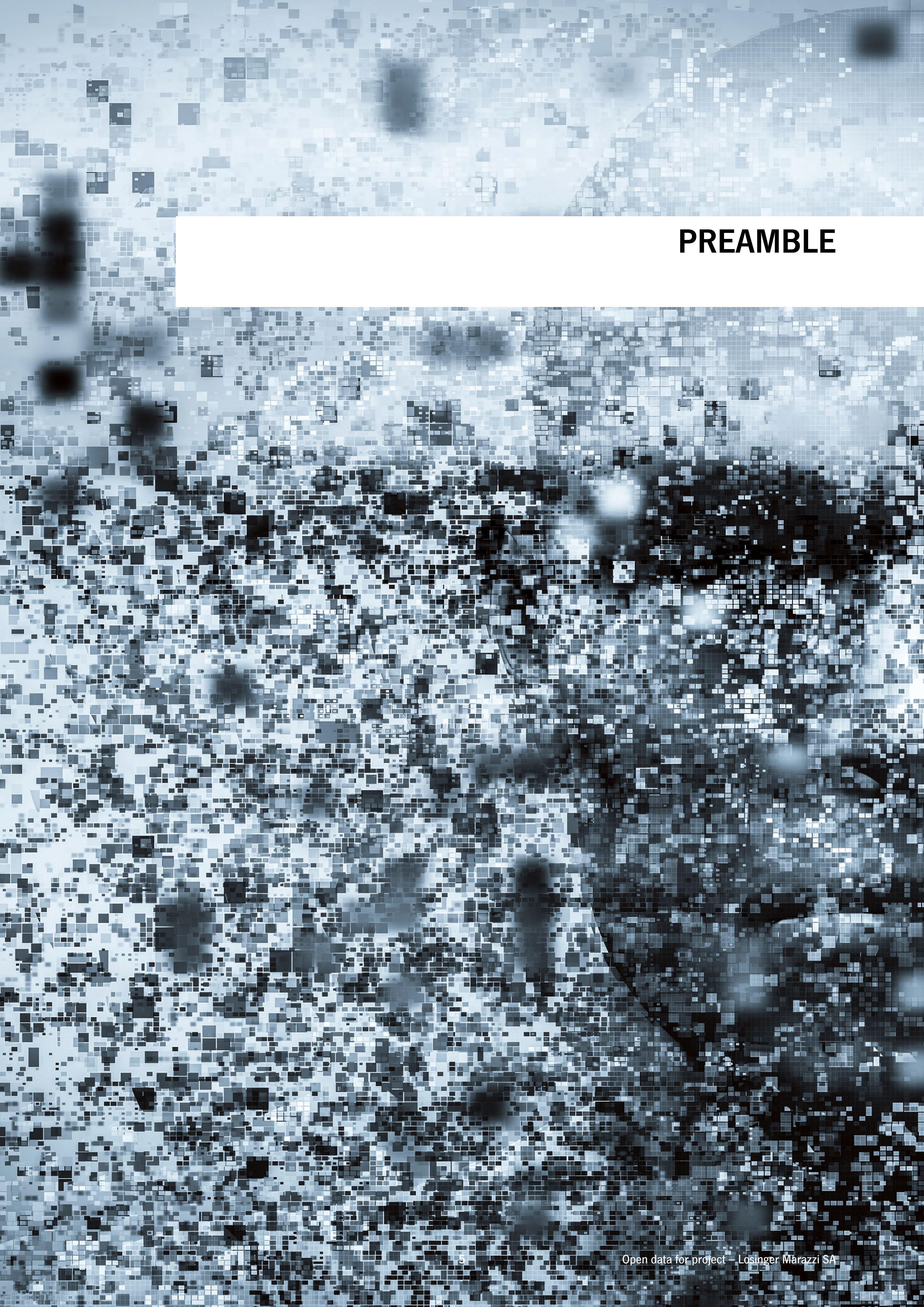
Open data for project

Seeing beyond 3D model

LOSINGER MARAZZI

Shared **innovation**



PREAMBLE

Implementing and integrating digitalisation into a management system is complicated. It is a complex process that has multiple steps, multiple interfaces with other processes and multiple players. In addition, it tends to conflict with current management systems, tried and tested building practices and commonplace design concepts. Digitalisation requires experimenting with new practices, each try with varying degrees of success. Some of these tries may be considered failures, but many more are starting points for improvement. Losinger Marazzi SA, leading property developer and construction company in Switzerland, presents in this document the way they are looking at this (r)evolution into the BIM, their approach and thought process to roll-out and implement BIM processes, and the impact this side of digitalisation has on other project tasks, team and trade organisation, decision-making processes and procedures. This document will not go into demonstrating the application of the BIM methodology in a project as it is too frequently restricted to the use of specialised IT tools and/or to the expertise of a limited team of professionals.

Losinger Marazzi AG chooses agility and openBIM procedures to ensure broader partnership possibilities. The choice is made to share experimentation, learning and best practices as well as provide access to the projects' digital data with all project Participants.

The Swiss construction market applies standards set by the Swiss society of engineers and architects (SIA), a Swiss Association of industry professionals.

This "Swiss-style" project development method has proved itself successful despite a greater focus on design and production than on operations. It is based on clearly defined "phase by phase" targets, on a dialogue between partners, and on a significant level of responsibility for each party, with a relatively low degree of digitalisation.

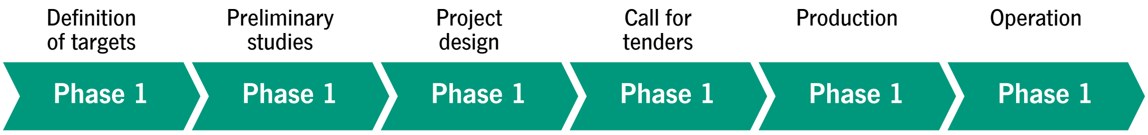


Figure 1 - Project process flow based on sia phases (copyright Losinger Marazzi SA)

In 2012, construction professionals in Switzerland became involved in the BIM process with the creation of the Swiss chapter of buildingSMART. A community of interests was set up at the beginning of 2016: Building digital Switzerland. It brings together the Boards in the construction industry (SIA, CRB, KBOB etc.) as well as building professionals (architects, engineers, suppliers, businesses, etc.). The aim of Building digital Switzerland is to produce a concrete proposal for the implementation of BIM in 2020 based on discussions and pilot projects. The SIA, in collaboration with Building digital Switzerland, is planning to release a final version of the first Swiss BIM Standards in 2018: the SIA 2051. This standard creates a common framework providing a definition of all building terms. Although Swiss-style BIM offers the potential for simplifying project phases overall (due to the increasing productivity of digital tools and the faster pace of exchanges), its aim is more to become part of conventional development phases rather than to completely overhaul the build & design process.

1. Losinger Marazzi - an innovative forward thinker with an all-round package

Losinger Marazzi, as leading company for intelligent construction in Switzerland, picks up the challenges of an ever more complex, networked and mobile society. As an innovative forward thinker, it utilises its innovative capacity, expertise and wide-ranging services to adapt developed real estate to the needs of the future and to design, configure and deliver living spaces of tomorrow. It focuses on urban regeneration, the development of smart cities and a holistic package of services that create sustainable added value throughout the lifecycle of a property. The company collaborates closely with customers, partners, local authorities and users. Losinger Marazzi takes its economic, social and ecological responsibilities seriously and seeks to contribute to the wellbeing of today' and future generations.

As a subsidiary of Bouygues Construction, Losinger Marazzi AS combines the flexibility of a locally anchored company with the strength and experience of a large international group. Losinger Marazzi AG has more than 800 employees and posts annual sales of around 800 million Swiss francs.

Losinger Marazzi celebrates its 100th anniversary in 2017.

2. Groupe Bouygues Construction - a global player in construction and services

A global player in construction with a presence in more than 80 countries, Bouygues Construction designs, builds and operates construction, infrastructure and industrial projects.

As a responsible, committed leader in sustainable construction, Bouygues Construction has made innovation its number one added value: shared innovation that benefits clients while also improving productivity and working conditions for the company's 50,100 employees. In 2016, Bouygues Construction's turnover was 11.8 billion euros.

Eight business units

Bouygues Construction is organised into eight operational and complementary entities, with a network of responsive companies that provide their clients and partners with innovative solutions for building, designing, operating, maintaining or financing structures and infrastructure.

Four main businesses

Public or private buildings, eco-neighbourhoods, transport infrastructure, and energy and communications networks at Bouygues Construction, we put our expertise to work for every type of structure, offering our clients comprehensive, innovative support over the long term.

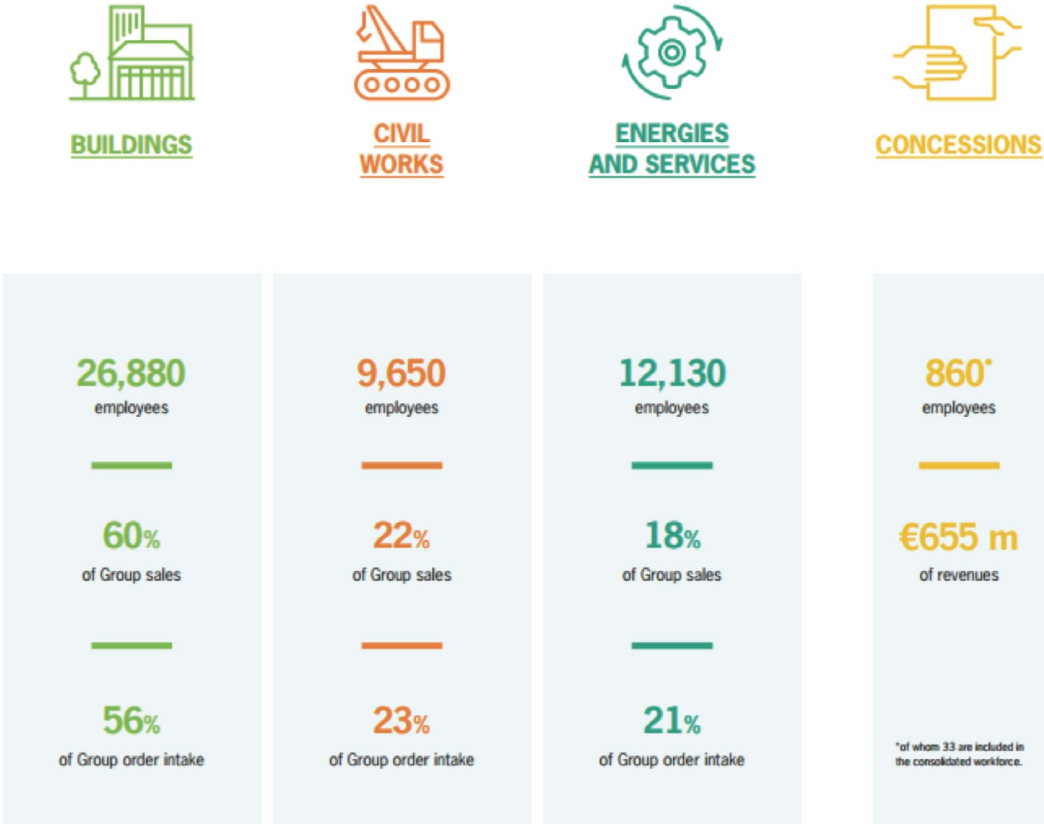


Figure 2 - Bouygues Construction - main business (copyright Bouygues Construction SA)

3. The other participants

The inherent quality of a BIM project is to be based on a multi-disciplinary team and not on one single Participant. Therefore, through this dossier, Losinger Marazzi becomes the spokesperson for all Participants pro-active in implementing BIM in projects: Clients, Architects, Engineers, Businesses, Sub-contractors, and suppliers. Thus each one of them at their level contributes to the tests, to writing new processes, to creating the digital copy of the project.

THE CONCEPT

1. The genesis of the concept

Losinger Marazzi had its first go at BIM with the New Limmattal Hospital project in Schlieren (Zurich Canton in Switzerland).

When the tender for a Design & Build contractor was launched in February 2012 (the first project of this type in Switzerland), the client asked participants to turn in a digital model tender.

The need to provide a solution to this request highlighted the lack of maturity of the available softwares and processes and the need for a shared language.

The launching pad: The new hospital Limmattal in Schlieren (2012 - 2018)

The new Limmattal Hospital won the BIM d'OR 2015 in the "International Projects" category at the competition organised by "Le Moniteur", a leading weekly construction-industry magazine in France, and rewarding the best uses of BIM processes. The jury particularly liked the centralisation of data and the permanent fluidity of exchanges between all the project participants.

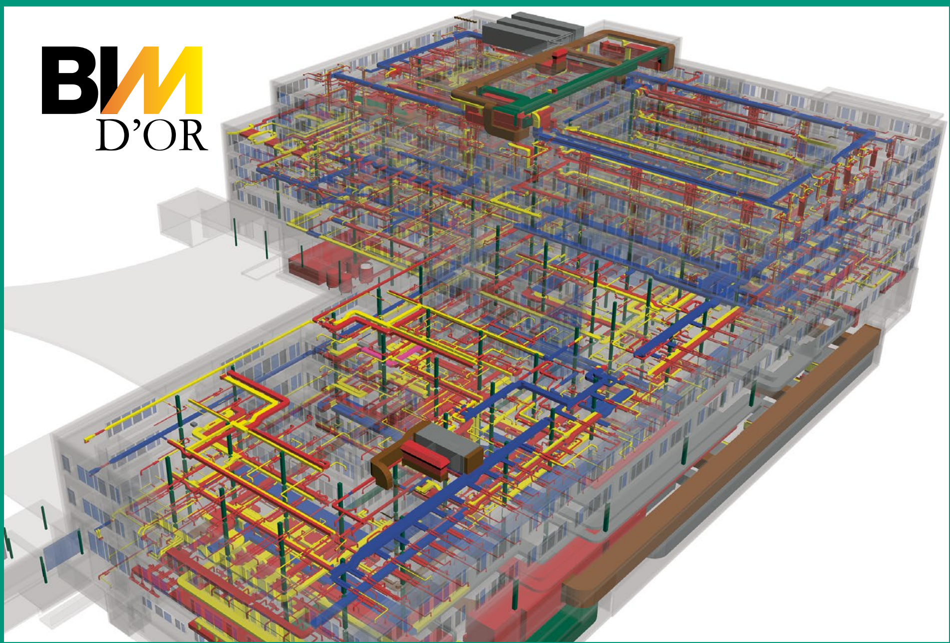


Figure 3 - New hospital Limmattal - coordination model (copyright Losinger Marazzi SA)

This was the starting point for Losinger Marazzi SA to launch a long-term BIM strategy to achieve greater productivity.

In 2013, Losinger Marazzi set up a department dedicated to BIM within its Engineering Division. This team, composed of engineers, architects and IT personnel proposed a plan to implement the Company's new strategy, testing software solutions, researching new uses and tools, and supporting internal teams in their learning processes. It was also involved externally in helping Project participants to become engaged in the collaborative process by providing feedback, training modules and technical assistance. Losinger Marazzi SA promoted digitalisation and BIM through its Swiss offices and at the group level, in collaboration with various associations and third-level institutes.

A network of Participants (both in-house and external) is in the process of being set up to allow us to learn, to challenge ideas and discuss new topics, moving beyond the concept of the per-project BIM implementation. In addition to the use of software tools per project, new topics are shared with a new vocabulary: openBIM, Agility, Adaptability, etc. This resonates even more as trade software packages continue to grow requiring stronger and more reliable interoperability.

Common tools

	3D Model "Revit Server"	3D Model "Nova"	2D Plan "Allplan"	Database "dRofus"	Merged model "Glue"	Control model "Field"	Learn Model "HTC"
Customers				X			X
Architects	X			X			
Civil engineers			X				
MEP engineers		X		X			
BIM Management	X			X	X	X	X
Design Manager				X	X	X	X
Construction worker				X		X	

Figure 4 - Table of used software on the new Hospital Limmattal (copyright Losinger Marazzi SA)

2. Outside BIM, a collection of partial and disconnected data

In a traditional building process, information is not interconnected. This is because documents produced by different participants are “flat”, with no intrinsic intelligence, such as hard copy blueprints. This information is distributed geographically and is closely linked to its “owner/creator”: Its relevance only emerges from the connections that humans are capable of making. If it is not automated, controlled information is restricted to the information directly needed for “demonstration” purposes (intermediate or collateral information is removed).

3. The emergence of opportunities to collate data

Early BIM feedback demonstrated that good data management within a software allows for a focus on data, rather than on its owner and/or its support, and therefore improves the project management processes. Greater efficiency results from this sharing of and updating the information available to all the Participants, thus reducing the silo effect amongst the trade functions, which frequently reduces quality when realising a project.

4. The limits of 3D modelling in data sharing

With the first models, it became immediately clear that information could be integrated into the objects modelled. Nevertheless, using 3D modelling software involves a relatively long-span learning process, which is becoming a specialist field and thus it is more complex for sharing.

Not all Participants (project managers, financial directors, work supervisors, etc.) need to use this type of software for their everyday tasks. There needs to be tools that Participants can access more easily and which can be integrated into the processes without reducing productivity.

Moreover, the quantity of data to be processed and, above all, the fact that the data originates from multiple Common tool

Participants, the question of its position is raised. For example, the purchase of a door can involve approximately one hundred parameters and only some of them are defined by the architect (dimensions, main material, etc.), many are provided by specialists who, in some cases, have little interaction with the drawing or modelling process (acoustic engineer, fire safety specialist, etc.).

In order to link this data to the designed object, and to ensure consistency (avoiding a scenario of the door without an automatic link to the plan), a procedure as well as shared tools for collecting and managing data needs to be defined.

5. Centralising data for mass access

The team at the new hospital Limmattal (Schlieren, ZH) put in place a spreadsheet to manage access rights for all the Participants: the first step in the cooperation process. However, the limits of this approach quickly became clear owing to the complexity of a system without standardization, the absence of a link with the architects' digital model and the size of the files.

A centralised collaborative database has proven to be stronger, more secure and the most long-lasting of these tools. It becomes possible to manage a sizeable amount of shared data. With the automatable link (configured specially for each project) and digital models produced by partners, the need to re-enter data allowing regular and relevant data checks can be limited.

Moreover, a high-performance tool enables a maximum number of Participants to access centralized data, and this without having to learn to use modelling software. As a result, it becomes far easier to take new participants on board. Management of rights and the distinction between read-only and write access reduces reticence with respect to transparency and cooperation.

The tool selected on this project to link the digital models is dRofus by the Nemetschek Group:

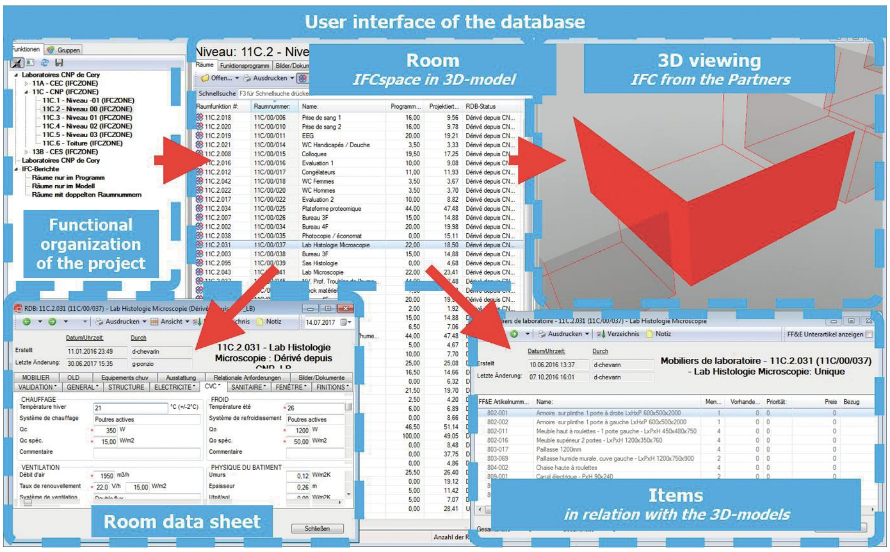


Figure 5 -Data organisation (copyright Losinger Marazzi SA)

Data has thus become the core of the project and the topic for future development.

Schönburg project : automatic integration of parts classification with automatic data implementation (2016-2019)

In this project, the team integrated typology classification of parts into the database with the parameters directly pre-filled by the HVAC specialist (heating, ventilation, sanitary and electricity). HVAC performances are determined for each type of room under SIA norms. Therefore, a code corresponds to a specific configuration of the parameters, which in turn allows a number of rooms to be managed with a very limited list: Standardization of types (room types).

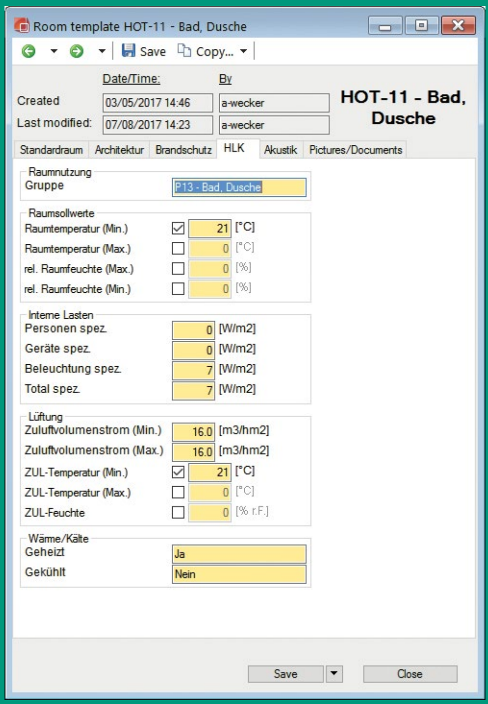


Figure 6 - Schönburg project - determining room HVAC parameters (copyright Losinger Marazzi SA)

6. A workflow in progress

6.1. A traditional process to be adapted to today's world

In a traditional process (without BIM nor digital model), communication is based on 2D plans published in fixed formats (PDF, paper), from which data extraction is difficult if possible at all. Analysis is done manually, with a notation system that is not readable by graphic design software. Thus, any comment on a version 1 of a plan will need to be copied onto version 2.

Benefits of this ongoing method are the ease of set-up, the clear definition of responsibility among participants and the low level of required digital tools.

Some activities push for a change to improve this process, such as:
- transcribing comments at each change of version
- absence of interaction between documents provided by the participants

6.2. A new process in the making

The setting-up of a continuous flow for Requests for Information on a common tool enables the tracking of changes and evolution of a project. This requires a stable tool that is understandable by all: the BCF format. Together with a digital coordination model gathering all the models from all the participants, it allows for data transmission that is quick and compatible with all modelling softwares allowing editing (responses) of RFIs. All of it managed from an EDM (electronic data management) where visualizing models and annotations is possible (for example Aconnex platform).

However, the tracking of data and their quality is not yet managed in this process (comparing to program, ratio analysis, etc.). The data-centralization tool must thus be the basis for this new creation and data validation process.

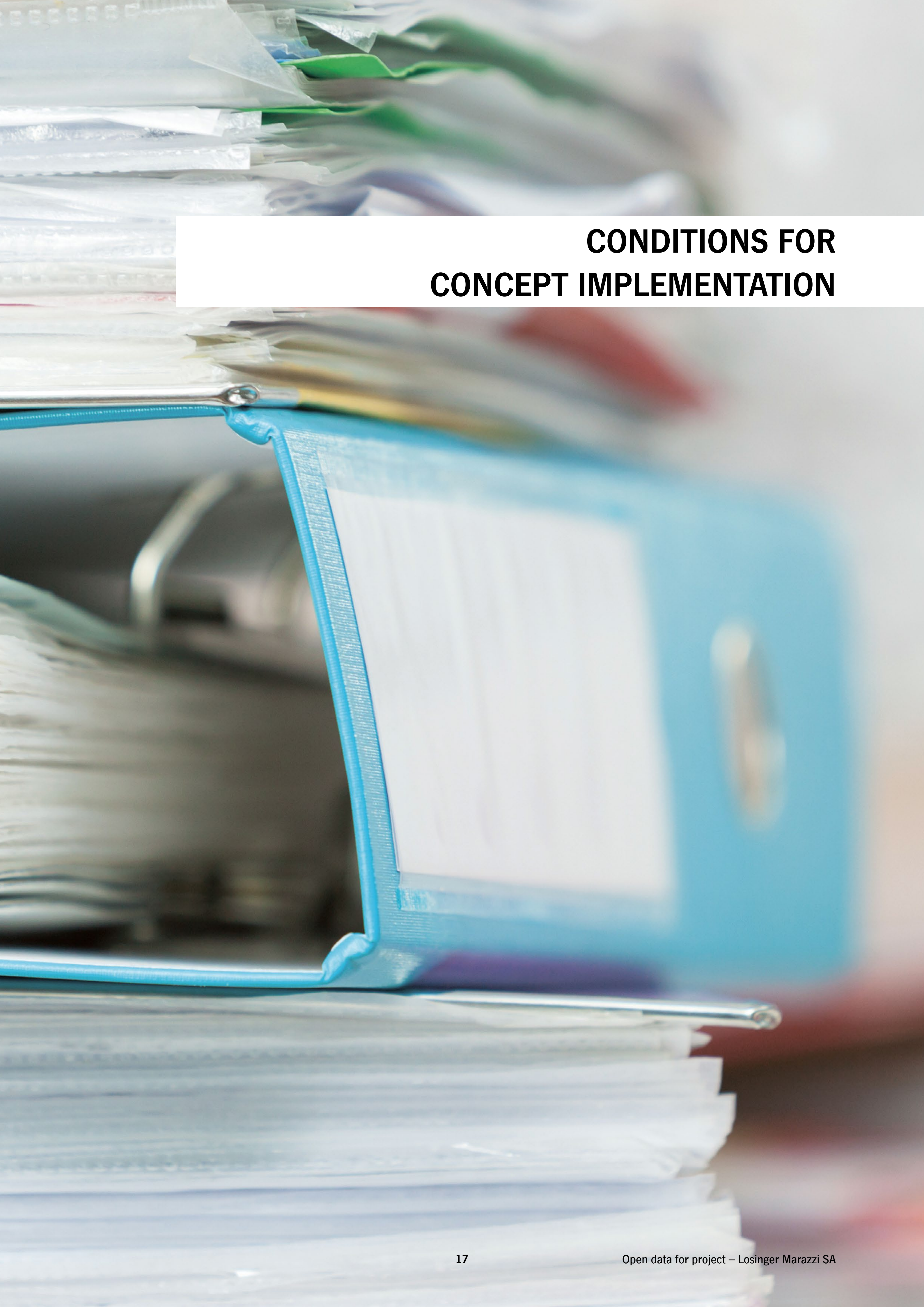
7. The players

Sharing data in a project development process where 3D modelling is not predominant is only possible if players go beyond their initial role. Thus, each participant, as they join the project team, helps put together the BIM strategy. Each team being made of multiple participants, the sheer amount of them at the project level managed by a large company quickly becomes gigantic, partly because of the professional networking within the construction world. Digitalization spreads by successive adding on of participants, quickly becoming viral.

As example, counting the current 25 projects at Losinger Marazzi, there are about:
- 30 architects
- 15 structural consultants
- 20 HVAC consultants

They all contribute to the BIM process on their projects by spreading digitalization throughout Switzerland.

CONDITIONS FOR CONCEPT IMPLEMENTATION



1. The benefits of collaboration

When talking about collaboration, our focus is mainly to determine how to solve our client's needs as a group (Internal employees along with external Participants). Clients also introduce new types of requirements such as Turnkey Projects: a single liaison person to manage the project, facility management, energy requirements etc. These changes in their expectations force changes to the structure of the project team, resetting each person's role, and thus making an ageing organisation more dynamic.

As it is clear to see, the implementation of software programmes and management processes do not in themselves constitute increased efficacy, the team itself is determined by its use of the BIM process based on the sum of all the individual advantages that each Participant finds in their collaboration: on a project level it must constitute a community of interests.

Cery Neuroscience Laboratories, Prilly (VD): The butterfly effect (2014 - 2018)

Beyond the data handled and the collaborative methods implemented, the greatest strength of the project team is its ability to use the BIM process even when not required to do so by the client (CHUV): Thus, when the general contractor tender was awarded, the team had analysed the architect's project and its varying designs (layout, functional organization, facade) on a unique digital model managed by the Company. Once CHUV awarded the project, the whole team (architects, civil engineers, HAVAC engineers, biomedical engineers, contractor) was mobilised to launch this project as a BIM process even though the majority of the Participants had not yet acquired modelling software programmes or the skills to use them. This is proof of the pertinence of the first model and the desire to become engaged in an innovative and inevitable procedure which allowed BIM to be implemented in this project.

Figure 7 - Cery neuroscience laboratories - technical visualisation for tender (copyright Losinger Marazzi SA)

Figure 8 - Cery neuroscience laboratories - Follow up on the progress and the quality of the build based on coordinated modelling (copyright Losinger Marazzi SA)

2. Assessing your partners and adapting the BIM roll-out

Participants are motivated to work together around the BIM process, but there is also the question of their availability and their capacity to integrate the collaborative process.

The team must know how to analyse and what to analyse in order to:
- Establish a specific map of the levels of competency and skill (which will be linked to the level of participation in the process)
- Evaluate the steps to be taken to learn to collaborate within a BIM process
- Plan the training programmes to be implemented

Therefore, one objective of the BIM community could be to share the configurable analysis matrices (to take into account regional specifications, project management methods and project steps).

For a Losinger Marazzi project, the BIM Management service analyses, as a priority, the digital models already realized by the Participants (test models or previous projects) complemented by discussions with the BIM Managers (determining staff numbers, infrastructures, etc.). This helps achieve a relatively reliable image of the Participants understanding of the BIM process (2D documentation, 3D visualisation, BIM model, etc.).

All participants are not yet “BIM compatible” (producing their own unique set of documents from a 2D software programme). The project leaders (in collaboration with the BIM Manager) must take this into account and define a strategy:
- Either to collect the basic information available whilst limiting information return
- Or support their development (solution preferred by Losinger Marazzi)
- Or give up the digitalisation of their contribution (if it is not blocking the project)

3. The contractual framework

In Switzerland, engineering contracts, in particular architects' contracts, are based on a very precise grid, set up by the SIA, (as a percentage of the total value of the operation's amount per mission and phase) not taking into account collaborative work and BIM processes (for the time being). It is therefore necessary to modify these agreements together with the Participants so that BIM becomes truly legitimate for the project. For this purpose, Losinger Marazzi implements a contractual project development framework based on general contractor boundaries. Losinger Marazzi, after consultation, implements the new collaborative tools with the project Participants, using their expertise and work methods respectively (this does not involve "doing something else" but "working together", supporting each other etc.).

Drafting the BIM contract is a two-phase exercise:

- The first step relates to the contract and aims to provide an overall framework of the BIM process: in compliance with the SIA2051 standard, it covers the collaborative element, the legal framework and the use of data as well as a correspondence table between the levels of detail described by the SIA for each phase of the LODs (Level of development) expected.
- The second step is drafting the BIM execution plan. These are specific rules which are applied to the project to enable us to work together: a discussion platform, a BIM coordination procedure, management of reservations in the structural work as well as the management of the data expected in the models and the database, the process of linking up the Digital models/database.

Contract	Client	Architect	Engineer	Entreprise	Subcontractor	(...)

Shared Basis	BIM Execution Plan - Shared objectives -

Details					
		Coordination schedule	Modelized Item	Item configuration	3D-Modell Organiation
	BIM glossary	Responsibility management	3D-Modell transfer	2D/3D Coordination	Modelling rules
	Request for information	Output Documents Own objectives	Collaborative Database	Detailed Validation process	Quality Control Rules

Figure 9 - Drafting a BIM contract (copyright Losinger Marazzi SA)

Project B1S - Greencity Zürich: Digitalised coordination

The project was not initially planned as a BIM development project (contract prior to Losinger Marazzi's advances in BIM development). The Participants wished to test the BIM method, implement the BIM execution plan and set up a precise coordination agenda. Thus, the digital models submitted by the Participants are defined and the elements and parameters to be exported (in IFC format) were jointly set up (Contractor Project Manager, BIM Manager, BIM coordinator and specific Participant for each trade). These models are examined from two different points of view: the quality of the data and the interaction between the models.

Figure 10 - Green city B1 Süd - coordination session (copyright Losinger Marazzi SA)

4. The value of tests and support

The development of the roles and the implementation of new tools imply a learning curve: Thus, the architect who works on a modelling software program for his/her specific purposes, must also learn to set up his/her model so that it can be compatible with other Participant models, thereby allowing the (automated) synchronisation of the information with the centralised database. This procedure is also valid for other building designers.

To dissipate the fear of change and the reticence in communicating project data other than essential data, Losinger Marazzi SA gives project Participants access to its own employees' expertise. BIM "coaches" have been trained in BIM tools specific to each trade so they can better support Participants.

In order to take into account the inherent features of each project, as for example: new BIM Participants, shorter production times, the implementation of innovative tools in terms of collaboration, etc., Losinger Marazzi SA engages in pilot phases during which series of modelling and collaboration tests are carried out, and discussions on the collaboration process and information sharing are encouraged. The aim is to reach beyond reticences, beyond the idea of budgets/ownership and predefined roles, to validate the future roll-out of the project together. This phase is one of the key phases for the success of a BIM project.

The importance of tests: Students housing - Vortex (2016 -2019)

This project for a student residence on the Lausanne campus is composed of a large circular 140 m wide building in the form of a ramp. The accommodation units overlook an internal 100m-wide swirling courtyard with an ascending floor at a 1% incline. To take into account this specific layout, the team (specifically the architect and the BIM specialists) worked on the most efficient modelling, taking into account: modelling time, the connection with the database and the specialist models (HVAC, Structure). The best solution was to create new theoretical principles, and then add lags between the heights of the buildings in relation to these levels.

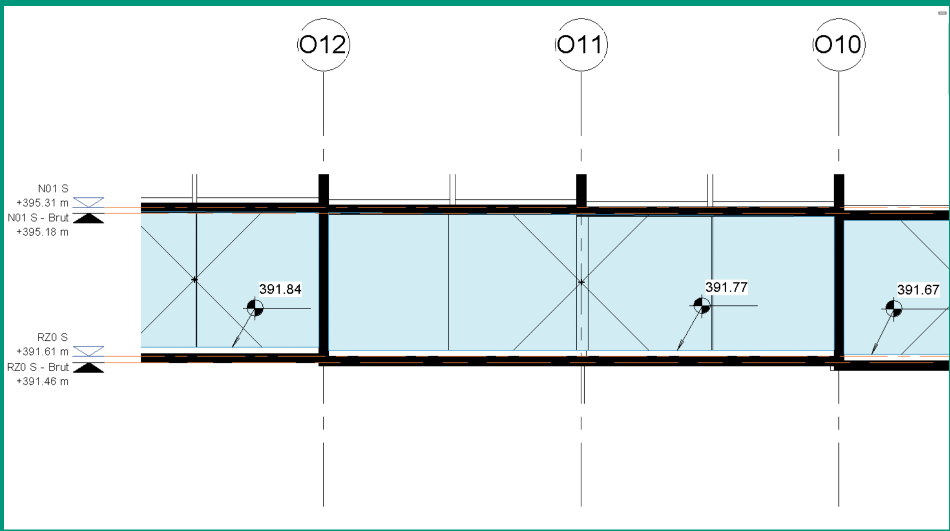


Figure 11 - Students housing Vortex - section with alimetry of the parts (copyright Losinger Marazzi SA)

5. The lifecycle and consistency of data

Since data is placed at the centre of this new organisation, it is important to provide a process that enables the project team to work with confidence. Each piece of data has to be placed within a framework:

- Is the information relevant and does it meet an objective?
- Is the information available at the right time?
- Is it properly integrated?
- Is it accurate?
- Can it be exploited by other participants?
- Who created it, who controls it and who uses it?

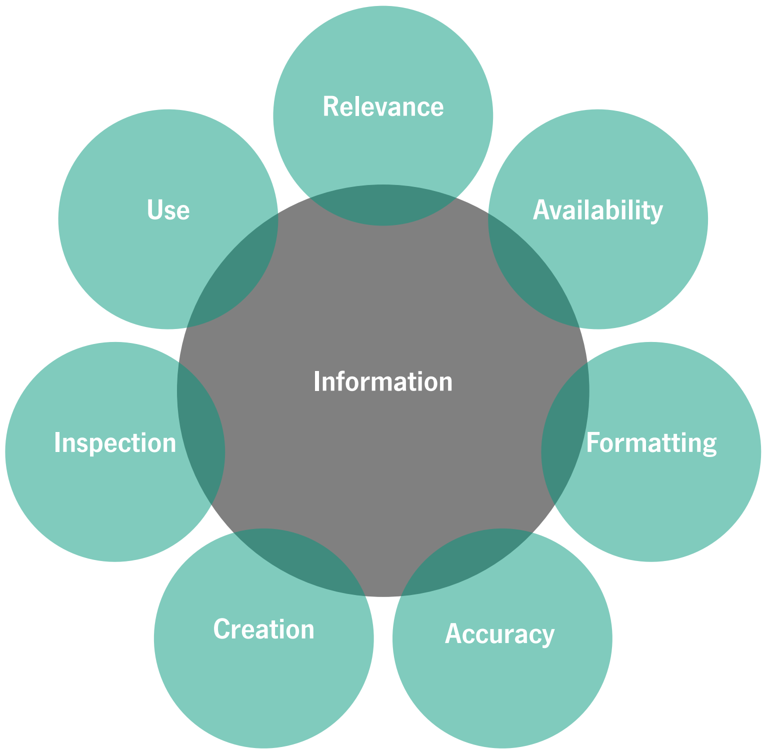
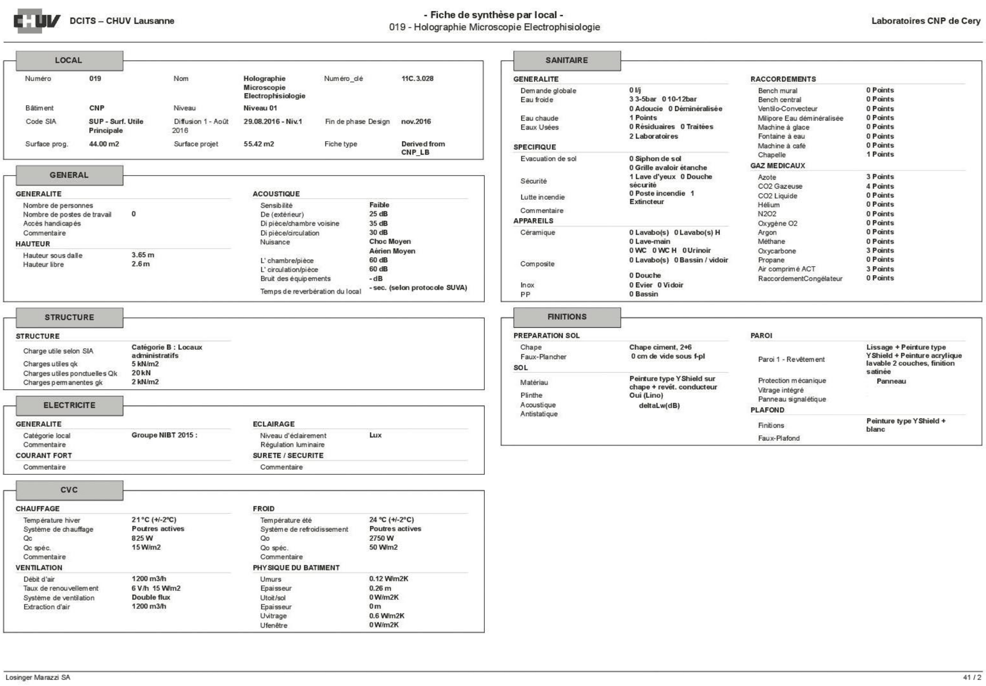


Figure 12 - The fundamentals of information management
(copyright Losinger Marazzi SA)

Due to the multitude of Participants present during the project development, one and the same piece of information must therefore be supported by a multitude of supports and administered by several Participants during the course of the project.

What is new with the centralisation of the data is the ability to obtain a complete picture of the project: for example, to retrieve a file for a room including all restrictions and component parts before the room itself has been designed or realised. Going into a lot of detail in describing the structures, allows:

- Targeting the large scale / significant rooms of the project
- Reducing the production of the first graphic documents
- Making document submissions more precise
- Automatically eliminating errors in consistency between the trades



DCITS – CHUV Lausanne

- Fiche de synthèse par local -
019 - Holographie Microscopie Electrophisiologie

Laboratoires CNP de Cery

LOCAL

Numéro	**019**	Nom	**Holographie Microscopie Electrophisiologie**	Numéro_clé	**11C.3.028**
Bâtiment	**CNP**	Niveau	**Niveau 01**		
Code SIA	**SUP - Surf. Utile Principale**	Diffusion 1 - Août 2016	**29.08.2016 - Niv.1**	Fin de phase Design	**nov.2016**
Surface prog.	**44.00 m2**	Surface projet	**55.42 m2**	Fiche type	**Derived from CNP_LB**

GENERAL

GENERALITE		**ACOUSTIQUE**	
Nombre de personnes		Sensibilité	**Faible**
Nombre de postes de travail	**0**	De (extérieur)	**25 dB**
Accès handicapés		Di pièce/chambre voisine	**35 dB**
Commentaire		Di pièce/circulation	**30 dB**
HAUTEUR		Nuisance	**Choc Moyen Aérien Moyen**
Hauteur sous dalle	**3.65 m**	L' chambre/pièce	**60 dB**
Hauteur libre	**2.6 m**	L' circulation/pièce	**60 dB**
		Bruit des équipements	**- dB**
		Temps de reverbération du local	**- sec. (selon protocole SUVA)**

STRUCTURE

STRUCTURE	
Charge utile selon SIA	**Catégorie B : Locaux administratifs**
Charges utiles qk	**5 kN/m2**
Charges utiles ponctuelles Qk	**20 kN**
Charges permanentes gk	**2 kN/m2**

ELECTRICITE

GENERALITE		**ECLAIRAGE**	
Catégorie local	**Groupe NIBT 2015 :**	Niveau d'éclairement	**Lux**
Commentaire		Régulation luminaire	
COURANT FORT		**SURETE / SECURITE**	
Commentaire		Commentaire	

CVC

CHAUFFAGE		**FROID**	
Température hiver	**21 °C (+/-2°C)**	Température été	**24 °C (+/-2°C)**
Système de chauffage	**Poutres actives**	Système de refroidissement	**Poutres actives**
Qc	**825 W**	Qo	**2750 W**
Qc spéc.	**15 W/m2**	Qo spéc.	**50 W/m2**
Commentaire		Commentaire	
VENTILATION		**PHYSIQUE DU BATIMENT**	
Débit d'air	**1200 m3/h**	Umurs	**0.12 W/m2K**
Taux de renouvellement	**6 V/h 15 W/m2**	Epaisseur	**0.26 m**
Système de ventilation	**Double flux**	Utoit/sol	**0 W/m2K**
Extraction d'air	**1200 m3/h**	Epaisseur	**0 m**
		Uvitrage	**0.6 W/m2K**
		Ufenêtre	**0 W/m2K**

SANITAIRE

GENERALITE		**RACCORDEMENTS**	
Demande globale	**0 l/j**	Bench mural	**0 Points**
Eau froide	**3 3-5bar 0 10-12bar**	Bench central	**0 Points**
	0 Adoucie 0 Déminéralisée	Ventilo-Convecteur	**0 Points**
Eau chaude	**1 Points**	Milipore Eau déminéralisée	**0 Points**
Eaux Usées	**0 Résiduaires 0 Traitées**	Machine à glace	**0 Points**
	2 Laboratoires	Fontaine à eau	**0 Points**
SPECIFIQUE		Machine à café	**0 Points**
Evacuation de sol	**0 Siphon de sol**	Chapelle	**1 Points**
	0 Grille avaloir étanche	**GAZ MEDICAUX**	
Sécurité	**1 Lave d'yeux 0 Douche sécurité**	Azote	**3 Points**
		CO2 Gazeuse	**4 Points**
Lutte incendie	**0 Poste incendie 1 Extincteur**	CO2 Liquide	**0 Points**
		Hélium	**0 Points**
Commentaire		N2O2	**0 Points**
APPAREILS		Oxygène O2	**0 Points**
Céramique	**0 Lavabo(s) 0 Lavabo(s) H**	Argon	**0 Points**
	0 Lave-main	Méthane	**0 Points**
	0 WC 0 WC H 0 Urinoir	Oxycarbone	**3 Points**
Composite	**0 Lavabo(s) 0 Bassin / vidoir**	Propane	**0 Points**
		Air comprimé ACT	**3 Points**
	0 Douche	RaccordementCongélateur	**0 Points**
Inox	**0 Evier 0 Vidoir**		
PP	**0 Bassin**		

FINITIONS

PREPARATION SOL		**PAROI**	
Chape	**Chape ciment, 2+6**	Paroi 1 - Revêtement	**Lissage + Peinture type YShield + Peinture acrylique lavable 2 couches, finition satinée**
Faux-Plancher	**0 cm de vide sous f-pl**		
SOL		Protection mécanique	**Panneau**
Matériau	**Peinture type YShield sur chape + revêt. conducteur**	Vitrage intégré	
Plinthe	**Oui (Lino)**	Panneau signalétique	
Acoustique	**deltaLw(dB)**	**PLAFOND**	
Antistatique		Finitions	**Peinture type YShield + blanc**
		Faux-Plafond	

Losinger Marazzi SA

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Figure 13 - Room data sheet extract (copyright Losinger Marazzi SA)

In addition, the team also provides the client with a more reliable project, along with the possibility to better control the relevance and the kind of variations from their original programme.

The tools allow changes in the project to be tracked and to define which variations are presented to the client.

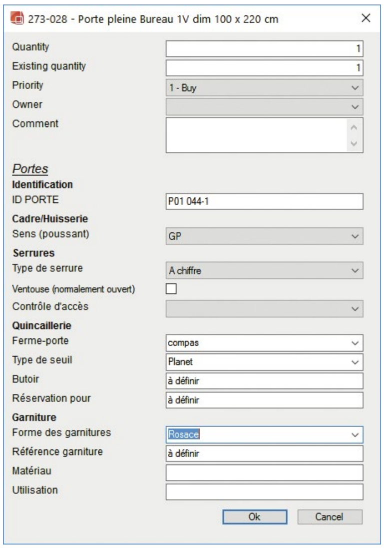

Figure 14 - profiling a door and unique ID (copyright Losinger Marazzi SA)

This database generates a catalogue of items by trade (eccBAT: A Swiss classification equivalent to Omniclass and Uniformat) which will change in accuracy and in quantity of data. Each Participant can fill in the characteristics of the elements for which they are responsible (for example the level of fire protection of a door by the fire safety specialist).

This data, which is accessible to everyone, will have an impact throughout the project and its different phases: The purchase of materials and equipment can be anticipated thus saving costs (especially if the project information is aggregated in order to share purchases). The building process can also benefit from this information, integrating it into the logistics and the organisation of supplies. Finally maintenance can be planned during the design phase (integration of material and equipment lifespans). This results in a consistency and continuity between design, production and maintenance.

First test on the pre-eminence of the data on graphic documents and 3D modelling: CIC-Riviera Clinic - Clarens (VD) (2014-2017)

This project involved the renovation, extension and addition of floors of a fully functional clinic. To define the services required by the client and to get a handle on the surface areas, the team put in place, during the pre-design contract negotiations, an automated (Excel-based) services management tool allowing all participants to integrate their elements, "room by room", without having to refer to the modelling (the architect worked with a 2D software programme).The lifespan of this information continued to change through a centralised database providing a rapid modelling of all rooms (all services and materials were known). These digital benchmarks allowed the client to validate the project and helped the worksite optimise the construction.

Figure 15 - 360° view - outpatient hospital (copyright Losinger Marazzi SA)

6. IFC formats, tools, and their interoperability

6.1. The project software map

The team, led by the BIM Manager, defines a map of the software programmes used on the project and a list of model links required, so that the workflow of the data is ensured and is uninterrupted.

The development of software tools is a lot faster than build-process tools, the tools themselves changing at different rates. Interfaces have to be constantly updated to ensure data reliability so that the project can progress correctly. For example, in the new hospital Limmattal the architects used a software programme and changed the version 7 times in 5 years, from the first sketches up to the plans currently being executed.

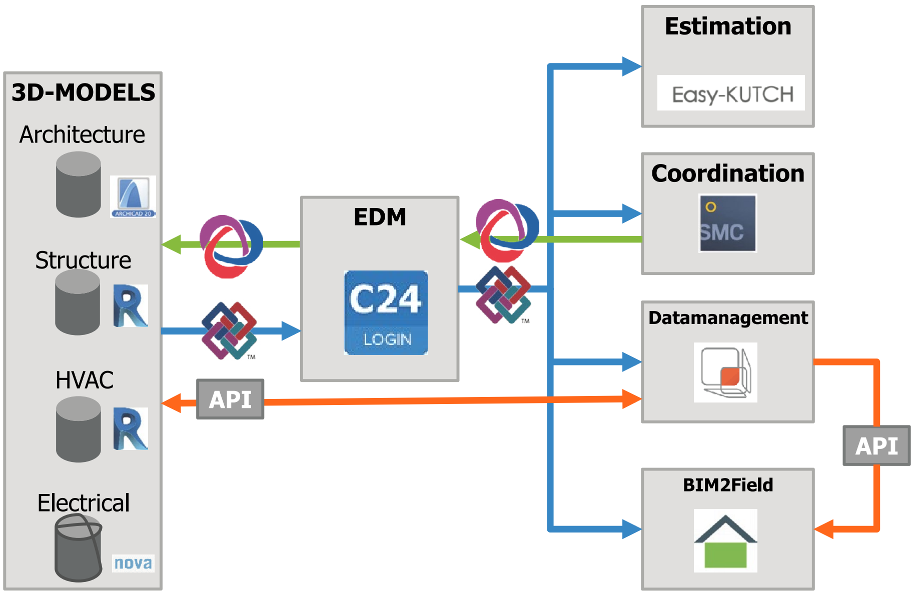

Figure 16 - Map of used softwares on a project (copyright Losinger Marazzi SA)

6.2. The quality of data transfer

The most sensitive point is the transfer of data between the digital models and the centralised and collaborative database. Reliability is only possible if the standards of interaction are acknowledged and defined. Data transfer (specifically with IFCs) must be done correctly:

- Data in a model or database faithfully exported from the transmitting software
- Data fully imported and transposed into the receiving software
- Data transfer should also be reversible to help achieve a high level of collaboration

For the moment, the bidirectional gateways between the digital model and the database (currently dRofus) are only effective for Archicad and Autodesk Revit. Once all the gateways are created between the modelling software and the database, a buildingSMART certified software programme used by any Participant programme can be integrated into an openBIM team which holds the data as the basis of the collaboration.

6.3. openBIM?

It would be tempting to "lock down" the system by predetermining the software that can be used to facilitate the implementation of the BIM process in projects, as is the case of a lot of roll-outs by a team on a target project. This choice, although it is functional and immediately effective, does not allow the adaptability of the procedures to be challenged, nor does it highlight the need to control the interoperability between the software tools. It is always best to be able to use the best tool (relevance, quality of available data) based on the context, so as not give one publisher or group of publishers all the data. If the choice of an openBIM approach is more complicated and takes longer to control (being based on exported data and a format that needs maturing), it allows, on a practical level, development and the flexibility required (data supports can develop more freely over the course of the phases, the Participants and the maturity of the software programmes). This significantly extends the field of skill and expertise of the Participants.

It has also become easier to respond to new expectations of the Participants in terms of new tools that regularly come onto the market; on condition they master data collection and management, security policies and placement tools.

7. Shared classification of items and data

Sharing data, specifically items containing this data, results in displaying available data that everyone understands. It is therefore necessary to determine the most suitable classification, as for example:

- International classification such as Omniclass or Uniformats, but Participants need to learn a new classification which is not in line with the Swiss system.
- The current CFCs have the disadvantage of combining elements and materials of their component parts: a PVC window is classified under CFC221.2 and a steel window under CFC221.3.
- The eCCbat classifications come closest to the international classification codes (classification per element regardless of its main component material) by adapting the CFC codes to the Swiss classifications (thus windows are now classified E.3.1). Despite a still limited use by professionals, this option being the preferred one by far.

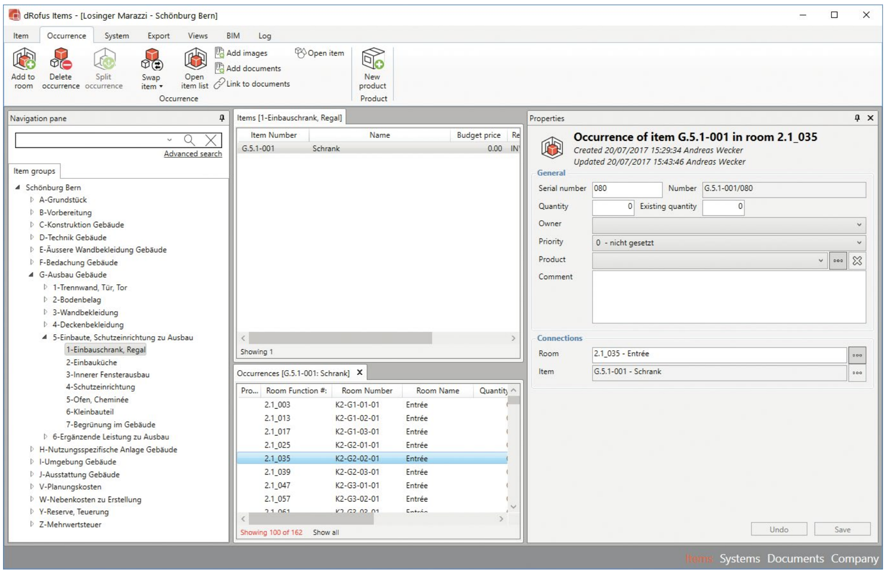

Figure 17 - Classification of building items with ECCCBAT (copyright Losinger Marazzi SA)

APPLYING THE CONCEPT TO THE PROJECTS: A MULTITUDE OF PARTICIPANTS

1. The launch pad: The new hospital Limmattal- Schlieren (ZH)

Project Information	Current phase	Execution
	Type of Contract	Design and Build
	Calendar	Competition 2012
		Design 2013 - 2015
		Execution 2015 - 2018
	Type	Hospital
	Area	48 000m²
Participants (using BIM on the project)	Clients	Spital Limmattal (Schlieren - Switzerland)
	Architects	Brunet Saunier Architecture (Paris - France)
		BFB Architekten (Zurich - Switzerland)
	HVAC Consultancy firms and technical coordination contractors	Hans Abicht (Zurich - Switzerland)
	Electrical consultancy firm	Scherler AG (Zug - Switzerland)
	Structural consultancy firm	BG Ingénieurs Conseils SA (Zurich - Switzerland)
	BIM coordination	Losinger Marazzi (Zurich - Switzerland)

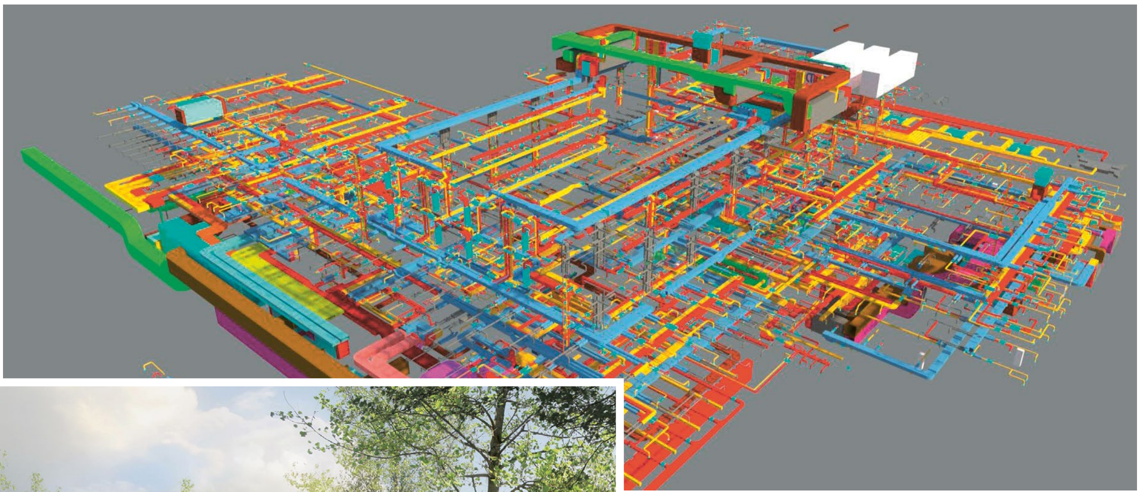

Figure 19 - New hospital Limmattal - Coordinated model (copyright Losinger Marazzi SA)

Figure 18 - New hospital Limmattal - Overview (copyright Brunet Saunier Architecture & BFB architeckten)

2. Data in prevalence: renovation, extension and raised height of the CIC Riviera Clinic - Clarens (VD)

Project Information	**Current phase**	**Delivery**
	Type of Contract	**Negotiated contract**
	Calendar	
	Type	**Hospital; Renovation, Extension**
	Area	**10 000m²**
Participants (using BIM on the project)	**Clients**	**CIC Groupe Santé (Clarens - Switzerland)**
		Patrimonium (Echandens - Switzerland)
	BIM Model	**Losinger Marazzi SA (Bussigny - Switzerland)**
		Mensch und Maschine (Paudex - Switzerland)
	HVAC and technical coordination engineer	**BG Ingénieurs Conseils SA (Lausanne - Switzerland)**
	BIM Coordination	**Losinger Marazzi SA (Bussigny - Switzerland)**

Figure 21 - CIC Riviera Clinic - Room view
(copyright Losinger Marazzi SA)

Figure 20 - CIC Riviera Clinic - Architecture view
(copyright Losinger Marazzi SA)

3. First project 100% BIM coordination: Hotel Palexpo - Grand Saconnex (GE)

Project Information	Current phase	Execution
	Type of Contract	Negotiated contract
	Calendar	Design 2015-2016
		Execution 2016-2017
	Type	Hotel / Offices
	Area	9 500m^2
Participants (using BIM on the project)	Clients	Boisset finances (Paris - France) pour le compte de Accor Hotel
	Architects	Group8 architectes (Carouge - Switzerland)
	Designer	Agence Terrones (Paris - France)
	HVAC and technical coordination engineer	BG Ingénieurs Conseils SA (Vernier - Switzerland)
	Electrical engineer	B+S ingénieurs conseils SA (Genève - Switzerland)
	Structural engineer	Losinger Marazzi SA (Geneva - Switzerland)

Figure 22 - Hotel Palexpo - Overview (copyright Group8)

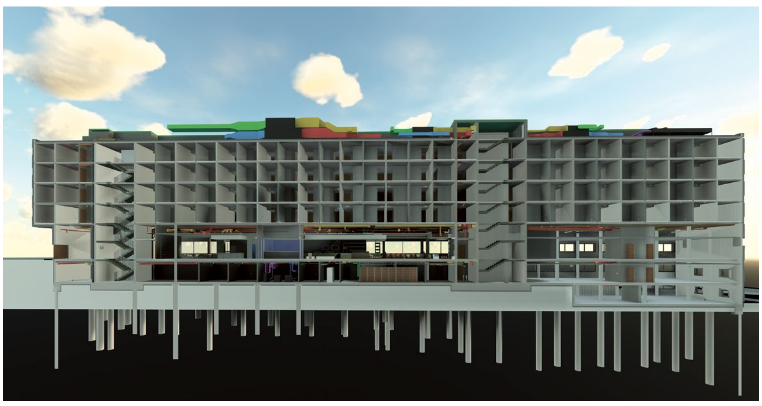

Figure 23 - Hotel Palexpo - Coordinated model (copyright Losinger Marazzi SA)

4. Quality of data and project coordination: B1 Sud Residence - Ecoquartier Greencity - Zurich (ZH)

Project Information	Current phase	Construction
	Type of Contract	Design and Build
	Calendar	Construction: September 2016 - March 2019
	Type	Collective housing
	Area	21 700 m^2
Participants (using BIM on the project)	Clients	Home ownership
	Architects	Steib & Geschwentner Architekten AG (Zurich - Switzerland)
	HVAC and technical coordination engineer	Pöyry AG (Zurich - Switzerland)
	Structural engineer	Urech Bärtschi Maurer AG (Zurich - Switzerland)
	BIM Coordination	Emch+Berger WSB AG (Cham - Switzerland)

Figure 24 - B1 Sud Residence - Overview (copyright Losinger Marazzi SA)

Figure 25 - B1 Sud Residence - Coordination view (copyright Losinger Marazzi SA)

5. Use of BIM in design phase: Baleo Residence, Quartier Erlenmatt - Basel (BS)

Project Information	Current phase	Construction
	Type of Contract	Design and Build
	Calendar	Construction: September 2016 - March 2019
	Type	Collective housing, Retail
	Area	56 000 m^2 (Retail 7 500m^2)
Participants (using BIM on the project)	Clients	Credit Suisse (Switzerland)
	Architects	Morger & Partner Architekten AG (Basel - Switzerland)
	HVAC and technical coordination engineer	Energieatelier AG (Thun - Switzerland)
	Electrical engineer	Aare Elektroplan (Olten - Switzerland)
	Structural engineer	Schnetzter Puskas Ingenieure
	BIM coordinator	Losinger Marazzi SA (Basel - Switzerland)
		BIM6D (Emmenbrücke - Switzerland)

Figure 26 - Baleo Residence - Overview
(copyright Morger & Partner Architekten AG)

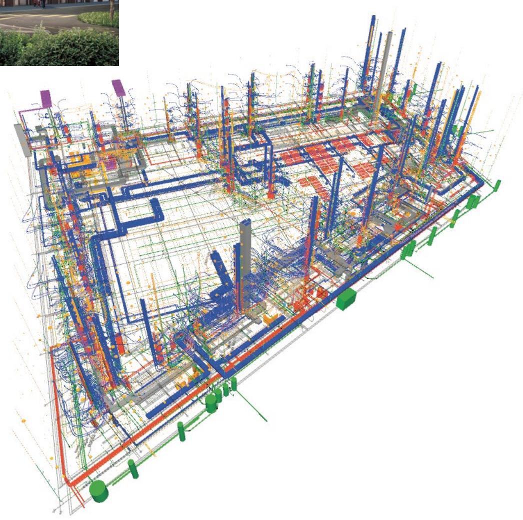

Figure 27 - Baleo Residence - Coordinated model
(copyright Losinger Marazzi SA)

6. Pilot phase: Students housing Vortex - Echallens (VD)

Project Information	Current phase	Design
	Type of Contract	General contractor
	Calendar	Design: 2017
		Construction: 2017-2019
	Type	Students housing
	Area	36 700 m²
Participants (using BIM on the project)	Clients	Caisse de Pension de l'Etat de Vaud (Lausanne - Switzerland)
	Architects	Itten&Brechbuehl (Lausanne - Switzerland)
	HVAC and technical coordination engineer	Tecnoservice Engineering S.A. (Fribourg - Switzerland)
	Electrical engineer	Perrin - Spaeth SA (Renens - Switzerland)
	Structural engineer	Thomas Jundt Ingenieurs civil (Carouge - Switzerland)
	BIM coordinator	Losinger Marazzi SA (Bussigny - Switzerland)

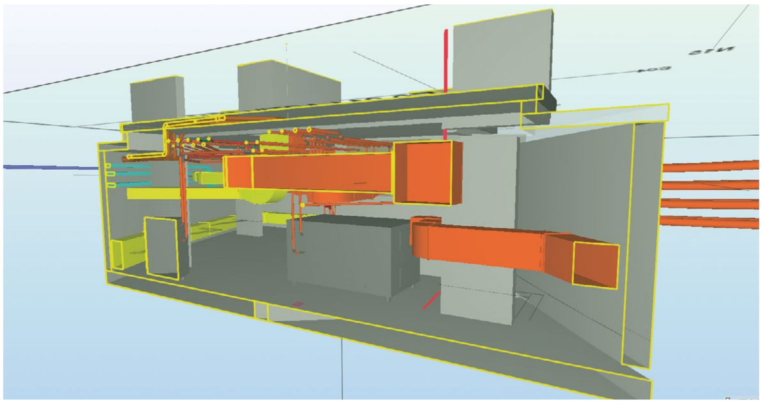

Figure 29 - Students housing Vortex - Coordinated model (copyright Losinger Marazzi SA)

Figure 28 - Students housing Vortex - Overview (copyright J.P. Dürig)

7. Butterfly effect: Cery Neuroscience Laboratories - Prilly (VD)

Project Information	Current phase	Construction
	Type of Contract	Design and Build
	Calendar	Competition: 2014
		Design: 2016-1017
		Construction : 2017-2018
	Type	Hospital
	Area	4 400 m^2
Participants (using BIM on the project)	Clients	Centre Hospitalier Universitaire Vaudois (Lausanne - Switzerland)
	Architects	Burckhardt+Partner SA (Lausanne - Switzerland)
	Technical coordination and engineer	Ponzio Etudes Sanitaires (Lausanne - Switzerland)
	HVAC engineer	Weinmann Energie SA (Echallens- Switzerland)
	Electrical engineer	MAB Ingénierie SA (Morges - Switzerland)
	Structural engineer	Monod Piguet Ingénieurs Conseils SA (Lausanne - Switzerland)
	BIM coordinator	Losinger Marazzi SA (Bussigny - Switzerland)

Figure 30 - Cery Neuroscience Laboratories - Overview (copyright: Burhkhardt & Partner)

Figure 31 - Cery Neuroscience Laboratories - Lab view (copyright Losinger Marazzi SA)

OPEN QUESTIONS

1. Re-allocating resources

Losinger Marazzi looks at the tools and procedures, and learning to manage them, with the intention of soon integrating BIM into the standard project development process - but what is the time-scale for digitalisation, when it took over 20 years to move from the design table to CAD? The next question to arise is where will employees fit within the company and what will their roles in the projects be? The time saved could:

- be assigned to other projects
- be used to examine the interdisciplinary variations to improve the project and/or its process upgradeability during its full lifecycle, this being by far more complicated to implement because it requires dynamic design tools coupled with digital modelling tools which are yet to be operational.

2. Prospects for the future

Within the framework of the strategy in implementing a BIM process, several issues need to be explored further:

- Increase the disassociation between the data and their supports: work on neutral formats and software interoperability
- Capitalise and set up management tools for data exploitation
- Involve all services to go beyond project data to integrate metadata

Other points should really be dealt with:

- Training in data exploitation
- Managing employee skills

CONCLUSION

1. As it stands today

Losinger Marazzi AG, when faced to the single and mandatory standard, opted to adapt the roll-out process on a case-by-case basis so as to be flexible and responsive to the evolution of the Swiss construction market. This non-choice of imposed and standardized tools and infrastructures is today a choice that promotes agility. The difficulties in managing this openness were offset by investing in the development of skills to extract, organize, control and share digital data for projects.

This strategy combined to the expertise of the company and of its staff show results in:
- 100% of the projects use a BIM execution plan, enabling each participant to be a stakeholder in the BIM movement.
- 80% of the BIM projects are connected to a collaborative and centralized database: there are thus more than 300000 m2 managed in August 2017 compared to 80000 m2 in June 2015.
- 100% of the BIM projects use 3D coordination with a specific software providing automatic clash detection and workflow for approval/publication.
- All BIM projects in execution have a BIM coordinator (staff or contractor) who is a member of the construction team and mentored by a Losinger Marazzi BIM manager: implementation is lasting and relevant.

2. Creating a BIM ecosystem

Encouraging the evolution of the participants' roles as well as of the processes, and basing them on the availability of data compatible with the various tools, creates an ecosystem (environment conductive to changes and experiments) and a community for the participants. A culture of collaboration and of data management emerges whatever the job or the expertise of the participant, beyond a simple change in software.

Moving away, at least partially, from graphical representation tools becomes possible: for example data creation can begin in a simple spreadsheet, then be transferred to a 3D Modelling tool, which in turn will be connected to a project database with its own materials and standard equipment library. Data can be immediately checked, approved and ordered for construction.

Priority is given to the control and sustainability of the digital data.

As the culture of digitalization progresses, the field of possibilities in matters of collaboration and data processing extends to make the construction world ever more responsive.

GLOSSARY

Participant

Project Participants are companies and/or entities signatories to this document (notably: Losinger Marazzi, authorised representatives, Project Managers, sub-contractors, suppliers, etc.).

Project Team

The Contractual organisation bringing together the Participants from the various companies (business, architect or engineer consultancy firms, sub-contractors, suppliers, etc.) required to build a project for a client.

General Contractor

Beyond the build, the Company manages the design phase of the construction. It is thus responsible for all the phases of the project. It leads the project alone or assigns a third party to manage it in its name and on its behalf. This third party does not sign any contract with the Project Manager. Therefore, the general contractor is only distinguished from the contracting business by the fact that, excluding the latter's functions, it takes on the tasks connected to the design of the project ordered by the Project Manager. The design and execution of the build come under the one and same contract.

Digital model

This is defined as a digital 3D representation of the component parts of a build in the form of configured elements.

A BIM model is made up of items of models developed in the BIM-compatible software programme.

Items

Indicates the various construction items of the digital model of the build, such as walls, supporting structures, doors, etc., as elements of the digital build. Frequently, a unit is defined for each element on the geometric plan with attributes such as type, function (or functions) or other properties.

Centralised and collaborative project database

Indicates the tool that manages the "room by room" services. It includes the database that is accessible to all Contractors (including a personalised management tool with user rights) and combines a certain amount of information to qualify the project (including an item catalogue). Gateways between this database and the specialist models are put into place (depending on the compatibility of the modelling software programmes) to allow information to flow.

More information

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