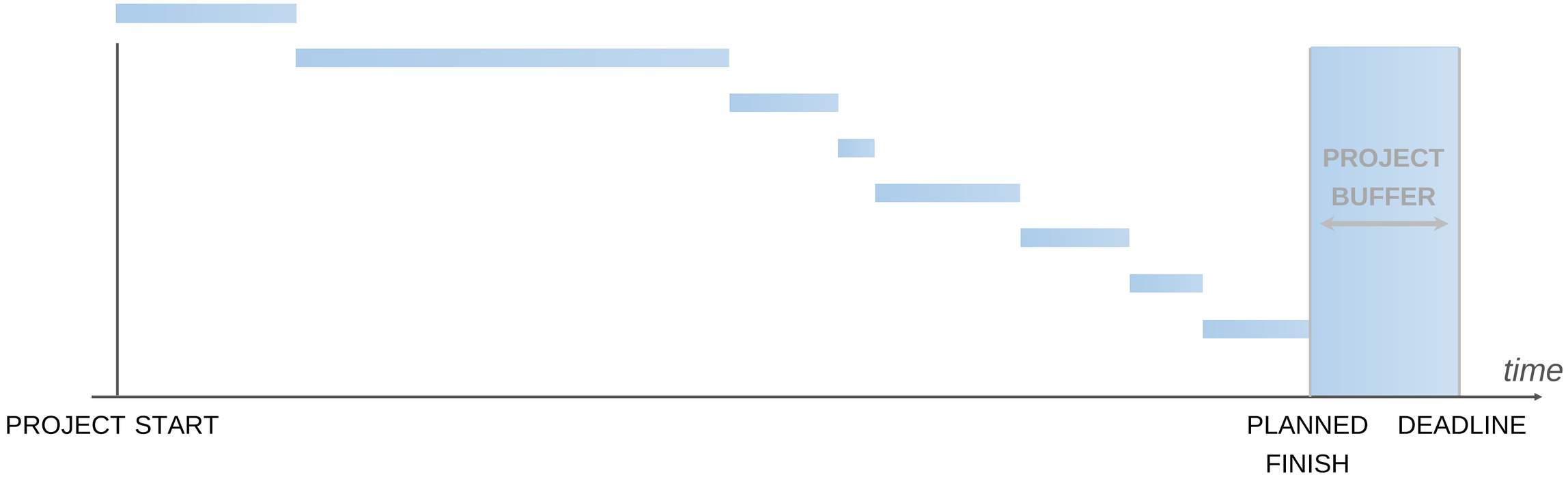

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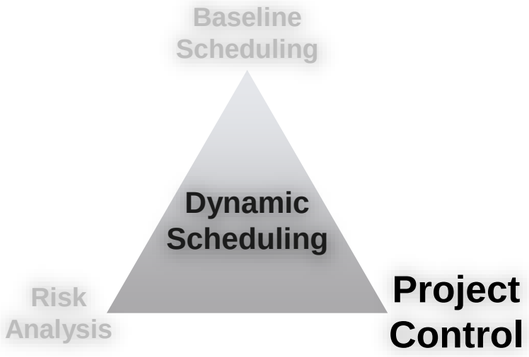

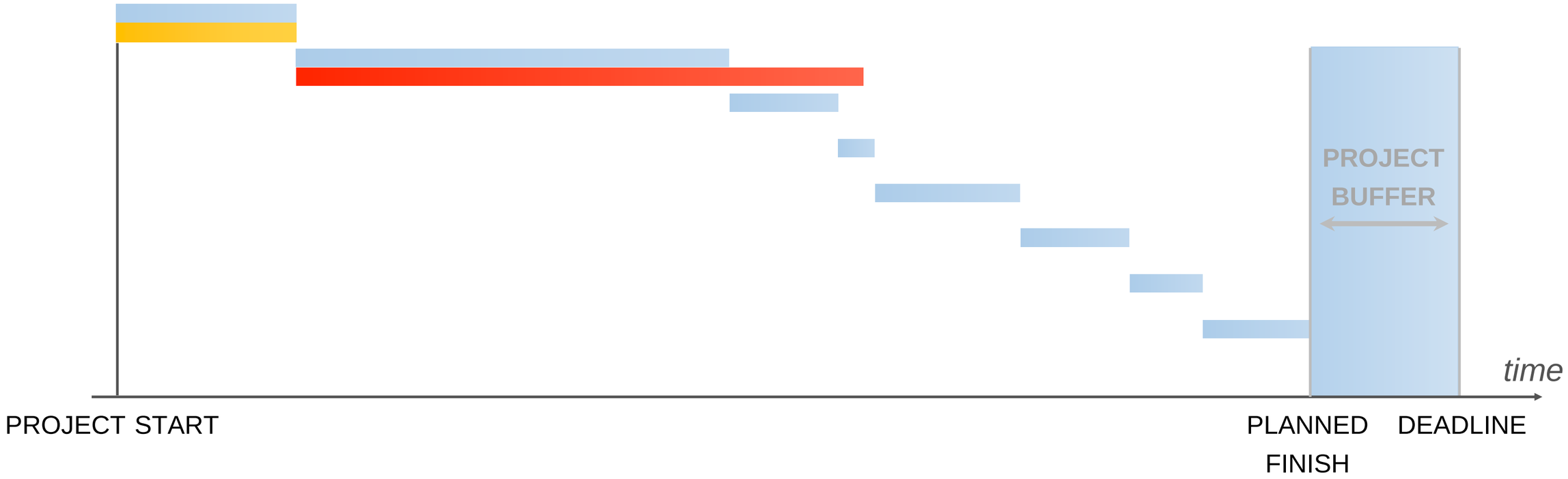

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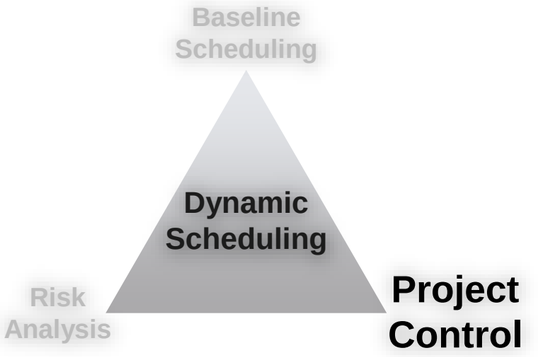

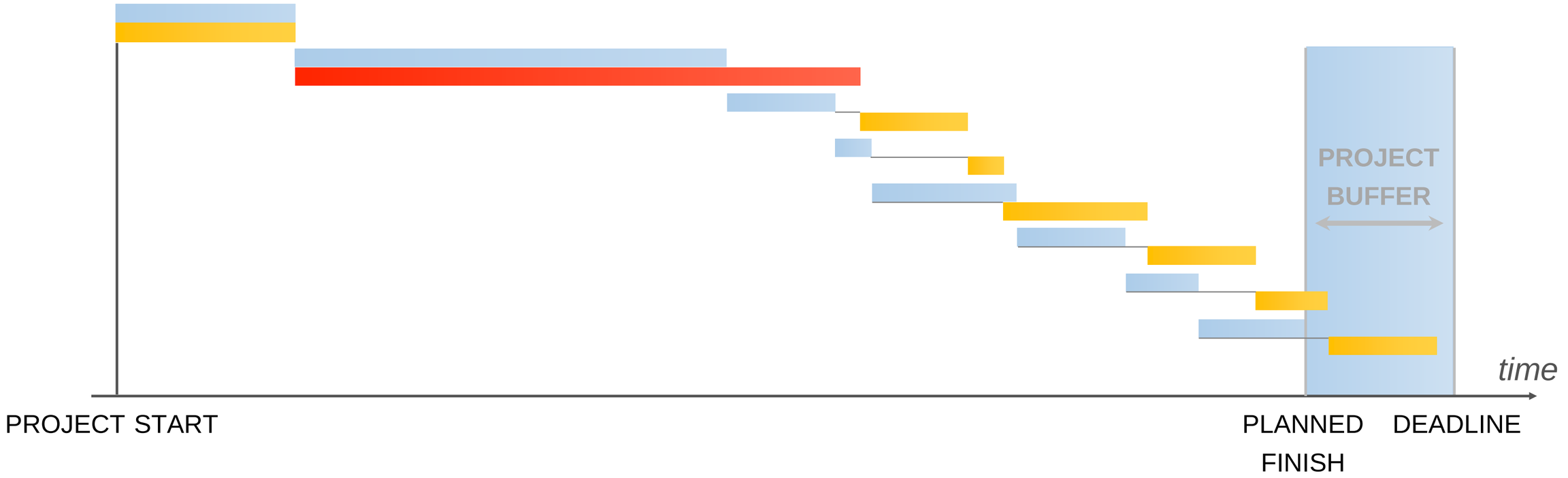

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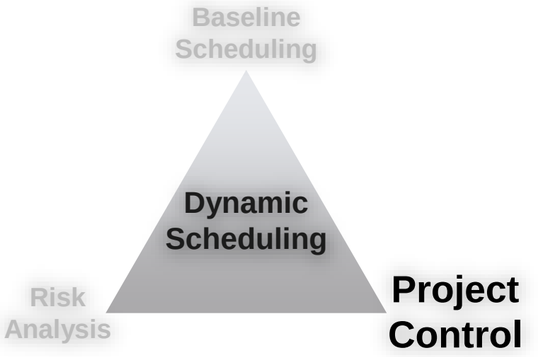

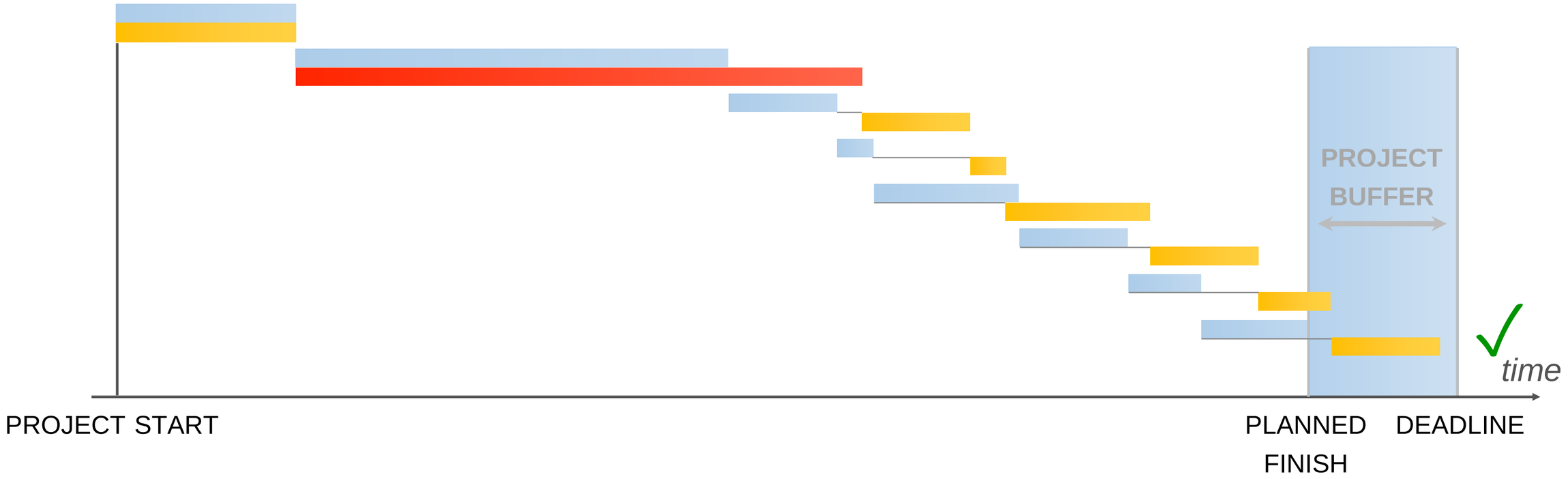

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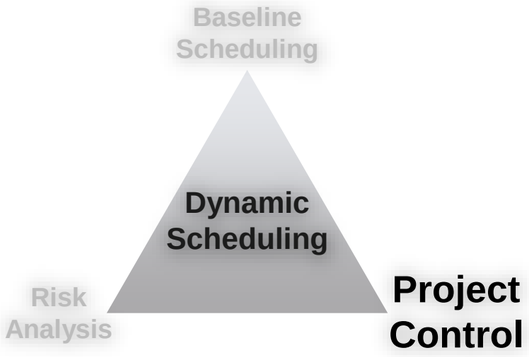

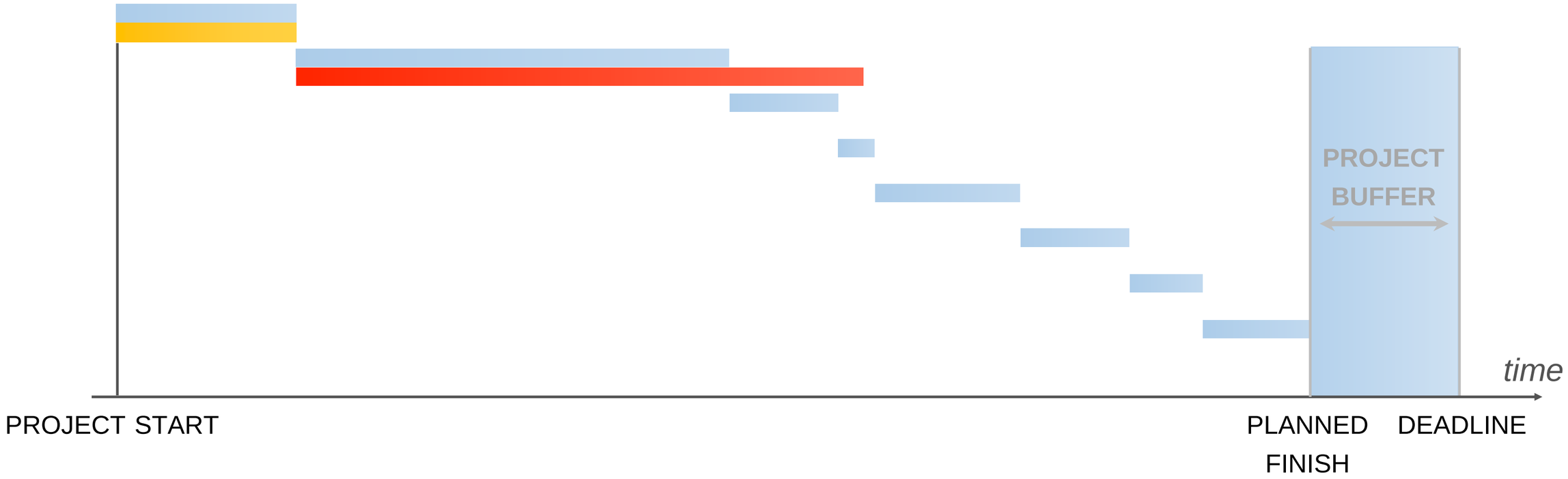

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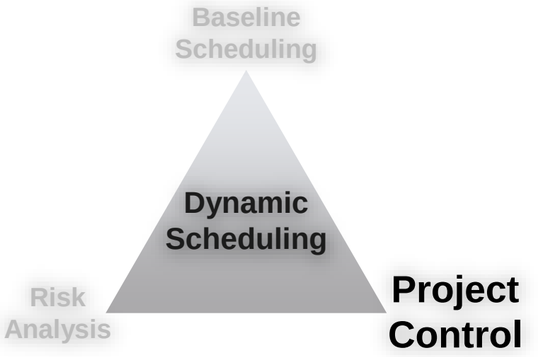

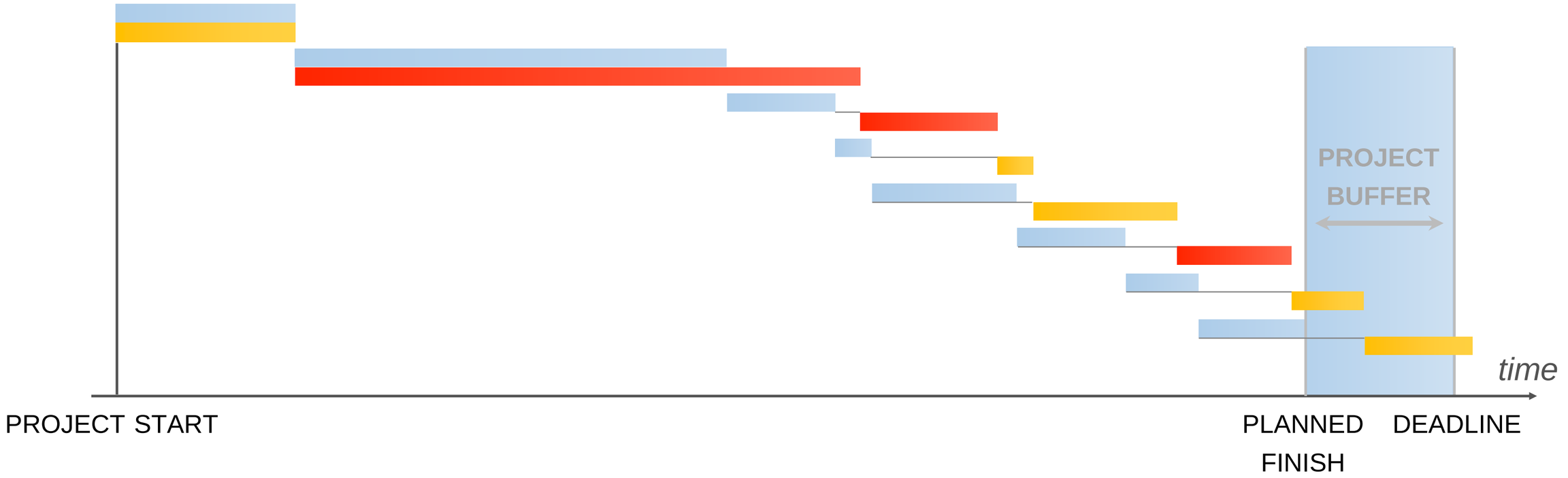

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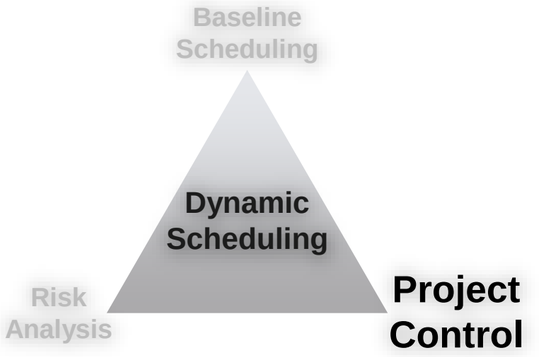

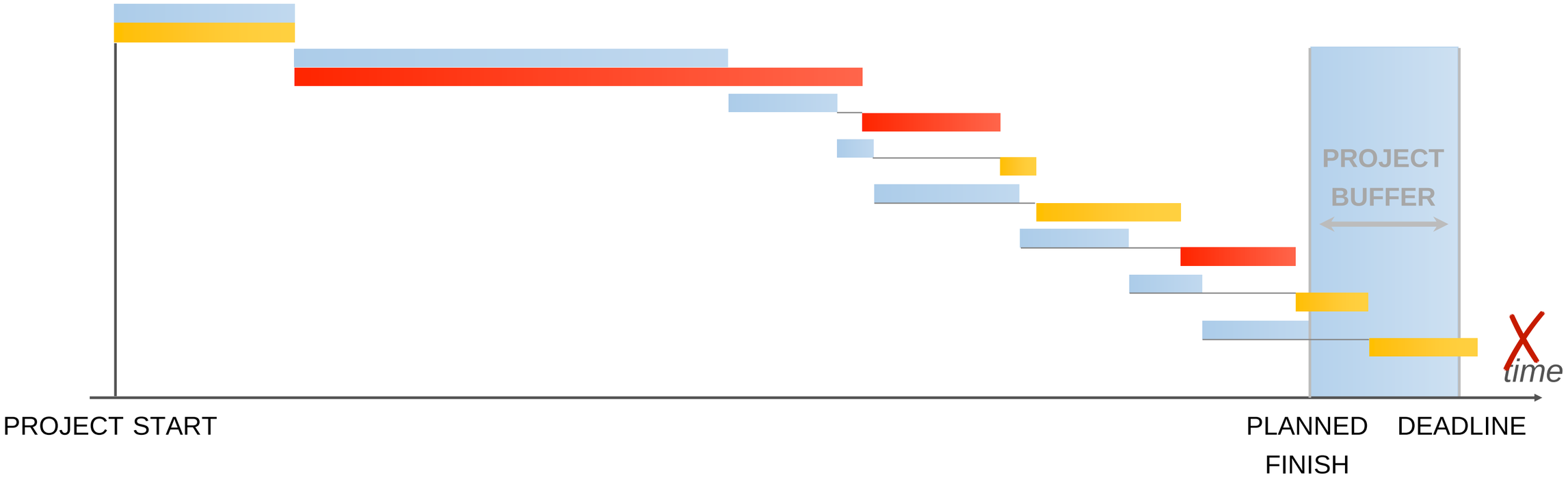

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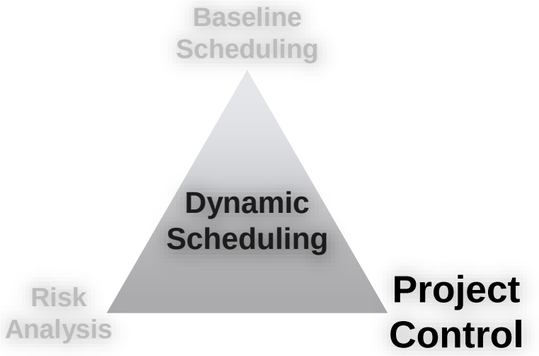

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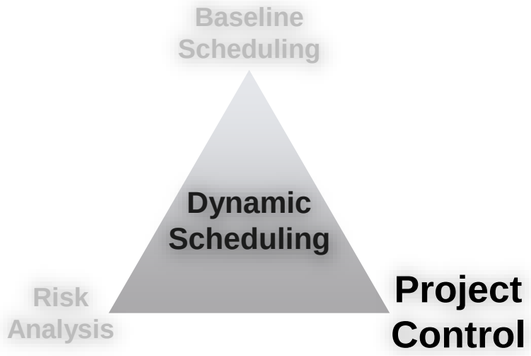

MEASURE

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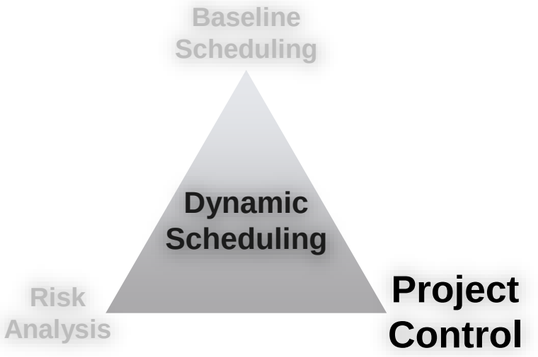

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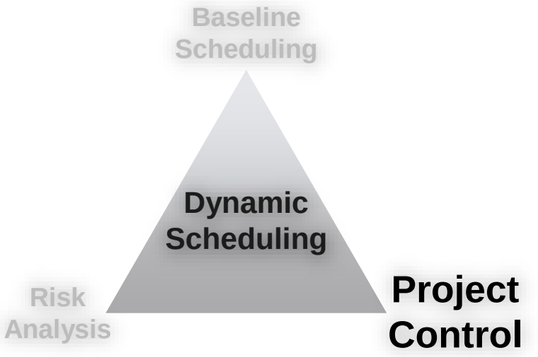

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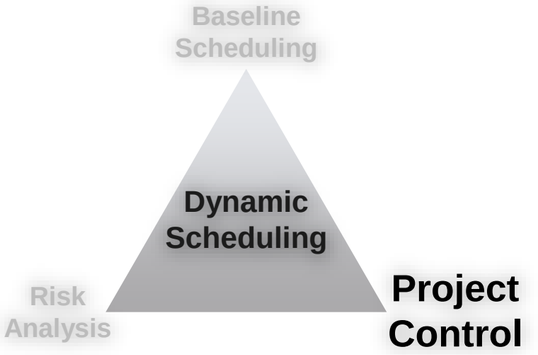

EARNED VALUE MANAGEMENT (EVM)

» progress at the project level

» in terms of planned value (PV), earned value (EV) and actual costs (AC)

» time and cost performance metrics: **SPI = EV/PV**

» SPI = 1: schedule progress as planned (EV = PV)

» SPI < 1: behind schedule (EV < PV)

» SPI > 1: ahead of schedule (EV > PV)

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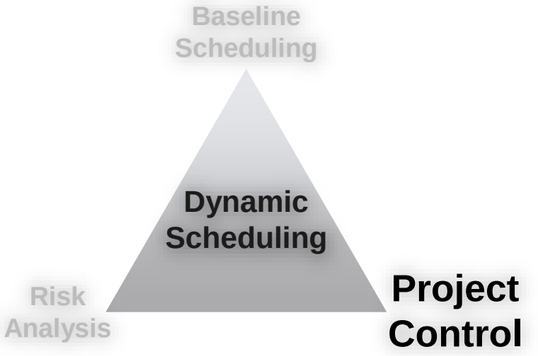
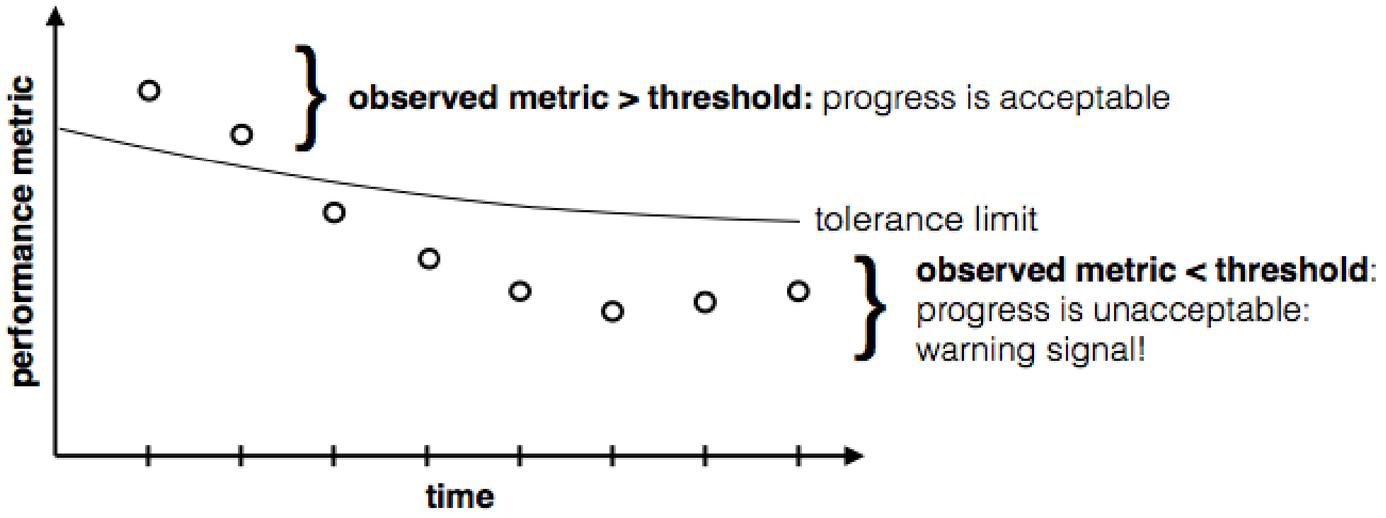


MEASURE → **EVALUATE** → TAKE ACTION

TOLERANCE LIMITS FOR PROJECT CONTROL

» thresholds for the performance metrics (for instance SPI)

» warning signals when performance metric is below the threshold



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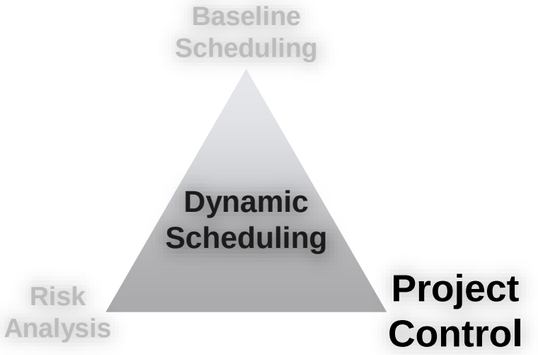

TOLERANCE LIMITS FOR PROJECT CONTROL

» thresholds for the performance metrics (for instance SPI)

» warning signals when performance metric is below the threshold

» different types:

- » *static tolerance limits*: rules of thumb
- » *statistical tolerance limits*: require historical data / Monte Carlo simulations
- » ***analytical tolerance limits***: require project-specific information

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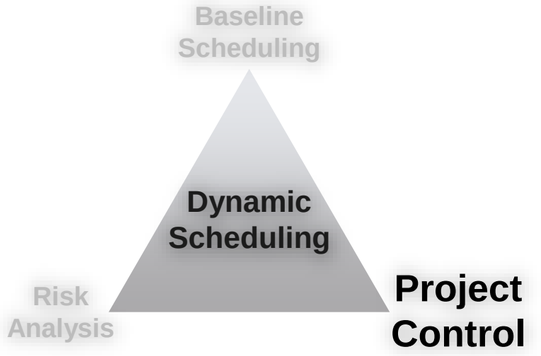

CORRECTIVE ACTIONS

» when warning signals are generated

» actions to get the project back on track

» *activity crashing*

» *fast tracking*

» *variability reducing*

» require managerial effort (time, money, resources…)

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BUFFER MANAGEMENT METHODS FOR PROJECT CONTROL

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BUFFER MANAGEMENT METHODS FOR PROJECT CONTROL

» Earned Value Management:

monitor progress during execution

» **Tolerance limits**:

generate warning signals

» **Corrective actions**:

get the project back on track

BUFFER MANAGEMENT METHODS FOR PROJECT CONTROL

» Project buffer: protect deadline against delays

» Focus on buffer consumption during execution

» Earned Value Management:

monitor progress during execution

» **Tolerance limits**:

generate warning signals

» **Corrective actions**:

get the project back on track

CHAPTER 1 - INTRODUCTION

BUFFER MANAGEMENT METHODS FOR PROJECT CONTROL

» Project buffer: protect deadline against delays

» Focus on buffer consumption during execution

» Earned Value Management:
monitor progress during execution

» **Tolerance limits**:
generate warning signals

» **Corrective actions**:
get the project back on track

» RQ_1. Progress evaluation: analytical tolerance limits for buffer consumption

» RQ_2. Corrective action taking: integration of analytical tolerance limits and corrective actions to achieve timely project completion

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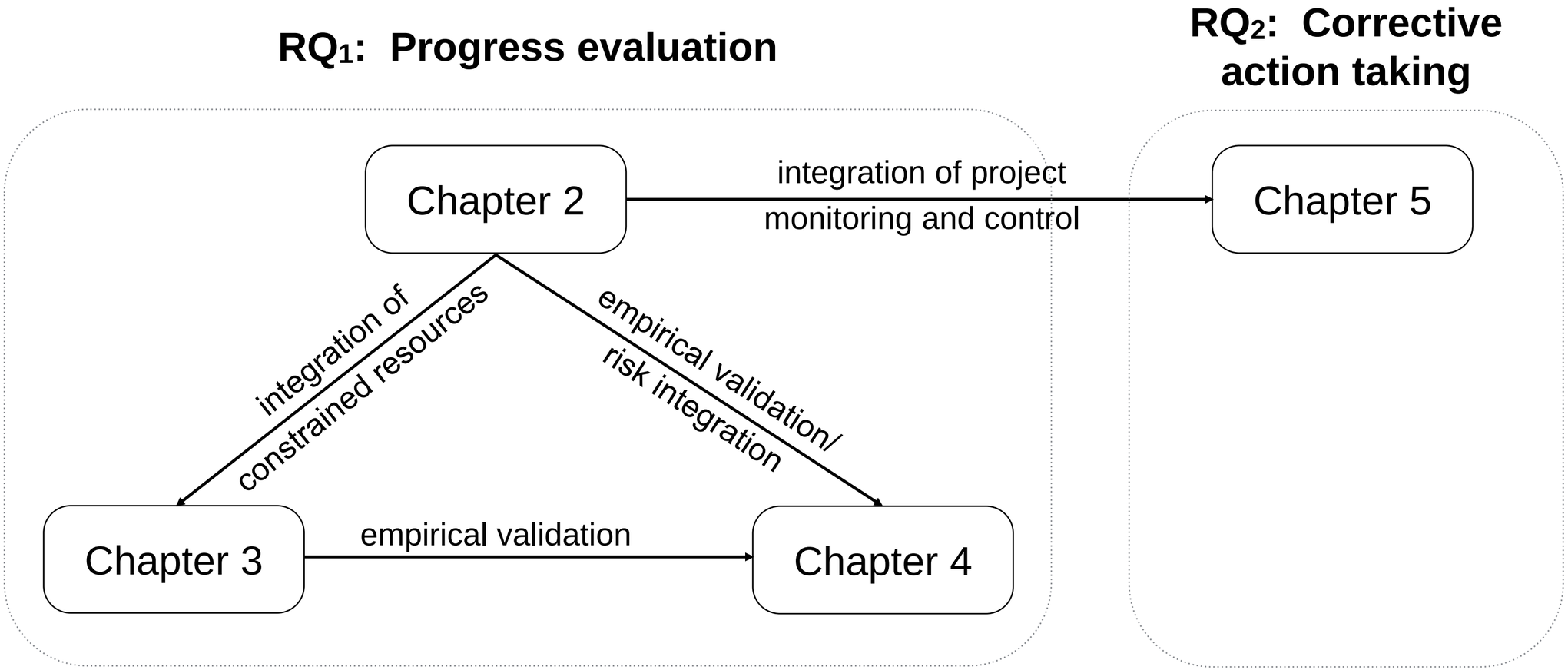

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» Introduction

» **Study 1**

» Study 2

» Study 3

» Study 4

» Conclusions

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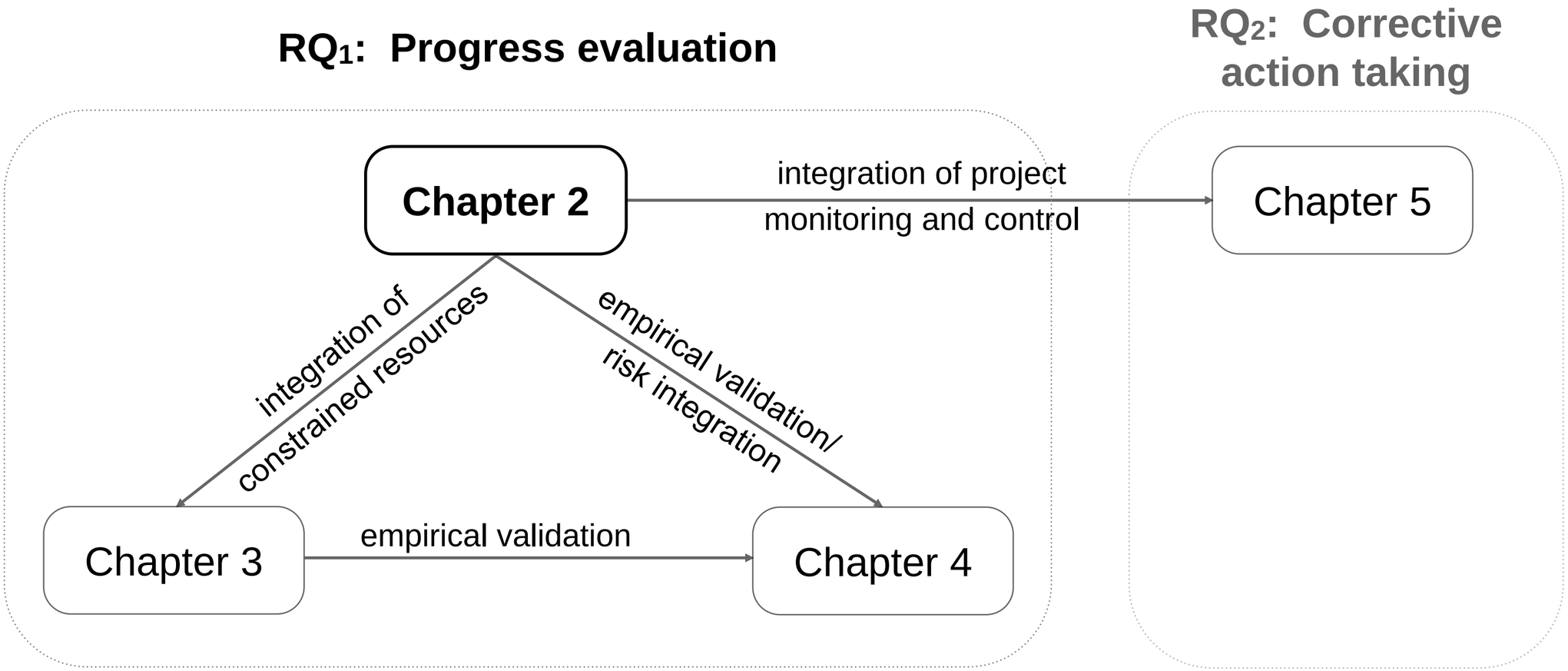
CHAPTER 2



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CHAPTER 2

GOAL Generate warning signals during project execution when deadline is expected to be exceeded

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» **correct warning signal:** warning signal for project that finishes late

» **false warning signal:** warning signal for project that finishes early or on time

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CHAPTER 2

GOAL Generate warning signals during project execution when deadline is expected to be exceeded

» **correct warning signal:** warning signal for project that finishes late

» **false warning signal:** warning signal for project that finishes early or on time

» **efficiency:**

probability that a project will finish late when warning signals are generated

» **reliability:**

probability that a project will finish on time when no warning signals are generated

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CHAPTER 2

GOAL Generate warning signals during project execution when deadline is expected to be exceeded

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GOAL Generate warning signals during project execution when deadline is expected to be exceeded

APPROACH Construction of analytical tolerance limits for the buffer consumption using a cost perspective

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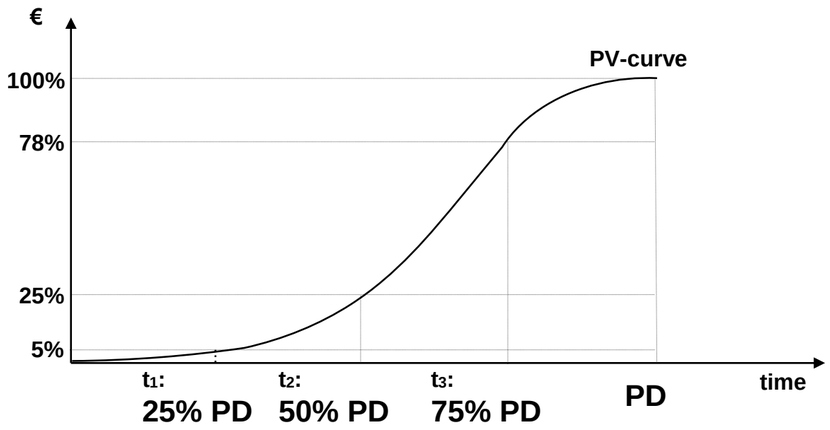
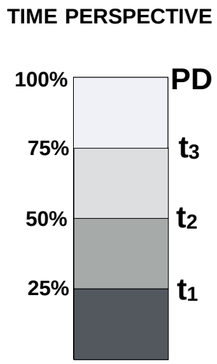
APPROACH Construction of analytical tolerance limits for the buffer consumption using a cost perspective





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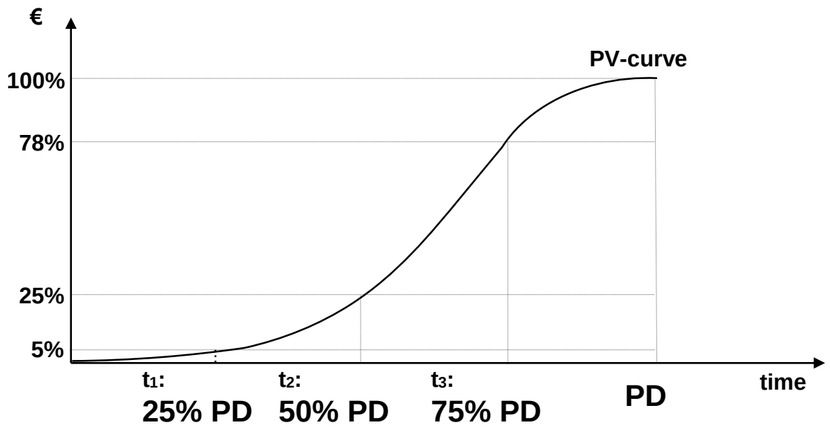
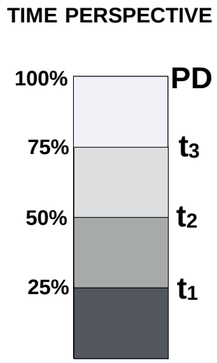
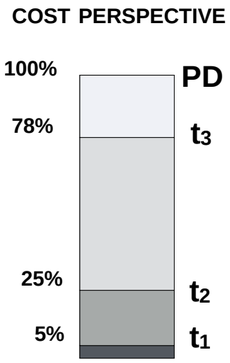
APPROACH Construction of analytical tolerance limits for the buffer consumption using a cost perspective







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CHAPTER 2

GOAL Generate warning signals during project execution when deadline is expected to be exceeded

APPROACH Construction of analytical tolerance limits for the buffer consumption using a cost perspective

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CHAPTER 2

GOAL Generate warning signals during project execution when deadline is expected to be exceeded

APPROACH Construction of analytical tolerance limits for the buffer consumption using a cost perspective

VALIDATION Monte Carlo simulation
» scenario analysis
» sensitivity analysis

RESULTS Equal reliability
Improved efficiency: especially for parallel projects

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» Introduction

» Study 1

» **Study 2**

» Study 3

» Study 4

» Conclusions

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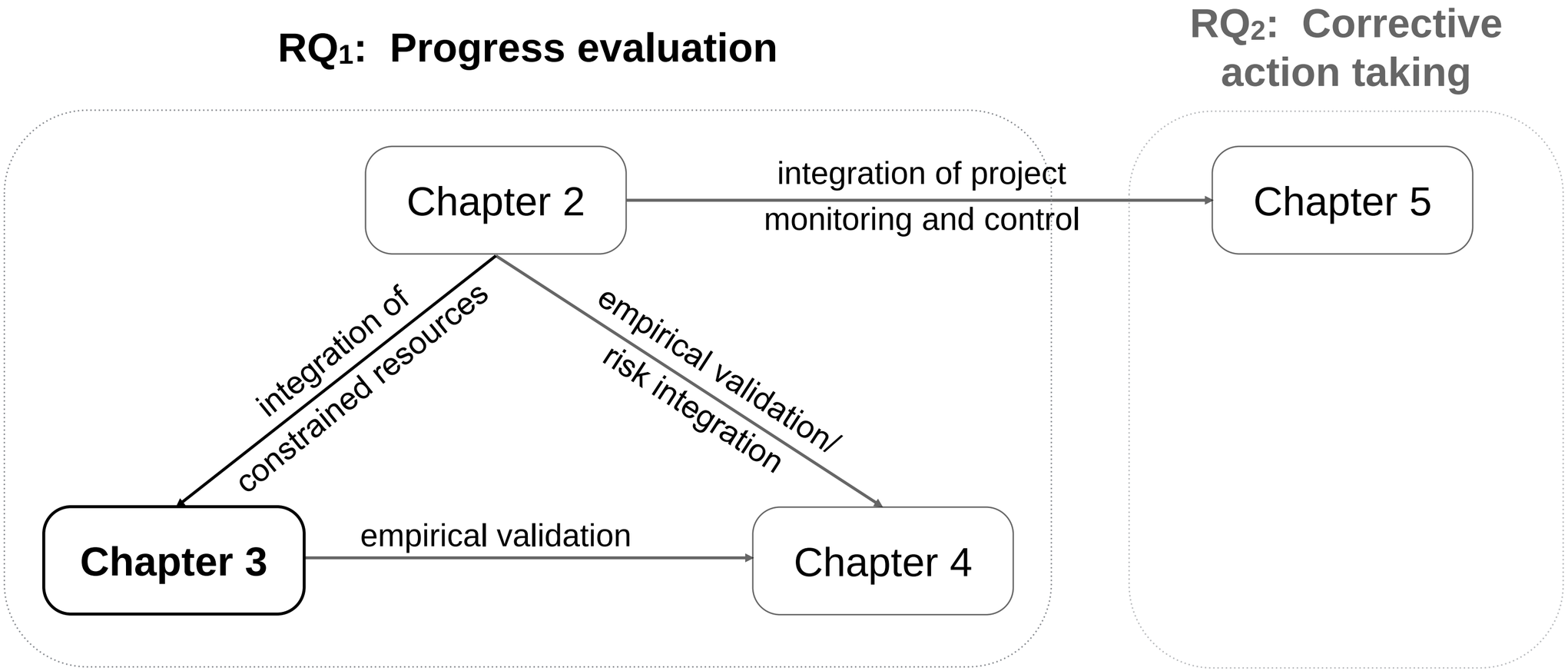
CHAPTER 3



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CHAPTER 3

GOAL Improve the efficiency and reliability of ATLs by considering a resource perspective

APPROACH
» focus on activity work content instead of activity cost
» focus on *shiftability* of the project phases

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CHAPTER 3

GOAL Improve the efficiency and reliability of ATLs by considering a resource perspective

APPROACH
» focus on activity work content instead of activity cost
» focus on *shiftability* of the project phases

VALIDATION Monte Carlo simulation
» impact of execution policies
» impact of SP and RC

RESULTS Improved efficiency compared to cost limits
Especially for projects with a substantial *shiftability*

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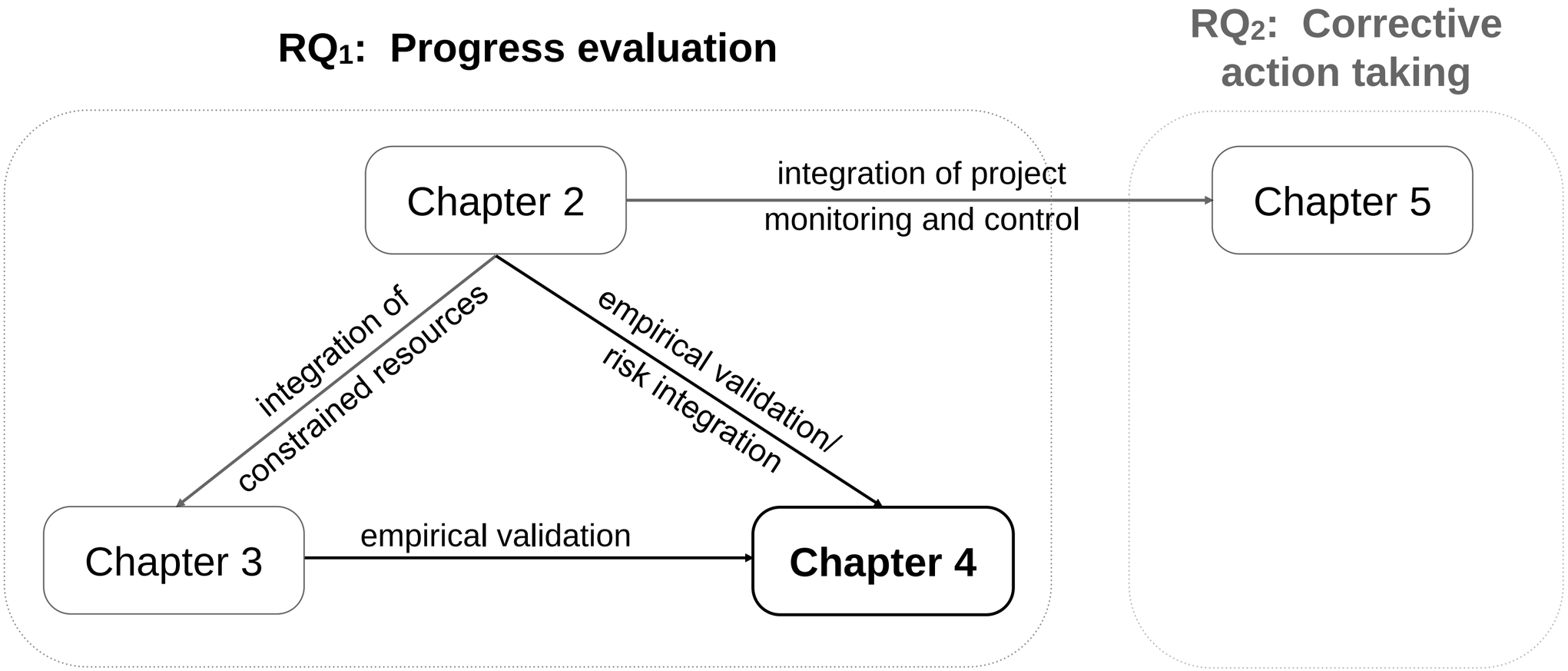
CHAPTER 4



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CHAPTER 4

GOAL » Improve the efficiency and reliability of ATLs by considering a risk perspective
» Empirical validation of time, cost, resource and risk limits

APPROACH Focus on activity risk level

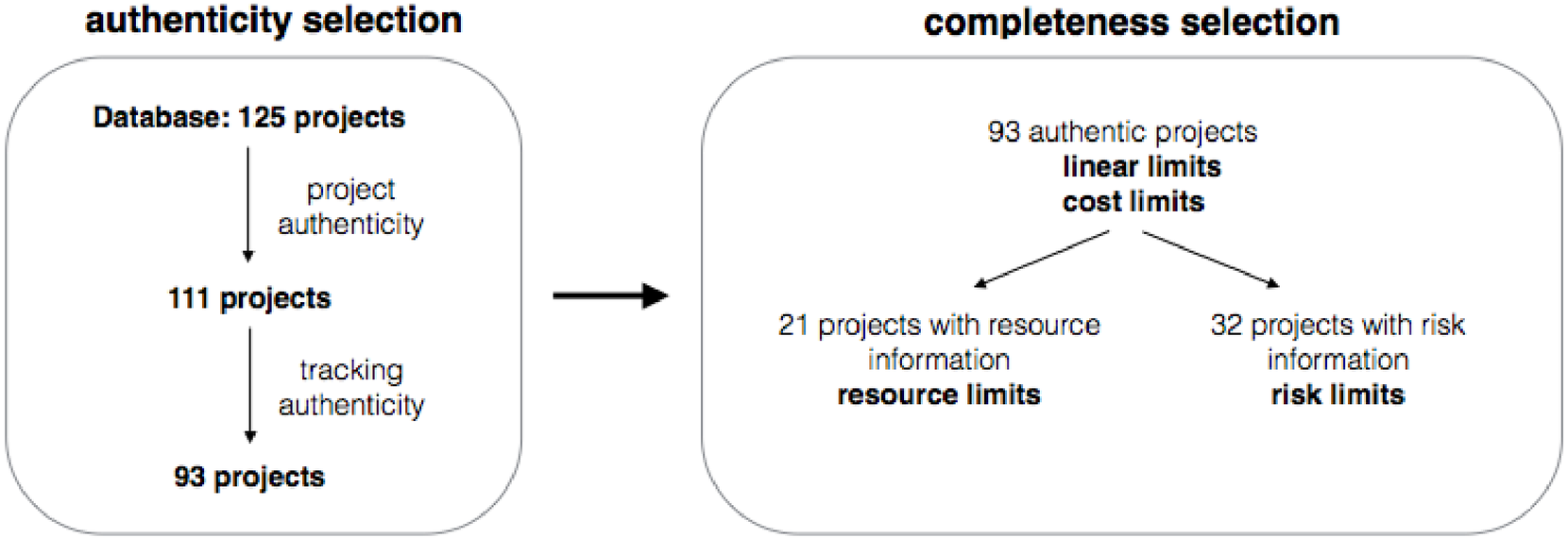
VALIDATION Empirical database (Batselier & Vanhoucke, 2015)

CHAPTER 4

GOAL » Improve the efficiency and reliability of ATLs by considering a risk perspective
» Empirical validation of time, cost, resource and risk limits

APPROACH Focus on activity risk level

VALIDATION Empirical database (Batselier & Vanhoucke, 2015)



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GOAL
» Improve the efficiency and reliability of ATLs by considering a risk perspective
» Empirical validation of time, cost, resource and risk limits

APPROACH Focus on activity risk level

VALIDATION Empirical database (Batselier & Vanhoucke, 2015)

RESULTS
» **RESOURCE LIMITS** highest efficiency *(Ch. 3)*
» **RISK LIMITS** valuable alternative in case of insufficient data on resources *(Ch. 4)*
» **COST LIMITS** valuable alternative for irregular projects *(Ch. 2)*
» **LINEAR LIMITS** sufficient for regular projects *(Colin & Vanhoucke 2015)*

» Introduction

» Study 1

» Study 2

» Study 3

» **Study 4**

» Conclusions

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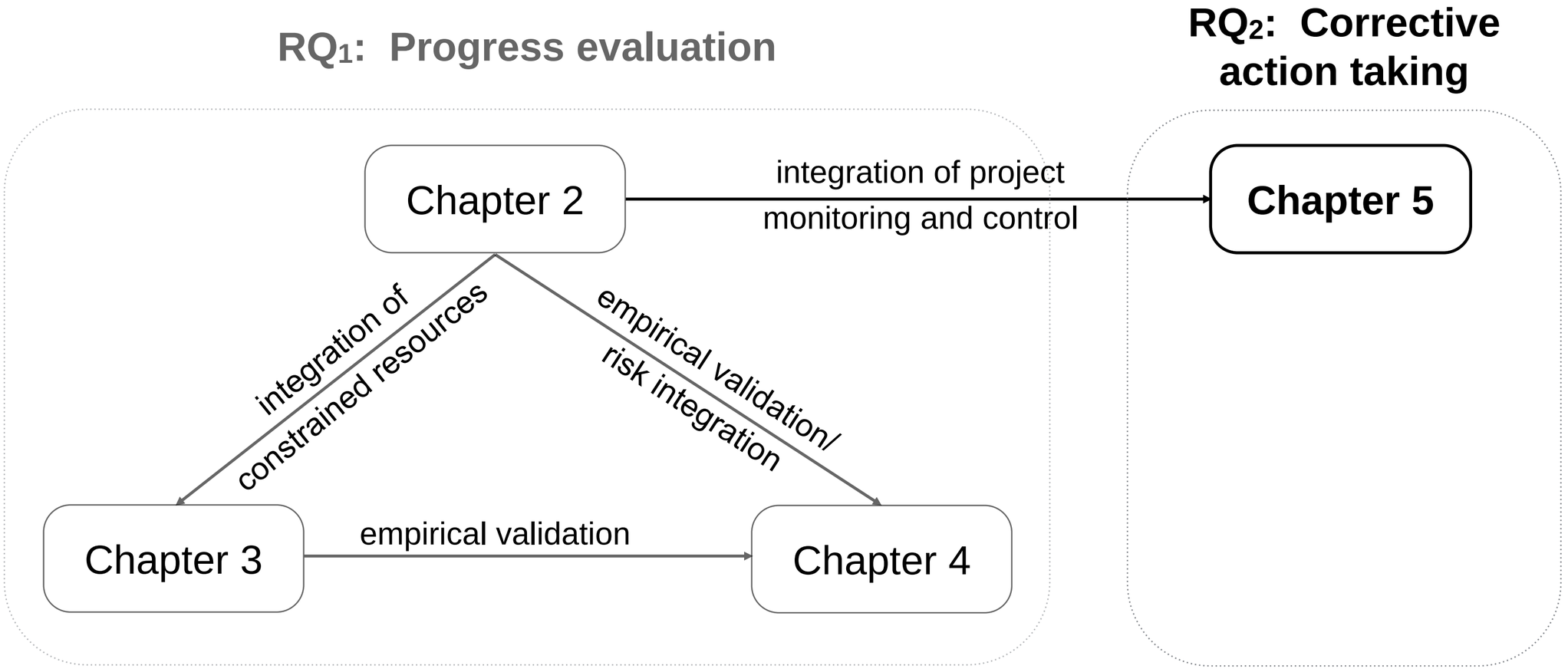
CONCLUSIONS



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CHAPTER 5

GOAL Integrate project monitoring with the corrective action taking process

» project monitoring: generate warning signals that act as triggers for action

» corrective actions: take actions to get the project back on track

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» project monitoring: generate warning signals that act as triggers for action

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APPROACH Combine ATLs of Chapter 2 with variability reducing corrective actions

» limited effort budget: define relation between applied effort and impact of actions

» different strategies to select the activities to take corrective actions on

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» project monitoring: generate warning signals that act as triggers for action

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» limited effort budget: define relation between applied effort and impact of actions

» different strategies to select the activities to take corrective actions on

» CORRECTIVE STRATEGY	FOCUS ON ONGOING ACTIVITIES
» PREVENTIVE STRATEGY	FOCUS ON FUTURE ACTIVITIES
» HYBRID STRATEGY	FOCUS ON ONGOING AND FUTURE ACTIVITIES

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» limited effort budget: define relation between applied effort and impact of actions

» different strategies to select the activities to take corrective actions on

VALIDATION Monte Carlo simulation

RESULTS Parallel projects: corrective and hybrid strategy are most effective

Serial projects: preventive strategy is most effective

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» INTRODUCTION

» STUDY 1

» STUDY 2

» STUDY 3

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» **CONCLUSIONS**

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CHAPTER 6 - CONCLUSIONS

RQ_1. PROGRESS EVALUATION:

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CHAPTER 6 - CONCLUSIONS

RQ_1. PROGRESS EVALUATION:

» Analytical tolerance limits combine the **advantages** of static and statistical tolerance limits

» No historical data or simulated data required: *easy to implement*

» Incorporation of project-specific characteristics: *efficient and reliable*

CHAPTER 6 - CONCLUSIONS

RQ_1. PROGRESS EVALUATION:

» Analytical tolerance limits combine the **advantages** of static and statistical tolerance limits

» No historical data or simulated data required: *easy to implement*

» Incorporation of project-specific characteristics: *efficient and reliable*

» Different **perspectives** can be considered

» Resource perspective: most efficient, requires the most project-specific information

» Risk perspective: valuable alternative when resource information is not available

» Cost perspective: efficient for irregular projects

Chapter 6 - Conclusions

RQ_2. Corrective action taking:

CHAPTER 6 - CONCLUSIONS

RQ_2. CORRECTIVE ACTION TAKING:

» Both an efficient monitoring process and an adequate corrective action taking procedure are required to achieve project success

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CHAPTER 6 - CONCLUSIONS

RQ_2. CORRECTIVE ACTION TAKING:

» Both an efficient monitoring process and an adequate corrective action taking procedure are required to achieve project success

» The most appropriate control strategy depends on the topological network structure of projects

  » Parallel projects: corrective/hybrid strategy

  » Serial projects: preventive strategy

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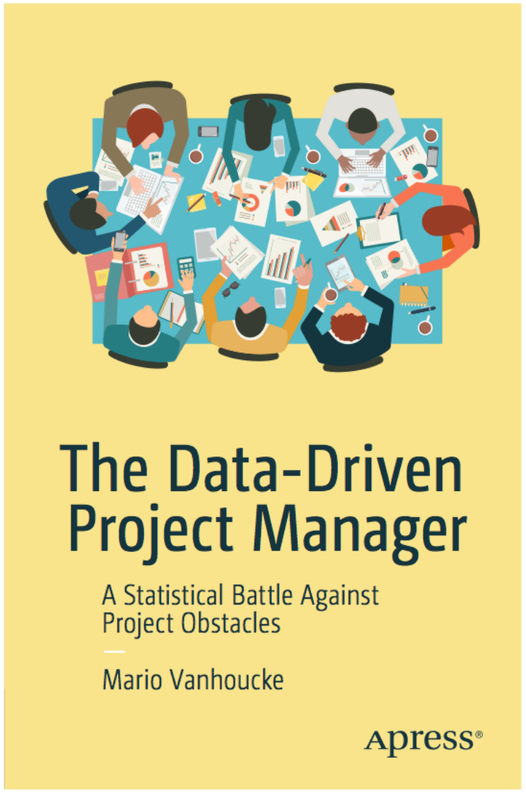

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