IGLC 28
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INTERNATIONAL GROUP FOR LEAN CONSTRUCTION

DIGITAL VISUAL MANAGEMENT TOOLS IN DESIGN MANAGEMENT

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1. Introduction

2. Digital VM tools in design

3. Research Method

4. Results

Analysis of VM tools

Discussion

5. Final comments

DIGITAL VISUAL MANAGEMENT TOOLS IN DESIGN MANAGEMENT

INTRODUCTION

Lack of knowledge

The links between VM and information technology has been poorly explored in the literature (Tezel et al. 2015; Tezel and Aziz 2017), and there are few studies exploring the implementation of VM in design (Tjell and Bosch-Sijtsema, 2015; Tezel, 2011)

The paper explores **benefits and barriers of digital VM tools in design**.

It describes **digital VM solutions adopted in the design management process** of two infrastructure projects, focusing on **design planning, control and coordination**.

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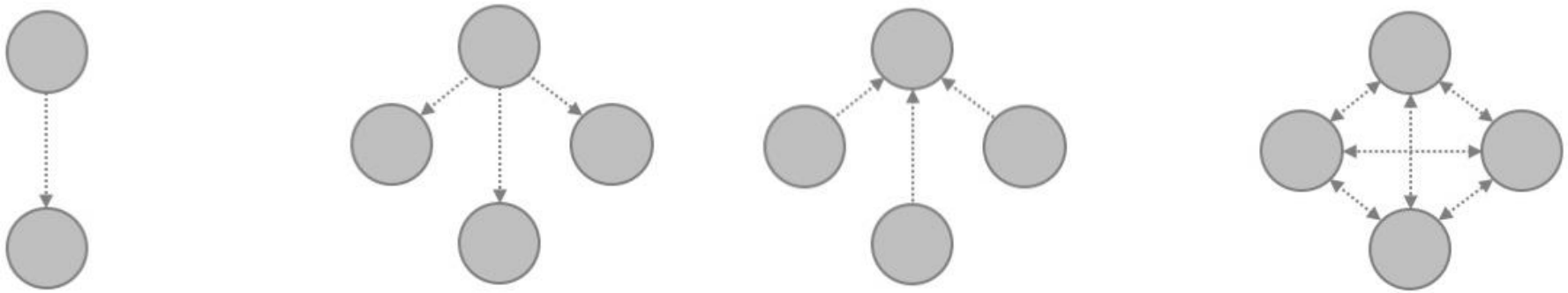
TAXONOMY OF VM SYSTEMS

One to one | **One to many or Many to one** | **Many to many**



(Adapted from Brandalise, 2018)

VISUAL MANAGEMENT CONCEPTS

Simplicity of functioning

(Saurin et al. 2006; Liker and Hoseus 2009)

Information Standardisation

(Alarcón and Mardones 1998; Laine et al. 2014)

Autonomy to plan and control

(Hopp and Spearman 2004; Liker 2004; Valente et al. 2019)

Right amount of information available

(Ohno 1988; Greif 1991; Sacks et al. 2010; Lee 2018)

Easy accessibility of information

(Tezel et al. 2016; Valente et al. 2019)

Flexibility

(Barth et al. 2019; Eppler and Bresciani 2013; Lindlöf 2014)

Information traceability

(Whyte et al. 2016)

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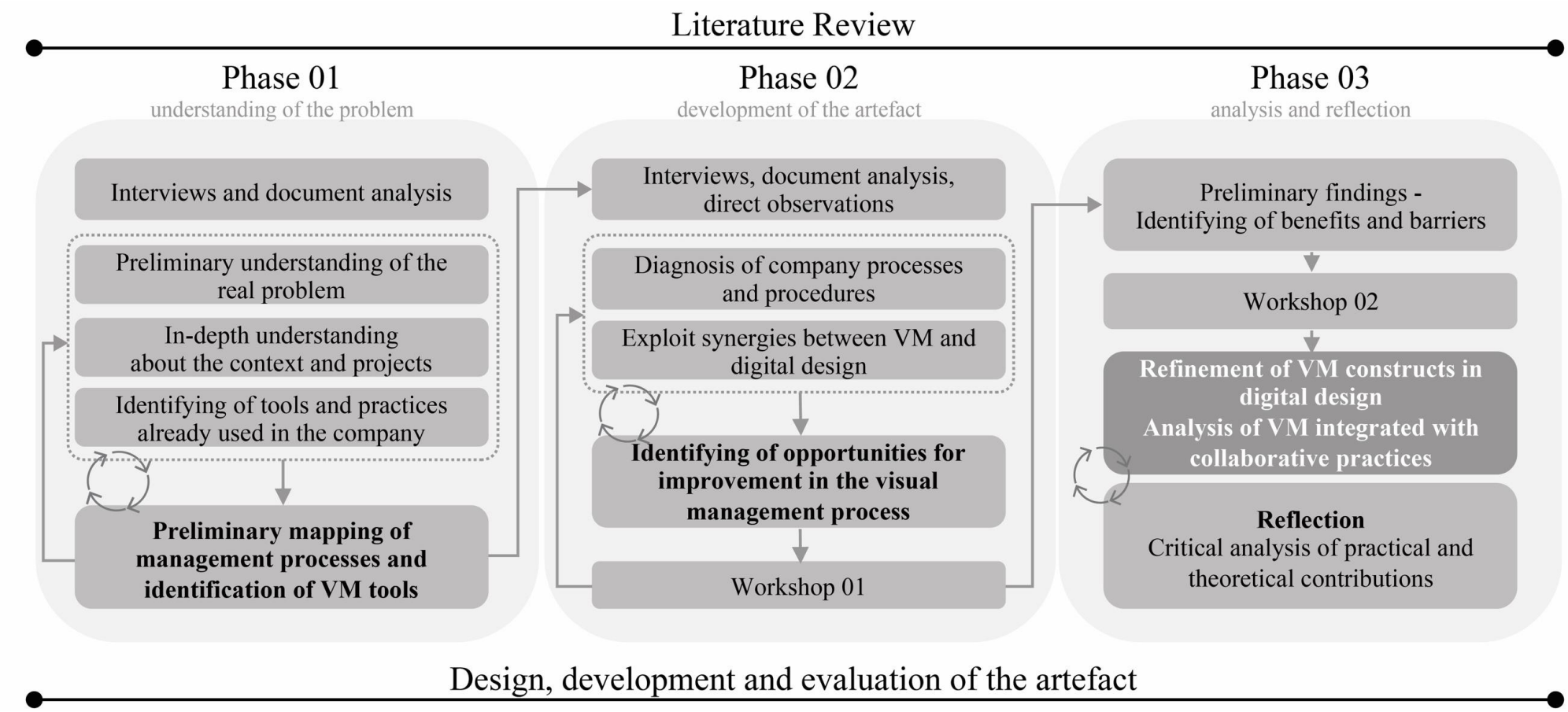
DESIGN SCIENCE RESEARCH (DSR)



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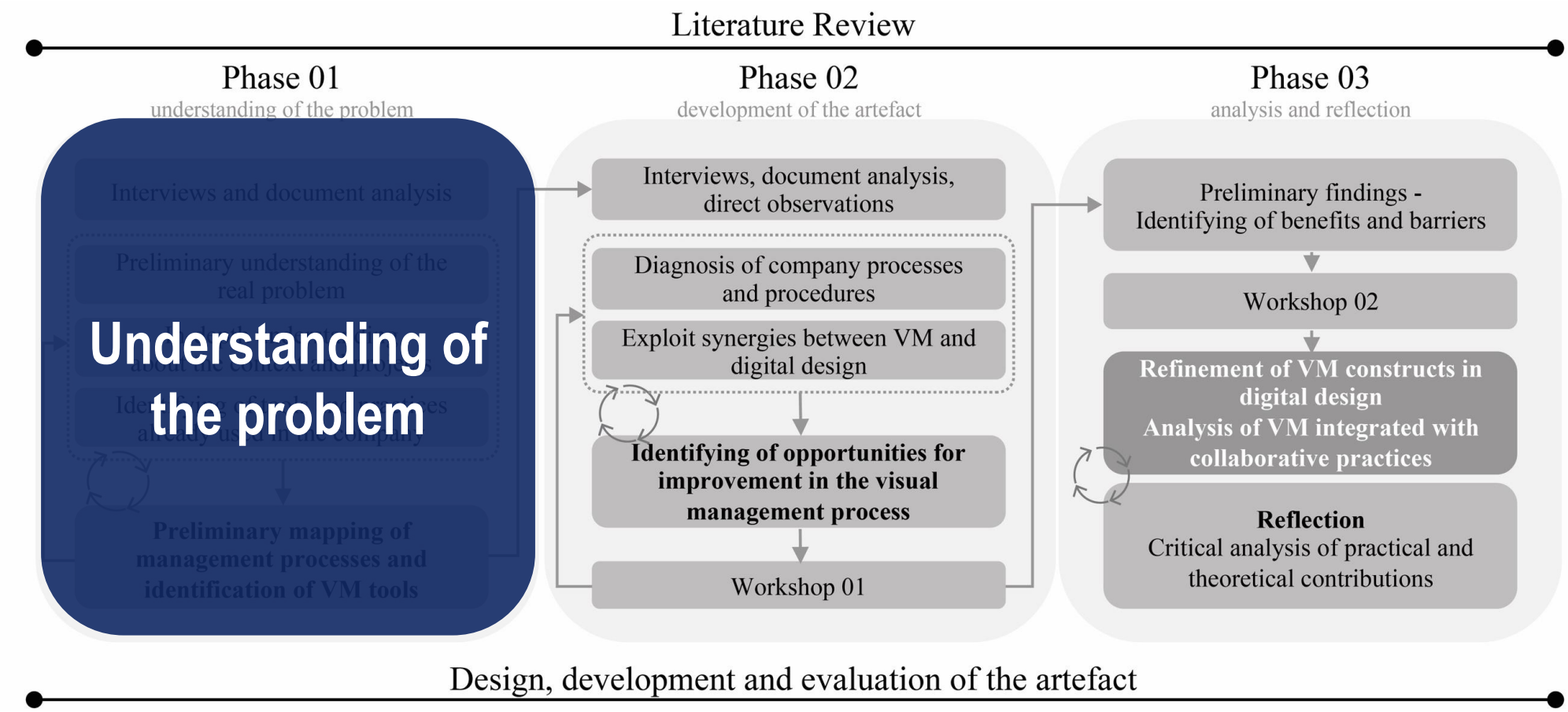

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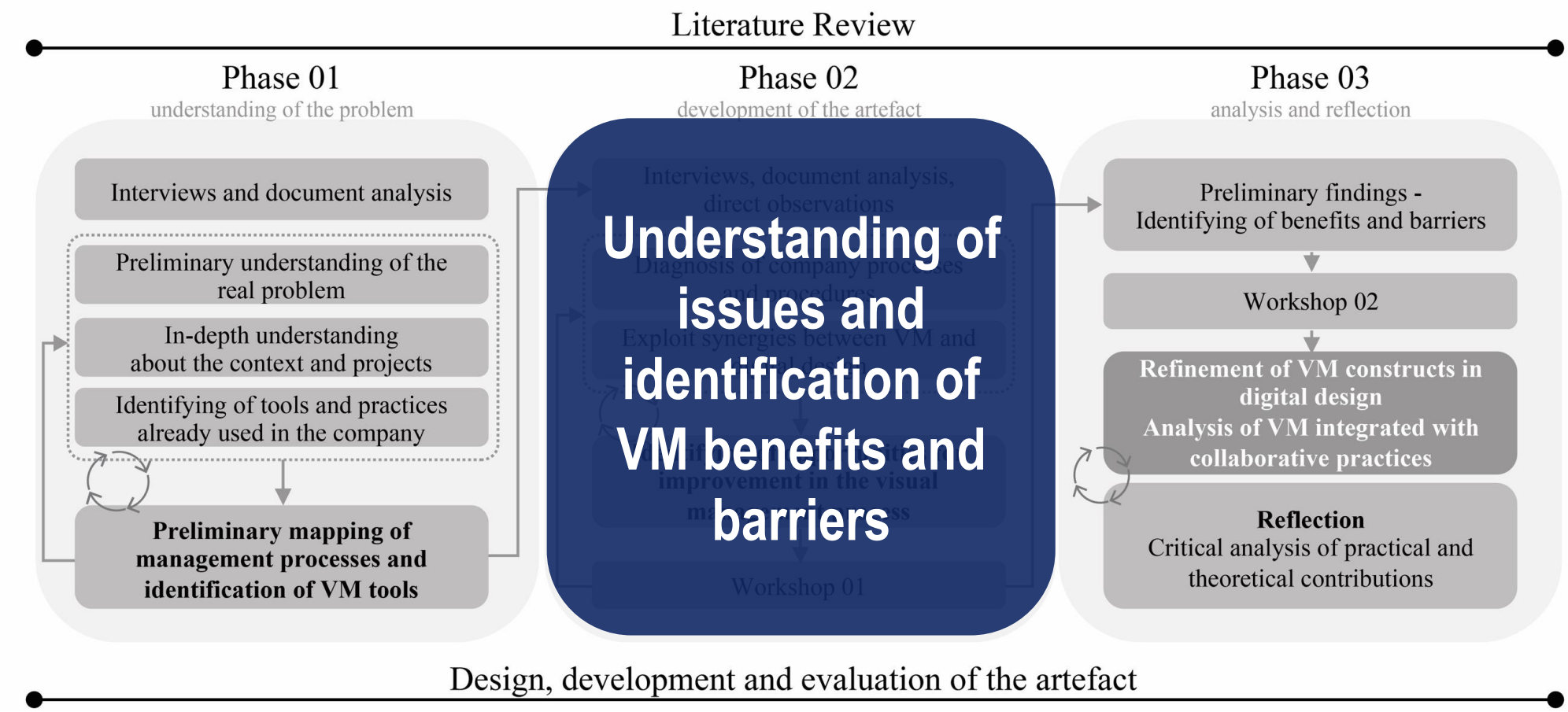
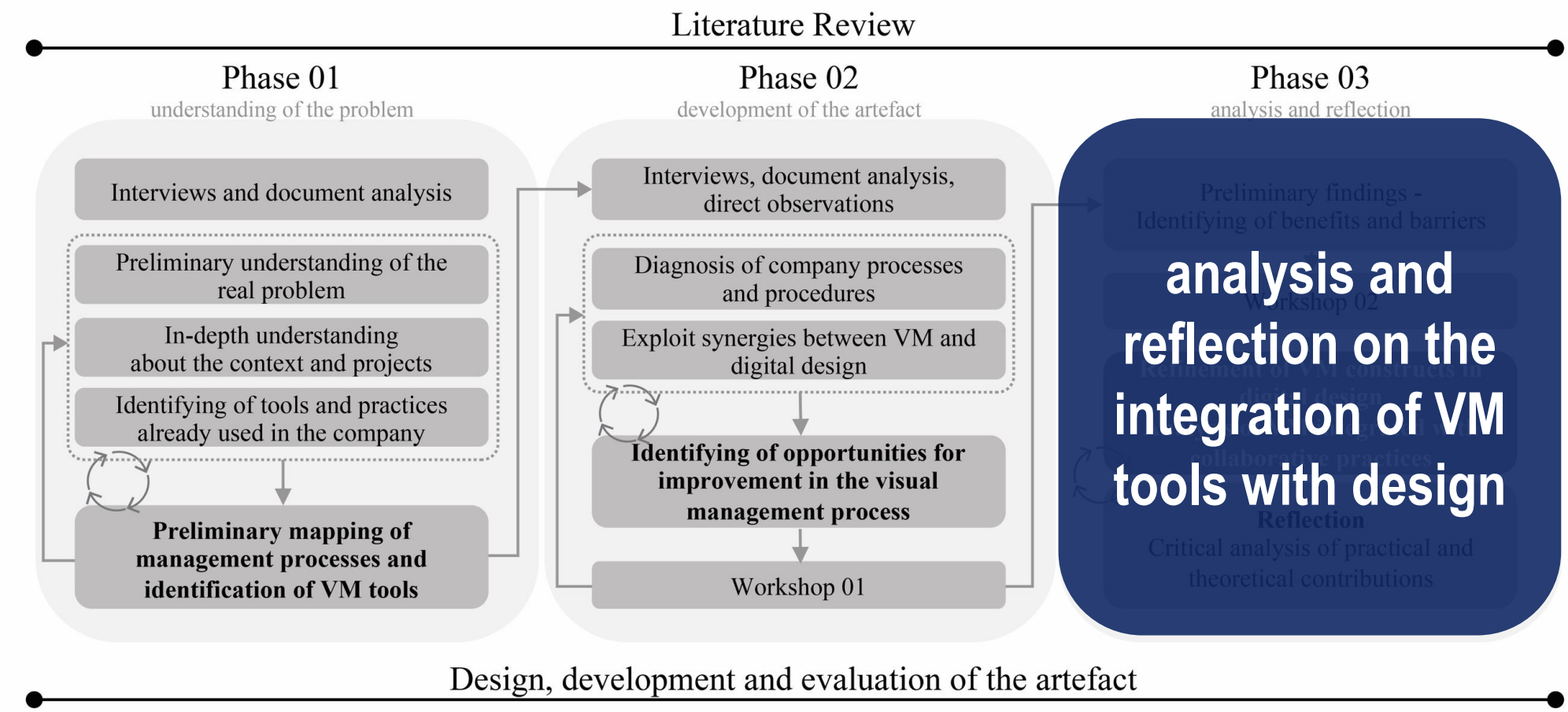


DESIGN SCIENCE RESEARCH (DSR)



DESIGN SCIENCE RESEARCH (DSR)

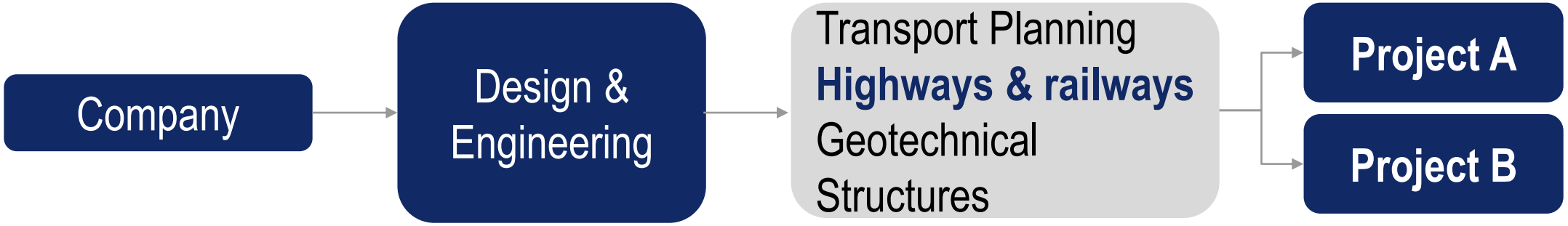
09 interviews

12 Direct observation
Project meetings

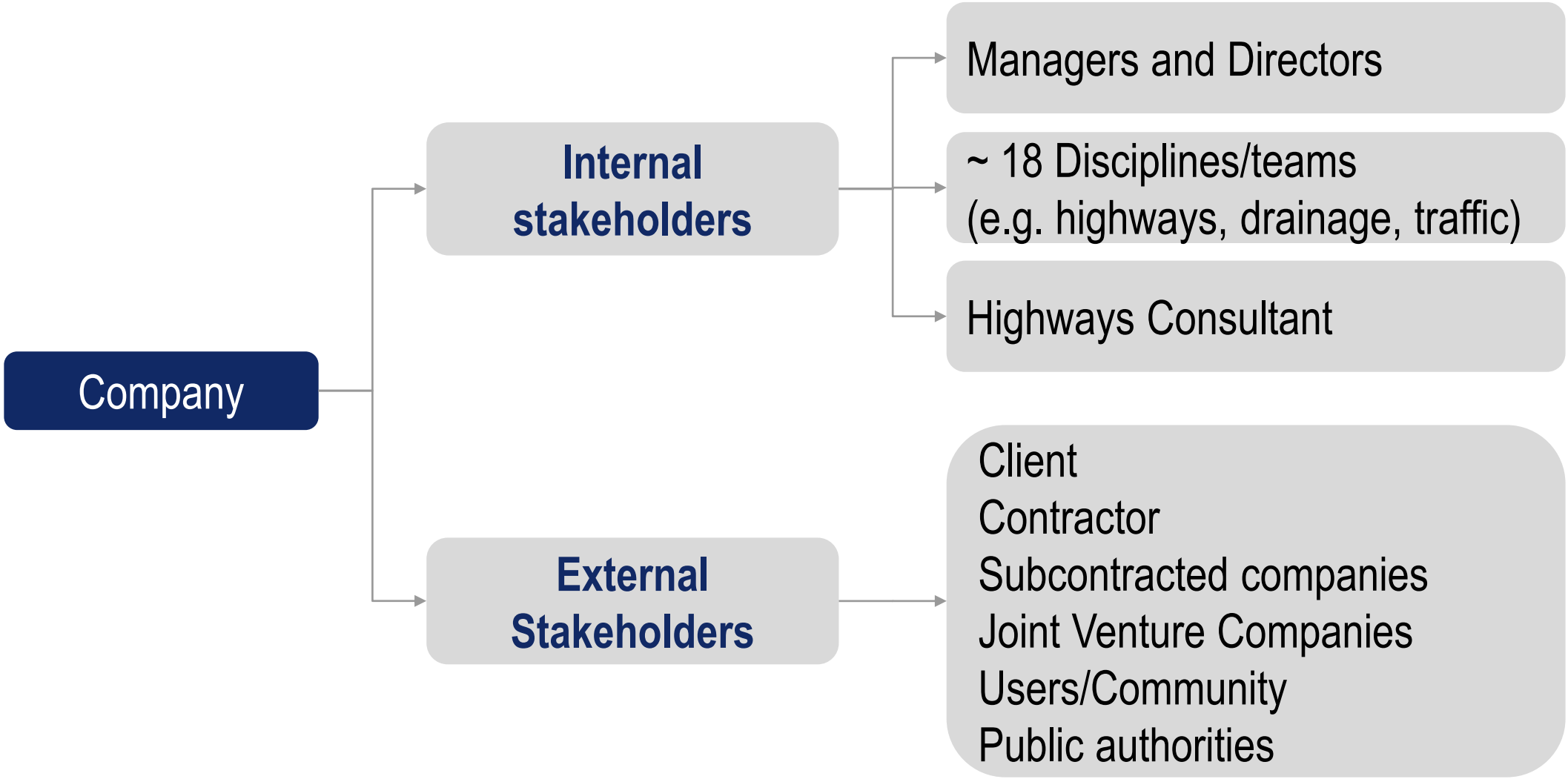
Documents and tools analysis

02 workshops with key members

THE COMPANY DESCRIPTION



THE COMPANY'S STAKEHOLDERS



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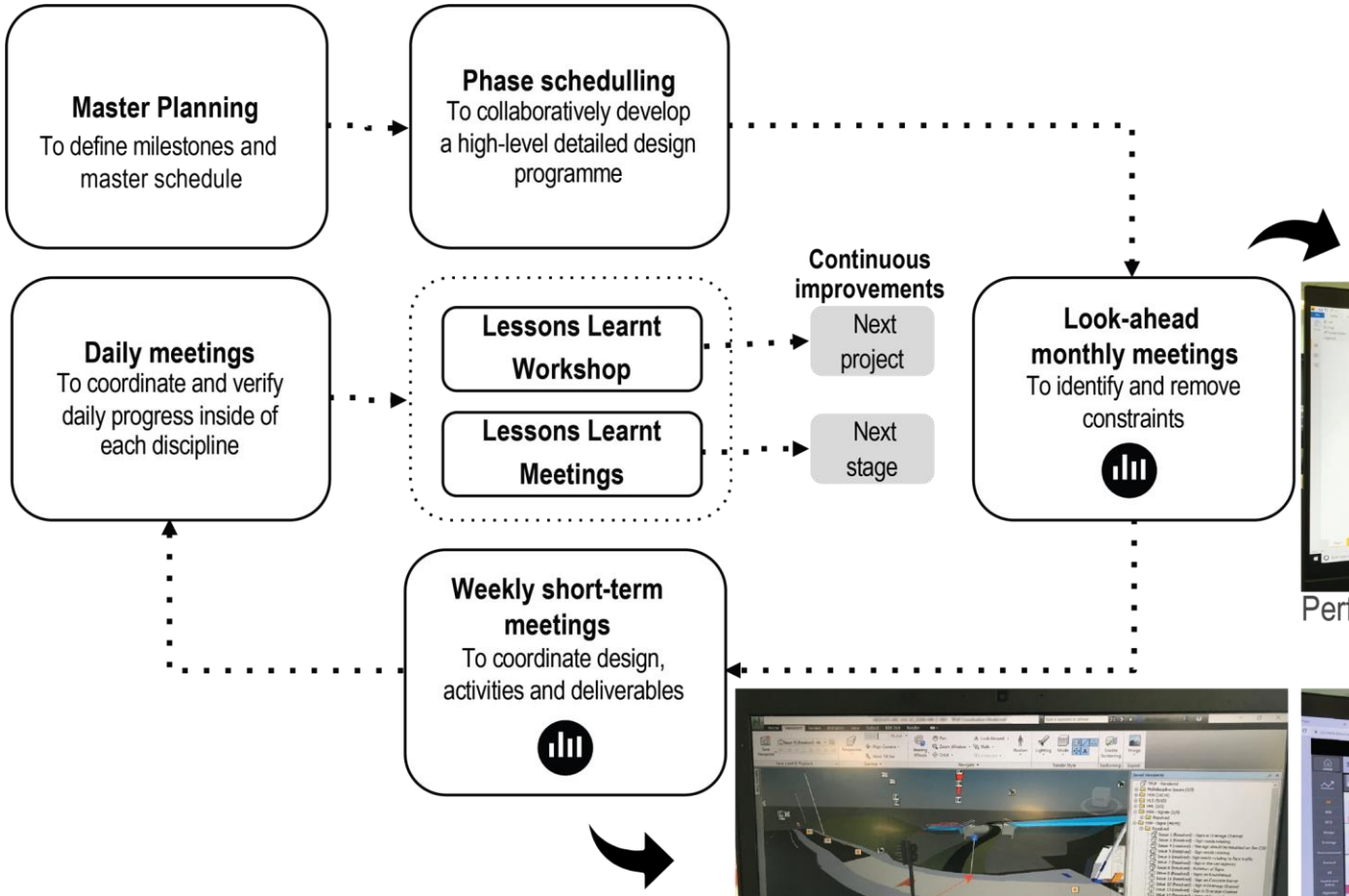
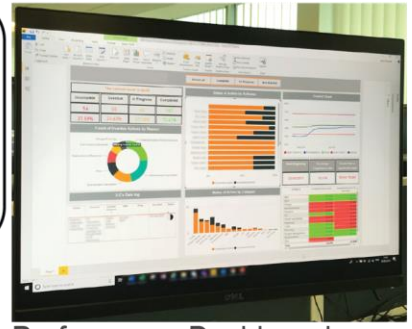
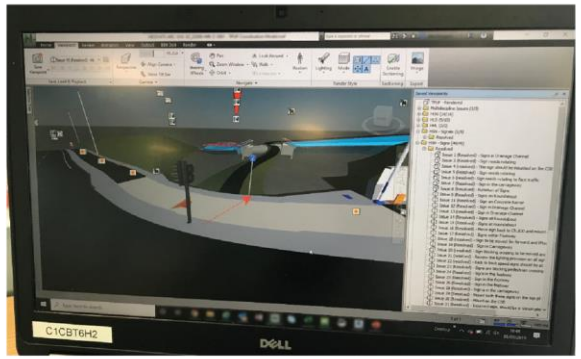
ANALYSIS OF VM TOOLS

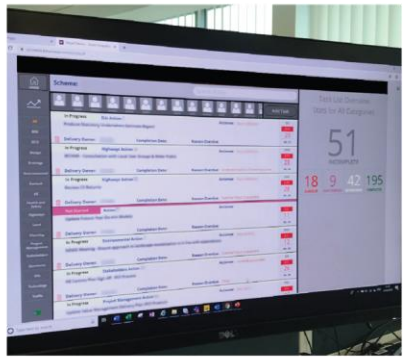
VM tools were used to support:

- **design planning and control**
- **coordination**.




Performance Dashboard

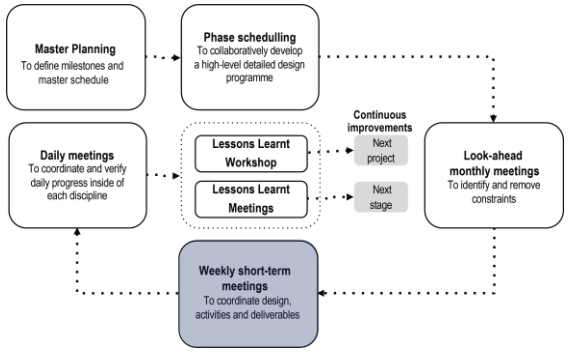

Clash Detection and Visualisation Tool


Activities Tracker

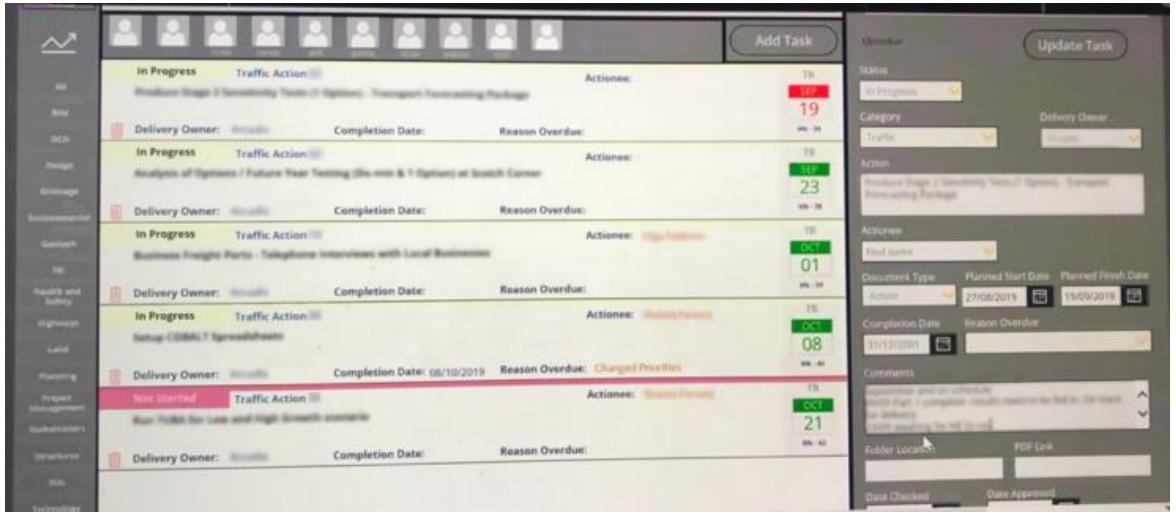
DESCRIPTION OF TOOLS

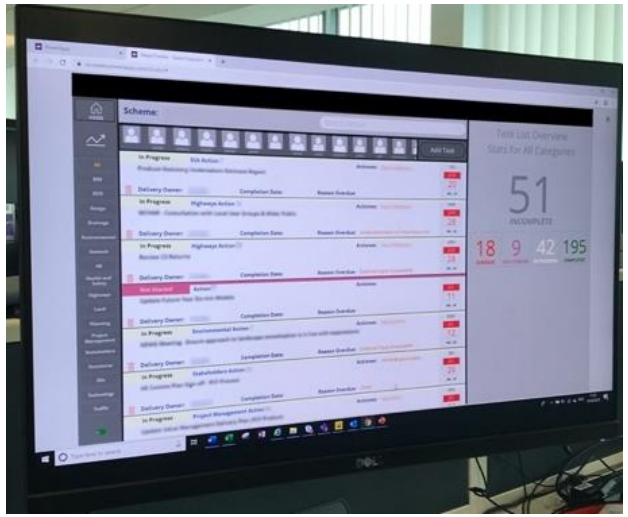
ACTIVITIES TRACKER

Aim: assist in the control of activities by design discipline, and update the tasks and actions



Virtual meetings

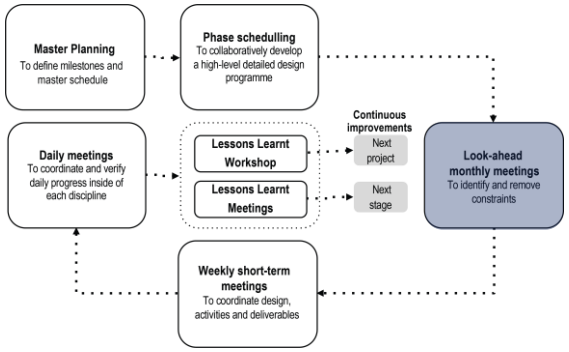




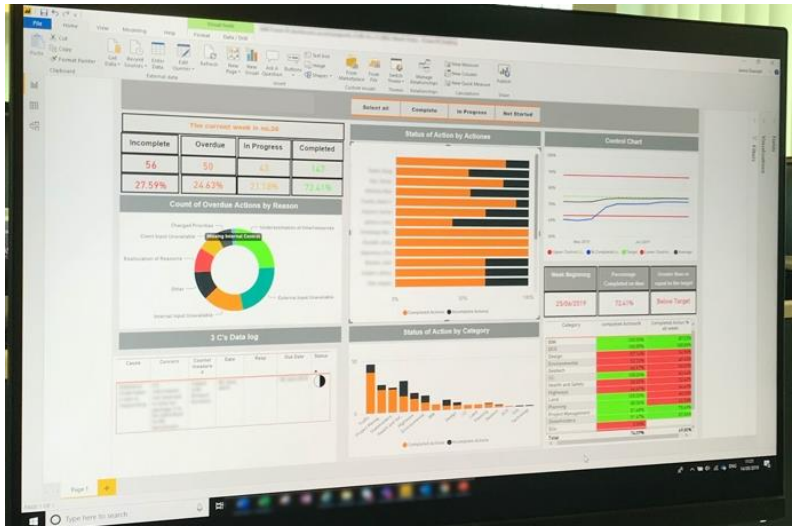
DESCRIPTION OF TOOLS

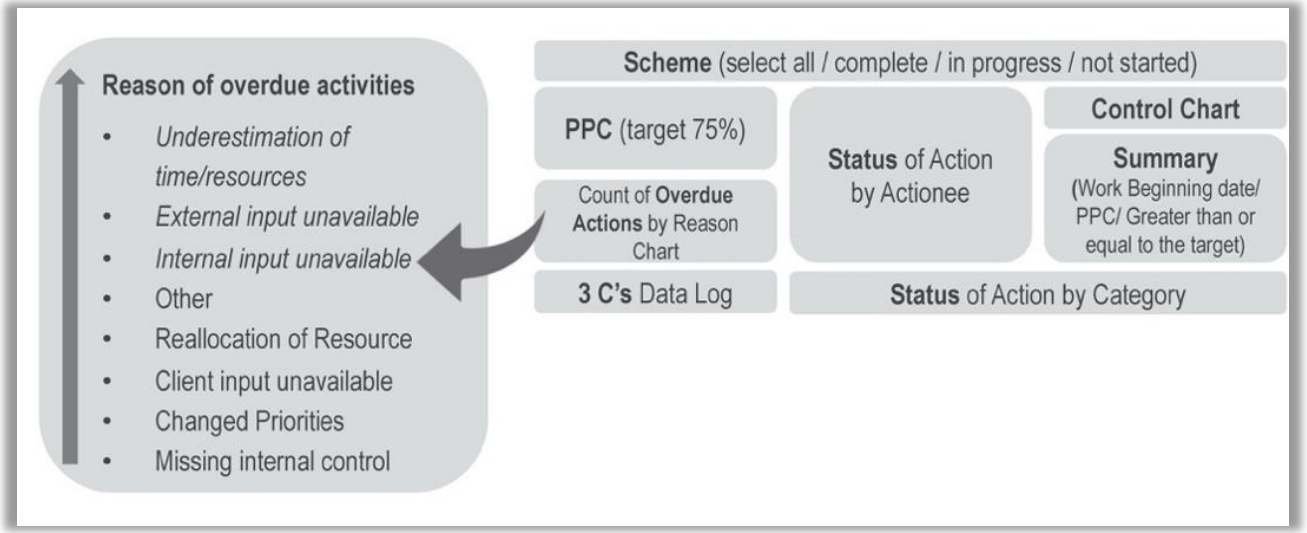
PERFORMANCE DASHBOARD

Aim: display planning and control performance metrics, e.g. reasons for the non-completion, PPC, and 3C's



Virtual and face-to-face meetings

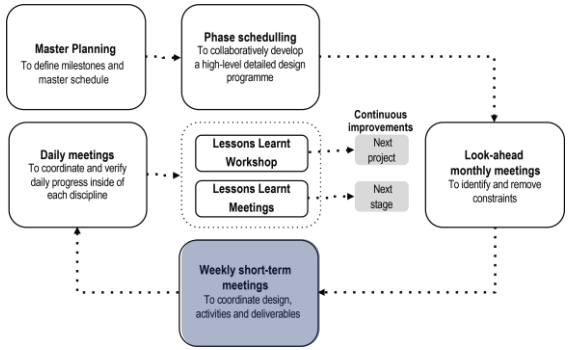




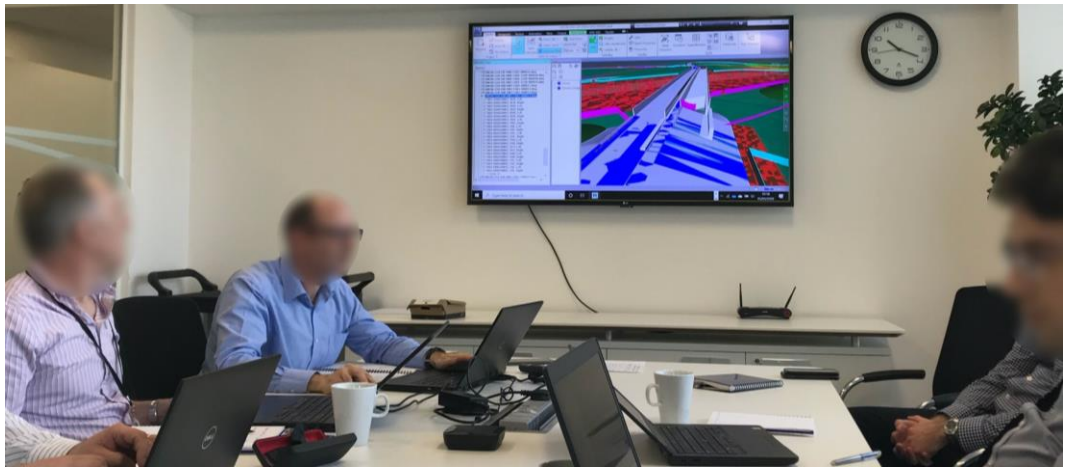
DESCRIPTION OF TOOLS

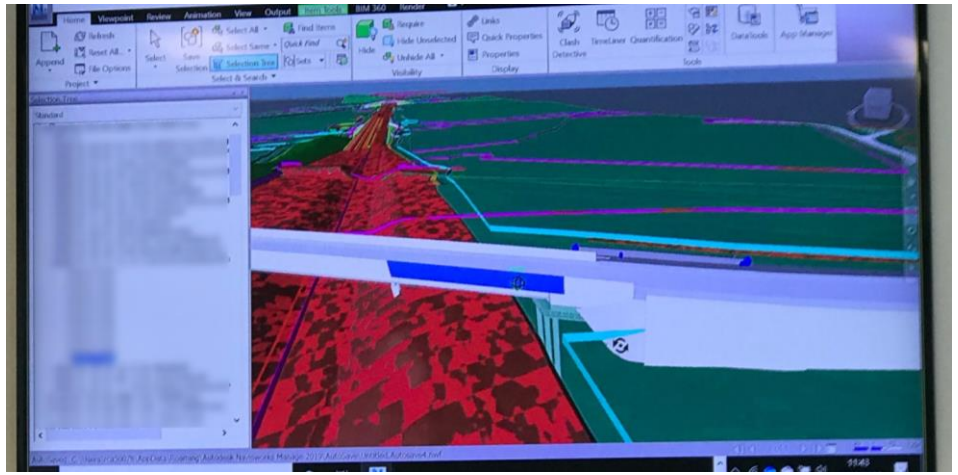
CLASH DETECTION AND VISUALISATION TOOL

Aim: identify clashes between disciplines, visualise combined models and help assure the quality processes between disciplines



Virtual and face-to-face meetings





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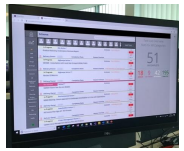
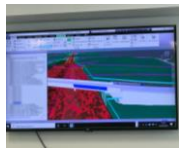
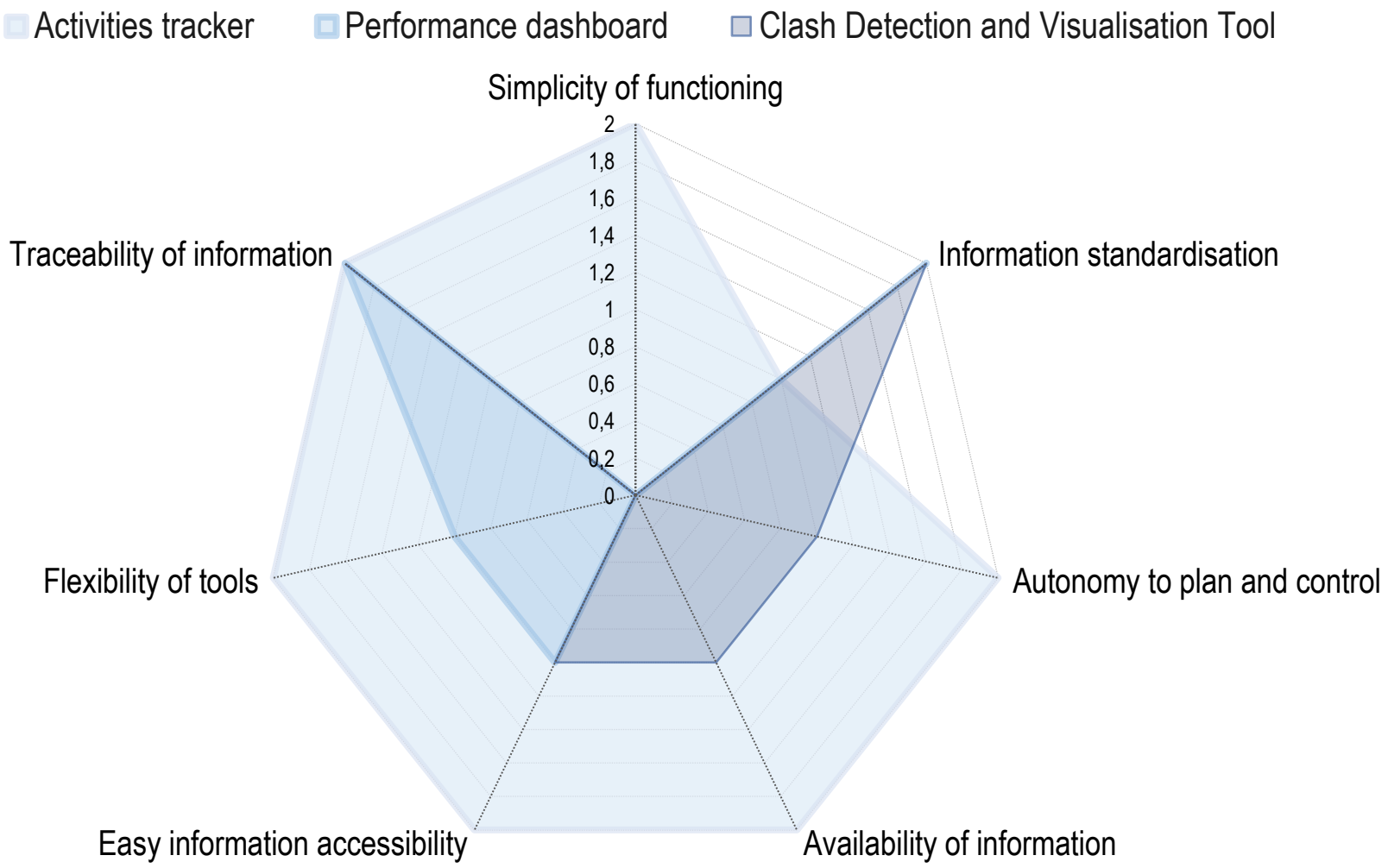
CLASSIFICATION OF TOOLS
ACCORDING TO VM CONCEPTS

Functional and aesthetics requirements of VM tools	Tools to plan and control		Tools to coordinate design activities
	Activities tracker	**Performance dashboard**	**Clash Detection and Visualisation Tool**
Simplicity of functioning	A	NA	NA
Information standardisation	PA	A	A
Autonomy to plan and control	A	NA	PA
Availability of information	A	NA	PA
Easy information accessibility	A	PA	PA
Flexibility of tools	A	PA	NA
Traceability of information	A	A	A
			

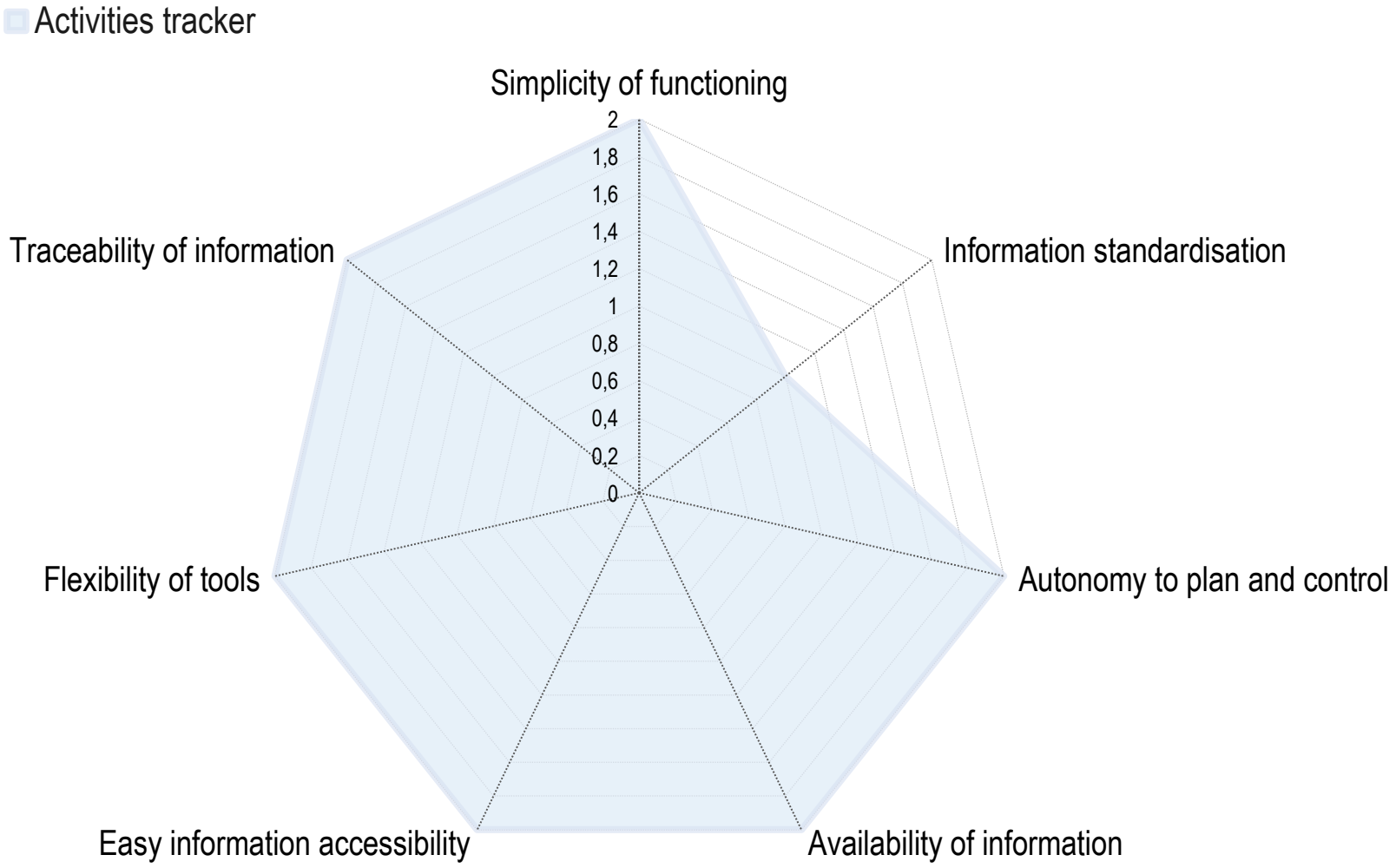
Legend:
Adopted (A) | Partially adopted (PA) |Not adopted (NA)

It adopts most of the VM concepts

CLASSIFICATION OF TOOLS
ACCORDING TO VM CONCEPTS



CLASSIFICATION OF TOOLS
ACCORDING TO VM CONCEPTS



IDENTIFICATION OF USERS

INTERACTIONS IN THE INFORMATION TRANSFER

		Receiver	
		One	**Many**
Sender	**One**	-	Clash detection/ visualisation tool
	Many	Performance dashboards Clash detection/visualisation tool	**Activities tracker**

(adapted from Brandalise, 2018)

Digital VM tools usually involve more users than traditional VM tools.

Transfer of information can be classified as:

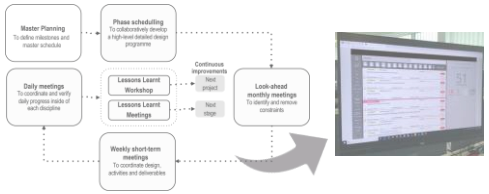
‘one to many’

‘many to one’

‘many to many’

BENEFITS

Activities tracker



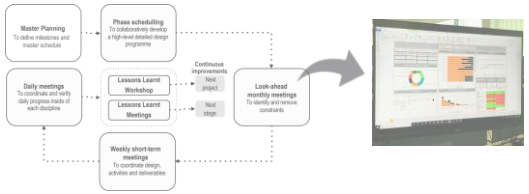
It is classified as the **tool that adopts most of the VM concepts** and also the tool which should be **used by a large number of people** ('many to many').

This can be related to **information availability**, **accessibility**, **and autonomy concepts,** resulting in:

- increased **team productivity**
- efficient **communication** and faster **feedback**
- **Independent use** of the tool and reduction of **design management time**

BARRIERS

Performance dashboard



It is the less integrated tool: created with team members input information, but only the project manager uses it effectively ('many to one').

- **It is not easy to access**

There is no clarity about how to use the tool and where to find the information

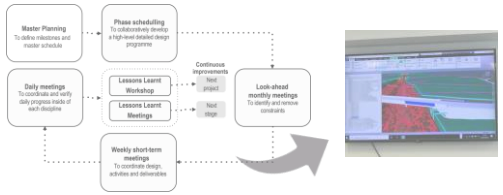
- **It presents a lack of real-time availability**

The tool is sent as a static information to team members

- **It presents a lack of decentralisation**

BARRIERS

Clash detection/visualisation tool



The information transfer is not fully integrated with all stakeholders involved
even it is used by different stakeholders and disciplines throughout the process.

- **The information is partially accessible and available**

challenges related to the regular sharing of information

- **Simplicity and flexibility concepts are not adopted**

issues to prioritise, select and update the information (overload of information)

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FINAL COMMENTS

Visual Management strategies were identified in design through the use of digital tools.

The proposed classification of VM tools explored the potential **benefits and barriers** of each tool investigated, better understanding the **effectiveness of VM tools**

Main benefit:

- **the potential to integrate many stakeholders** as they involve many users and disciplines in different ways of communication.

Main barrier:

- the **lack of traditional VM concepts in digital tools**, such as simplicity and flexibility, affecting its efficiency in use

LIMITATIONS AND FURTHER STUDIES

This research is limited to the study of three tools

further work should explore a substantial number of digital VM tools, enabling:

- **Further exploration of the barriers**

Identify how the design process can be further improved through the adoption of digital VM tools.

- **Further investigation of improvement opportunities**

Explore how to improve the tools and simplify accessibility and availability issues.

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