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séminaire MAP 2019

THÈSE DE DOCTORAT

COLLECTIVE DESISION-MAKING WITH 4D BIM: IDENTIFICATION OF SYNCHRONOUS COLLABORATIVE PRACTICES AND NATURAL USER INTERACTIONS

VERONIKA BOLSHAKOVA, GILLES HALIN, ANNIE GUERRIERO

1/ 4D COLLAB RESEARCH PROJECT

This thesis is a part of ANR **4DCollab** international research project [1]. Fig. 1 resumes related to the project research steps. The project ames to:

- propose an efficient set of ***BIM/4D collaboration tools;***
- increase the ***quality of human-computer interactions*** with digital decision support;
- bring new scientific, professional, educational values.

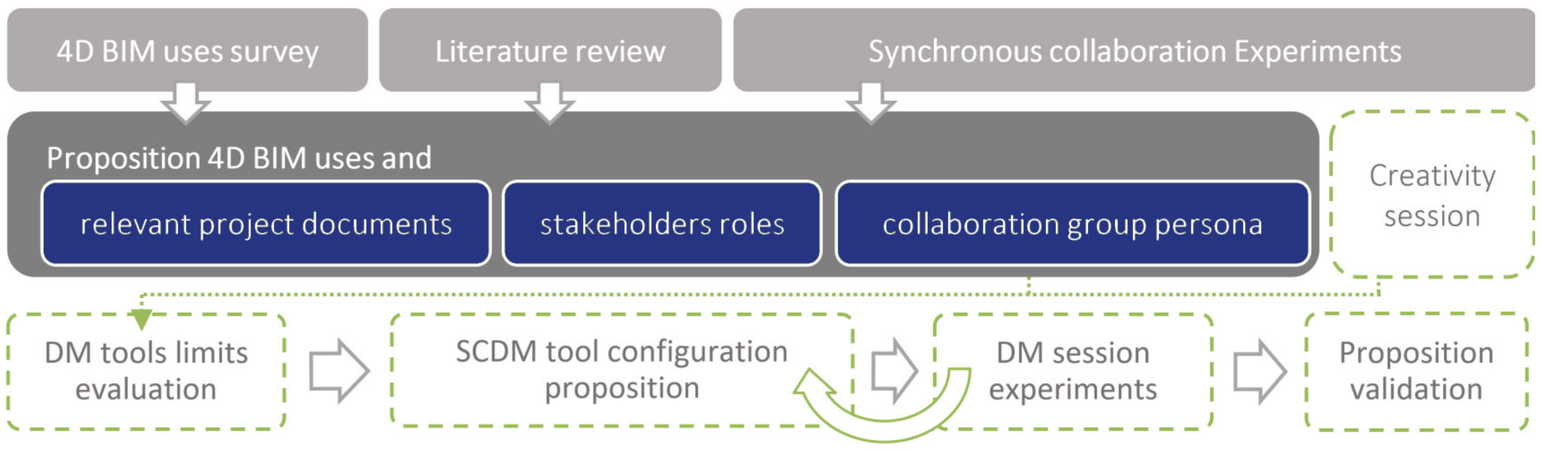

Figure 1 - Summary of methodology steps for decision-making support proposition [3]

2/ 4D BIM USES & PROJECT PHASES

4D (3D+time) BIM major benefits: information accessibility; clear visualization - all actors access 3D model & attached schedule and analysis. Guerriero et al. [2] propose 4D BIM uses. Their introduction and implementation **by project phases and with a corresponding LOD** is summarized in Fig2. 4D BIM main ***value is perceived as a visualization,*** however ***other potential uses*** have not yet been put in a common practice. All of them involve stakeholders' expertise and collaboration.

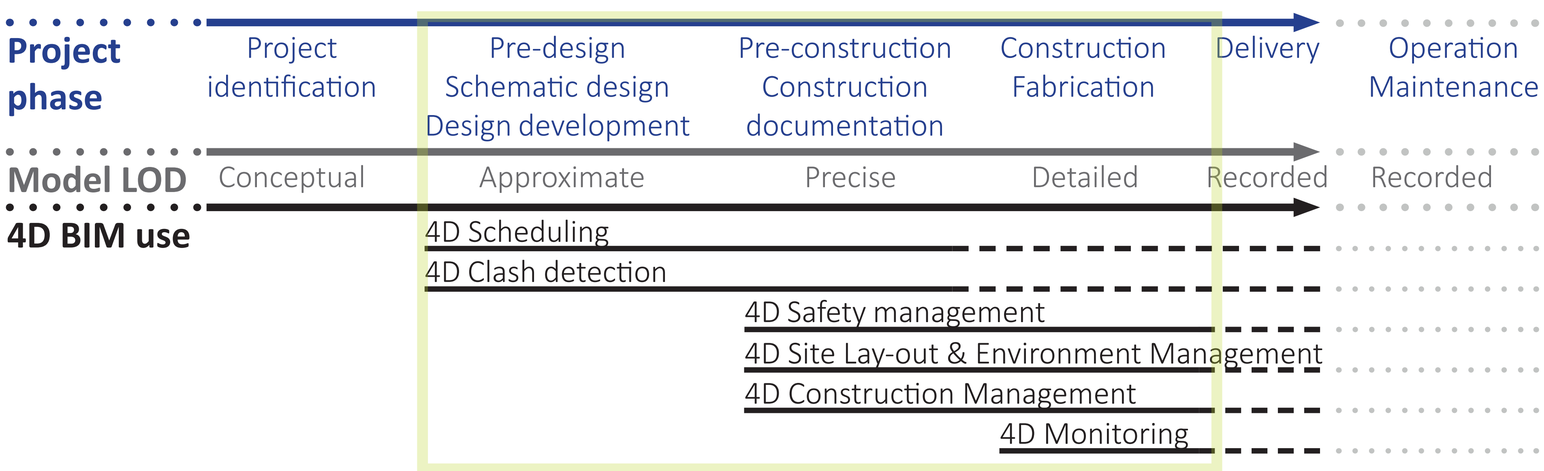

Figure 2 - Project phases and model LOD with 4D BIM use potential introduction [4]

3/ MULTI-USER SUPPORTS

There is no fully collaborative solution for a synchronous collaboration. 4D model interactions are mostly single-user targeted, ***thus the multi-user aspect*** is an important feature to be developed. An ease of access and low appropriation time with a tool is offered by natural user interfaces (NUI), we propose to ***implement a multi-touch collaborative table and wall within a NUI*** as session equipment (Fig.a,b). NUI fosters the convergence of 4D uses with project documents. The use of the table with the 4D software (Fig.2c) reveals new values for AEC project decision-making. The thesis research objective ***aims for a democratization of the 4D simulations*** of AEC projects usage and ***develop an easy access*** to these practices for the future actors.

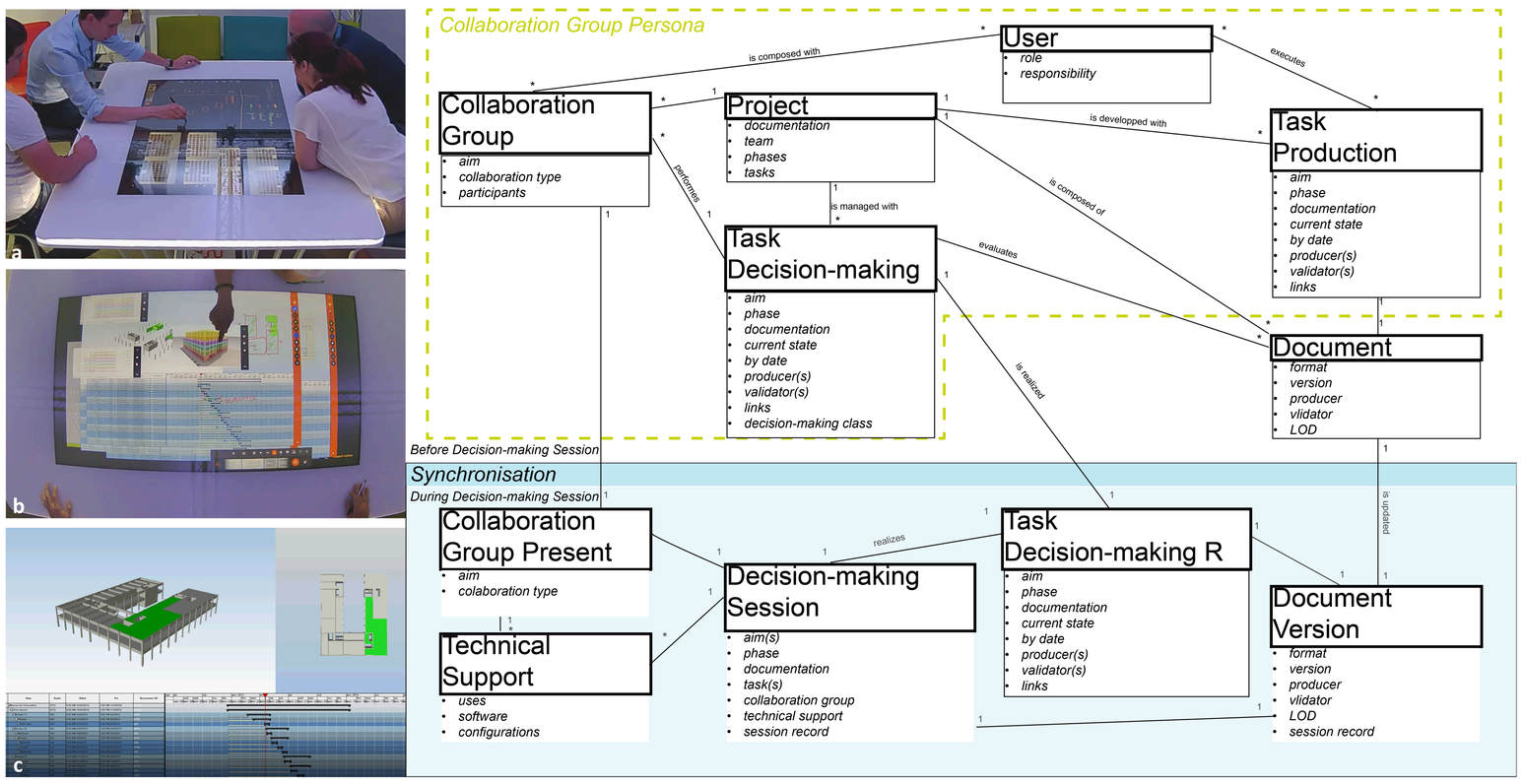

Figure 2 - Experiment session with AEC professionals: a.Desicion-making with 4D on a touch table Meetiiim & Shariiing [5] collaboration and natural interactions environment; b. Project documents visualisation and 2D «sketch» annotations of 4D model; c. 4D model of concrete structure construction logics; d. Syncronisation for decision making session of collaboration persona and project documents

4/ Collaboration personas approach

BIM allows the team to use the entire set of ***collective knowledge, skills and competencies*** as parts of collective intelligence, which is the key feature for digital project management. In order ***to describe a project group collective activity***, we propose a collaboration persona (CP) approach [6], which is derived from the original user persona method, also called Individual Persona. CP describes a new type of persona which focuses on ***group goals and needs, instead of personal needs***, and includes collaborative work aspects (Fig.2d).

5/ Designing a collaboration support for 4D

The design of a new support will consider different actor roles throughout the collaboration process, and adapt the interface and to collaboration scenarios and 4D BIM use-cases. The design is focused on: 1. providing users with a simple 4D simulations interactions 2. creating semi-automated digital feedback on collective decision-making.

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