A Case Study on Improving Standardization in the Conception Phase by Developing Tools and Protocols

July 2019

Martin Michaud, Daniel Forgues, Julien Meyer, Claudiane Ouellet-Plamondon

Problem Statement

- **Recurring problem:** Low productivity due to the fragmented nature of construction project.

- **Fragmentation** leads to the presence of complications, risks and uncertainty making the transfer of information difficult.

- **Building Information Modelling** (BIM) approach reduces information loss and centralizes it, aiming at decreasing fragmentation and inefficiency.

- **BIM issue:** Major waste in the production and exchange of information.

Research

- A collaborative action-research

- Focuses on the architects

- Uses approach derived from **Value Stream Mapping (VSM)** to visualize the information flows and identify waste

Context

The Architecture Firm

- Multidisciplinary (architects, engineers and technicians)

- Functional structure (5 departments)

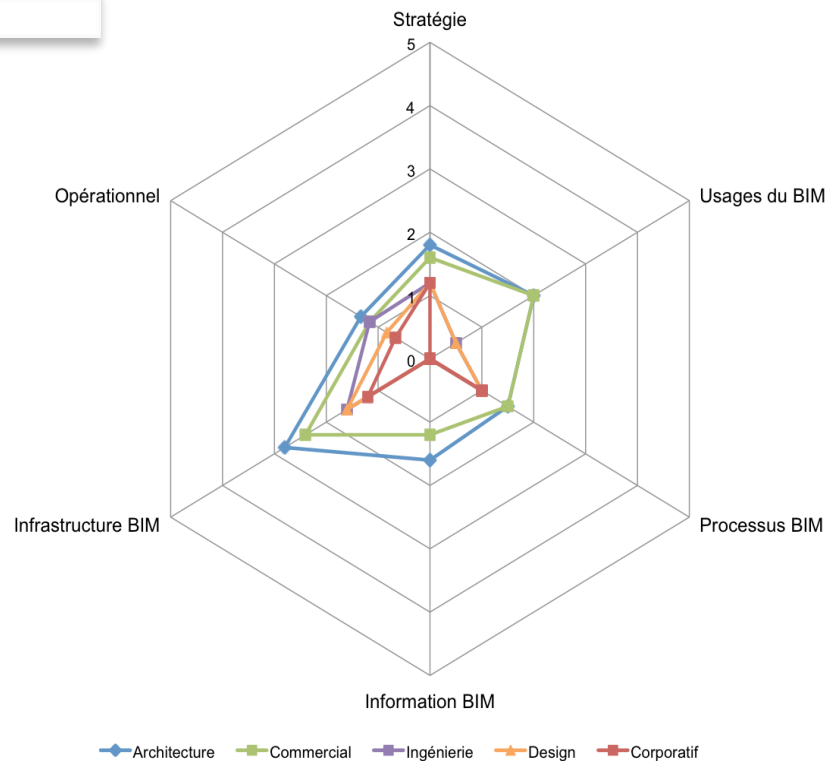- More than 100 employees in 3 offices

The research chronology

2014: Change Lab (activity theory)

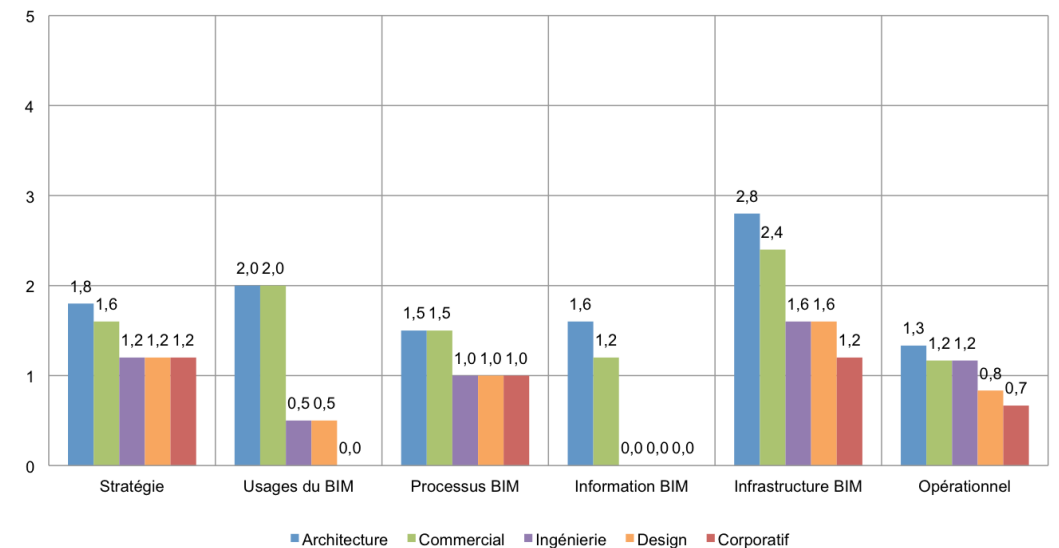2015- : Devising a participative action-research approach

- Devising a maturity model

- Conducting a Share Lab

- Defining the transformation plan and conducting the transition to BIM using **VSM**
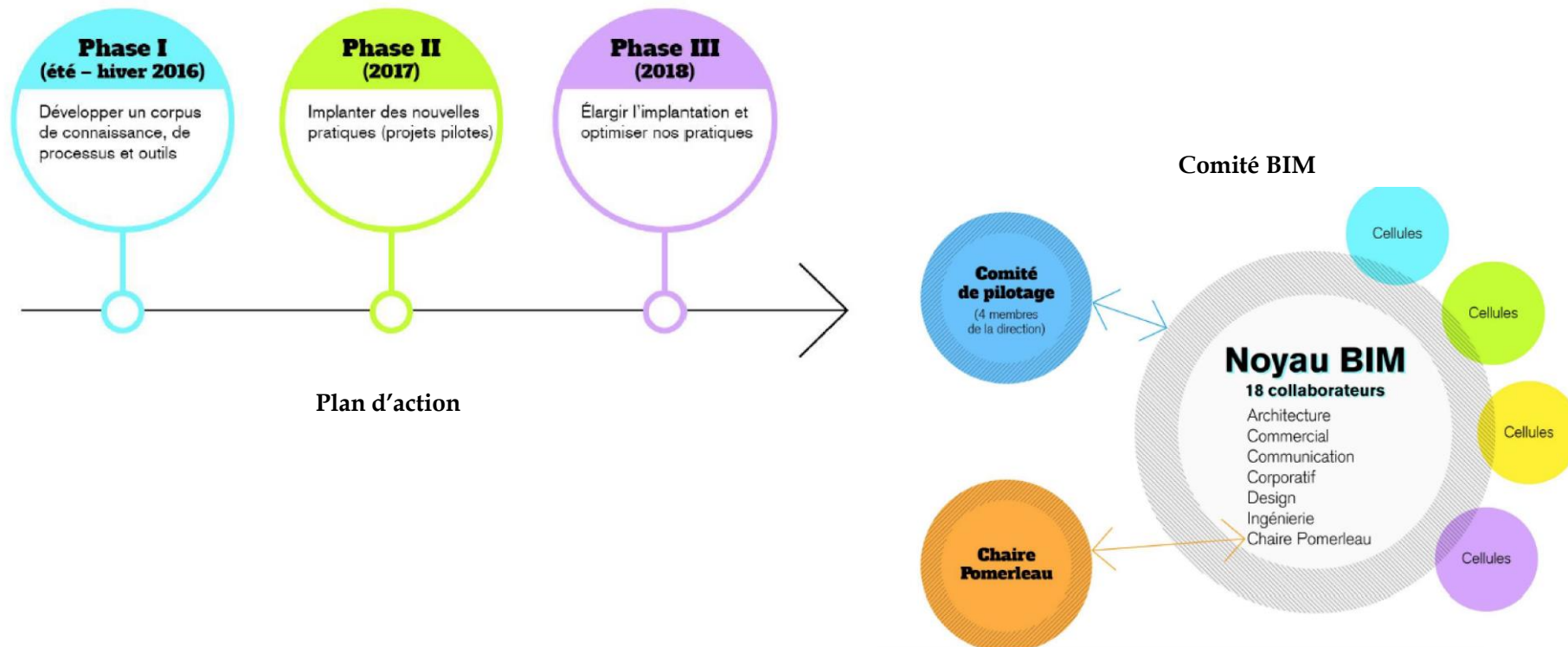
Maturity Audit

PROFILE DE MATURITÉ BIM						
Élément BIM Planifié	Architecture	Commercial	Ingénierie	Design	Corporatif	Total Possible
Stratégie	9	8	6	6	6	25
Usages du BIM	4	4	1	1	0	10
Processus BIM	3	3	2	2	2	10
Information BIM	4	3	0	0	0	12,5
Infrastructure BIM	7	6	4	4	3	12,5
Opérationnel	8	7	7	5	4	30
Totals	**35**	**31**	**20**	**18**	**15**	**100**

Share Lab: assist the organisational change for BIM implementation

Phase I
(été – hiver 2016)
Développer un corpus de connaissance, de processus et outils

Phase II
(2017)
Implanter des nouvelles pratiques (projets pilotes)

Phase III
(2018)
Élargir l'implantation et optimiser nos pratiques

Plan d'action

Comité BIM

Comité de pilotage
(4 membres de la direction)

Noyau BIM
18 collaborateurs
Architecture
Commercial
Communication
Corporatif
Design
Ingénierie
Chaire Pomerleau

Cellules
Cellules
Cellules
Cellules

Chaire Pomerleau

Collaborative Action Research Objective

- To provide a framework designed to help increase **standardization** as a way to improve the information flows → To facilitate the change from a **traditional practice** to a **BIM approach.**

Literature review

From **document-centric** to **information-centric** approach
Problem: Issues with BIM collaboration

Building Information Modeling

Helps to **identify and eliminate waste**
Improve **productivity**
Identifies **opportunities** for improvement

Value Stream Mapping

Notion of Flow

Lean construction: eliminate waste from processes and improve productivity
**Koskela (2000) theory of production**: link between value generation and the concept of flow
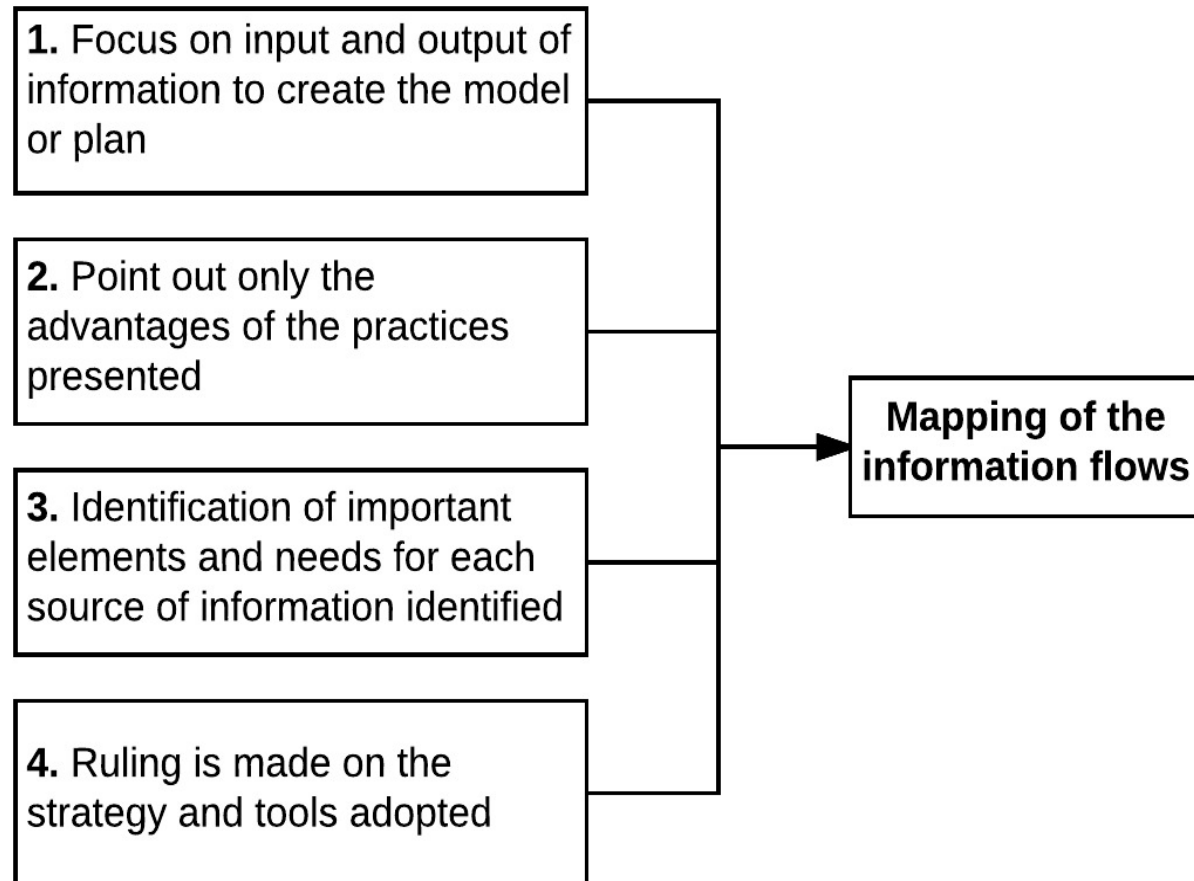
Knowledge gaps

- Tools and approaches developed to improve flows, mainly **focus on materials and work flows** and undermine information flows.

- The construction phase is the main focus when trying to improve flows. However, up to 33% of waste is generated in the design phase (Innes 2004).

Change Management Framework: derived from VSM principles
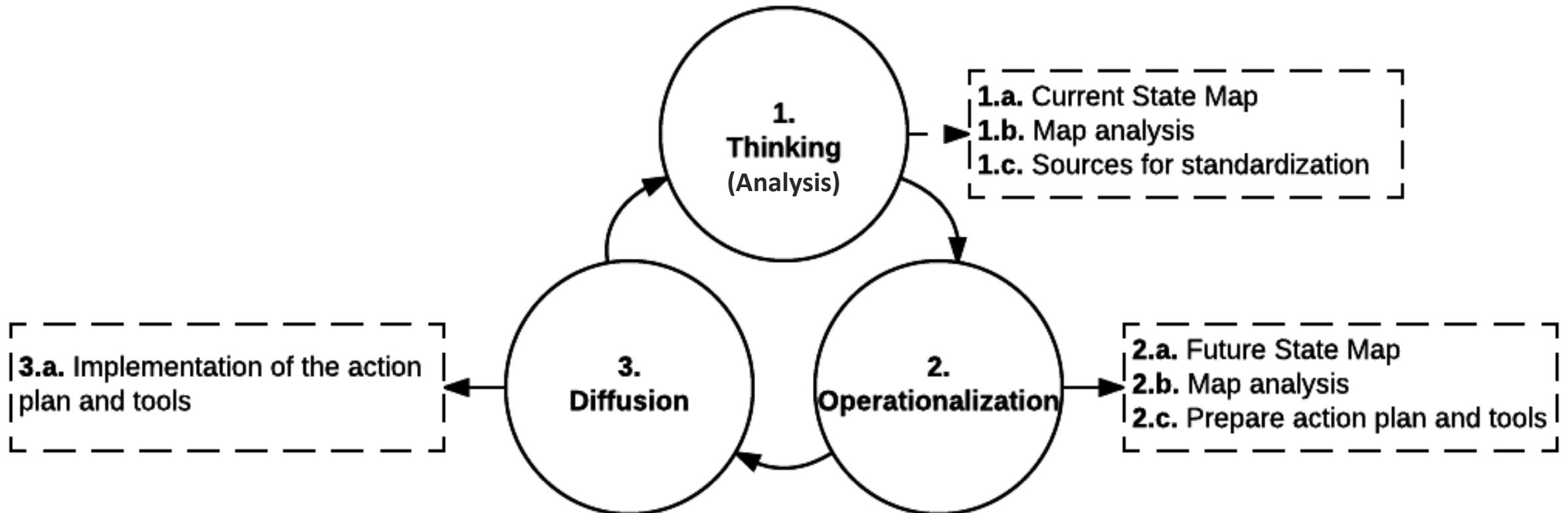
Analysis (Thinking)

- Use of VSM helped this work group visualizing the waste in their process through th mapping of their information flows.

- This protocol was used to maintain repeatability and standardization:

| 1. Focus on input and output of information to create the model or plan |
| 2. Point out only the advantages of the practices presented |
| 3. Identification of important elements and needs for each source of information identified |
| 4. Ruling is made on the strategy and tools adopted |

→ **Mapping of the information flows**

Analysis (Thinking)

Sources of waste	Forms of waste identified
Under-utilization of talents	Lack of new ideas
Waiting inputs	Difference of semantic Lack of knowledge, understanding, communication and coordination
Information transfer	Silo mentality Lack of communication and coordination
Overproduction of information	Repetition of activities Lack of knowledge, understanding, communication and coordination Push system
Loss of good ideas	The information created is not reused between the departments or the different projects
Resistance to change	Desire to keep the traditional processes
Achievements unappreciated by the customer	Misunderstanding between the client's needs and their interpretation Lack of communication and coordination

Analysis (Thinking)

Potential sources of information identified for standardization
Level of Detail (LOD)
Templates
Materials
Zoning plans
Estimates
Coordination per phases
BIM execution plan
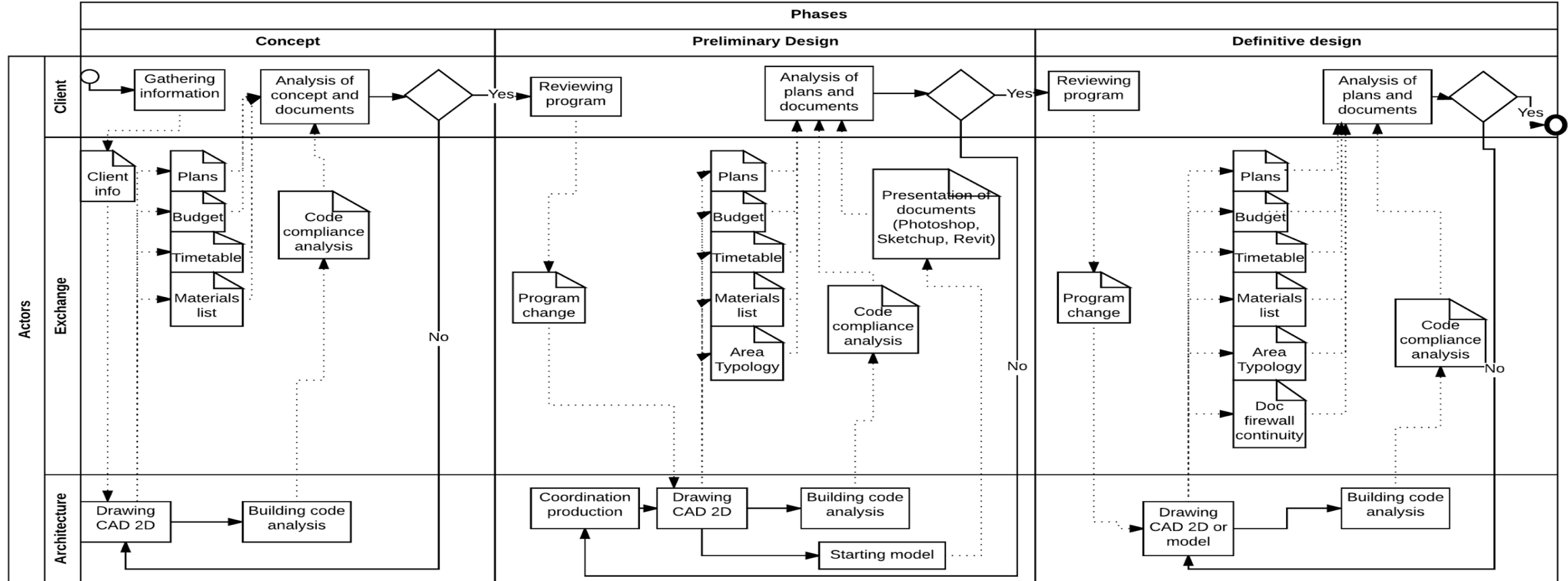
Current State Map: architectural information flow in the design phase

Operationalization

- The role: **format the templates**

- Every change implemented during this step needs to be **tested in practice**.

- **The standardization:** helped to give a better understanding of BIM processes to the users.

Diffusion

- The need **to identify** all **training tools** available for BIM authoring software.

- The **solution** therefore revolved around **the design of a single manual**.

- Work is still in progress

Conclusions and future work

- We investigated a collaborative design science research using VSM principles to **improve standardization** of information flows in the design phase.

- VSM proved to be a useful technique to understand and visualize processes in the design phase to **improve coordination** and to **reduce waste** within the information flows.

- **Future work:** This research is part of a larger research aiming to develop an interactive process map that represents a standardized process:
  - To develop protocols for each activity
  - To develop templates for documents
  - To validate the approach in a real environment

Thank You !