Action Plan for Digitization, Ocean Space Centre

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1 Introduction

The project's digitization strategy contains general principles for digital cooperation in the project, intended for the project lifetime. It ensures that all measures for digital collaboration support the project's goals and that they are coordinated with all involved parties. This action plan is derived from the digitization strategy and contains several topics related to digitisation and digital cooperation, figure 1.

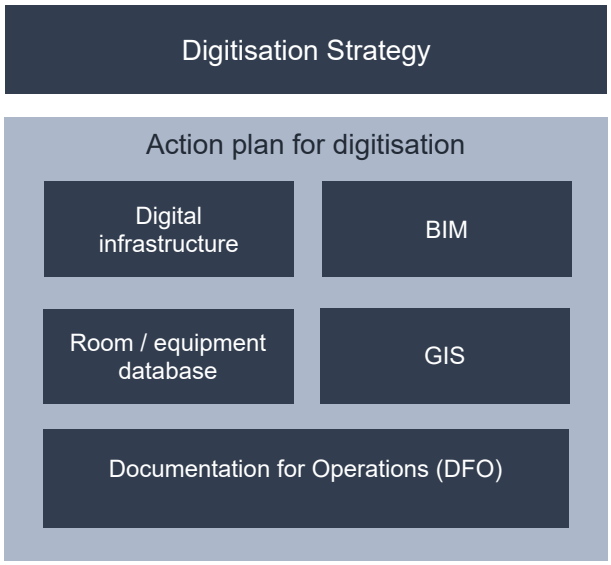


Figure 1 – Digitisation strategy and action plan for digitisation

The action plan includes digital infrastructure, GIS / BIM, room and equipment database, document management system, digital collaboration platforms, etc. It is completed/revised before each new phase and is part of the contract.

The overall structure for organizing the project with user participation from NTNU and SINTEF, as well as highly specialized user equipment requires comprehensive planning across organizations. This structure ensures the best possible quality of deliveries, utilize resources and expertise, decision-making, progress and dialogue. To achieve this, interaction with digital solutions is necessary to ensure a qualitative flow of information, visualization, control, maturity, planning and decision-making.

Information retrieval using e.g. process models must be used in all phases and by all actors in the form required by their processes. Ocean Space Center (OSC) will include many processes for the various parts of the project. These covers large to more detailed processes. Based on the needs, the project has defined and prepared generic processes that must be followed in an overall perspective. The purpose is to ensure equal expectations, interaction and understanding between all actors in the project.

1.1 Roles and responsibilities

Organization of roles, responsibilities and competence is crucial for progress and division of responsibilities in the project. In an overall perspective, the organization of project Ocean Space Center will consist of roles as identified in figure 2. The responsibilities distributed among roles are clarified in each phase. As head of management and coordination, Statsbygg (SB) must always have the role of project manager for digital collaboration.

Cooperation in OSC assumes effective exchange of information between the parties. To ensure this interaction, the role as digital collaboration coordinator must be established within all parties involved in the project - *Statsbygg*, *design engineers* and *executor*. This role must cooperate between parties to streamline collaboration in the project through exchange of experiences. The project will establish a suitable collaboration forum.

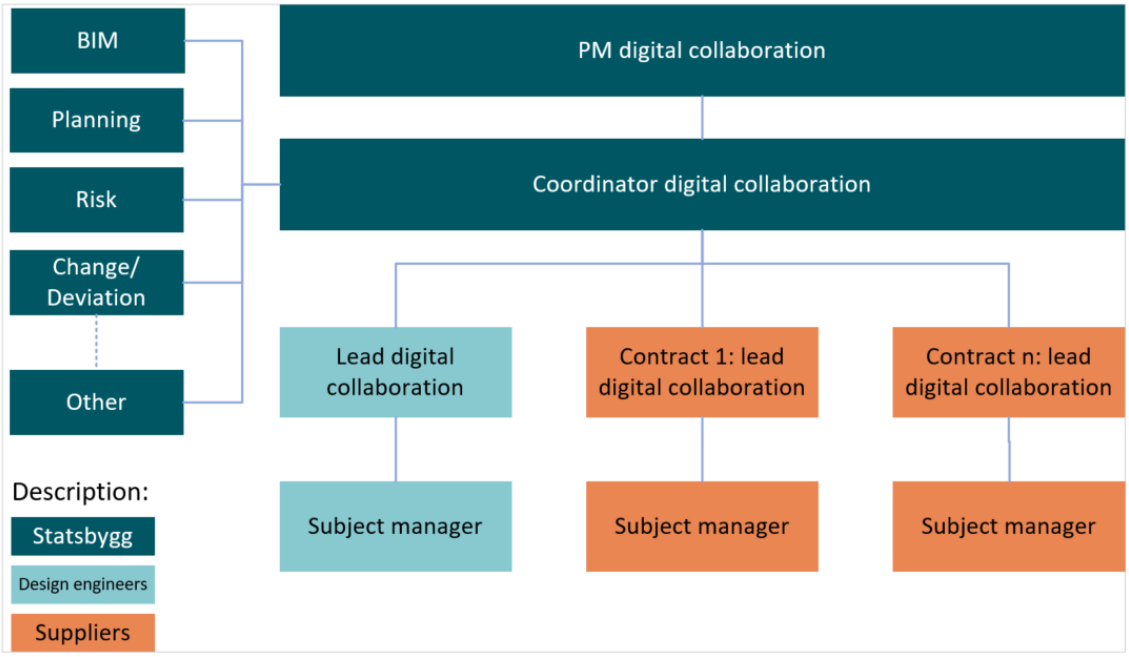


Figure 2: Organizational roles related to digital collaboration in the project.

Examples of distribution of responsibilities and tasks.

Project manager digital collaboration

- Overall planning and management of digital collaboration in the project

Coordinator digital collaboration

- Coordinate and manage reunions with lead digital collaboration
- Design and adapt SB`s requirements for digital collaboration and deliveries
- In cooperation with lead digital collaboration, coordinate a proper start-up of digital collaboration
- Facilitate the supplier's digital deliveries

Lead digital collaboration

- Ensure that information exchange in the project is carried out according to plan
- Overall responsibility that models and databases maintain standards according to governing documents, and can be used for agreed purposes (quantity extraction, analyzes, etc.)
- Create, adapt, and update the assembly model
- Facilitate efficient use of digital solutions for management of engineering / production

Subject manager - model

- Ensure that information content and structure is in accordance with current requirements
- Ensure correct composition and use of information from others (models/databases) as a reference in own tools

- Ensure conversion to agreed formats
- Ensure that model and information are coordinated between disciplines prior to publication for interdisciplinary control
- Ensure that comments from interdisciplinary controls are followed up, corrected, and acknowledged in report for interdisciplinary control
- Use BCF as an exchange format in design engineering
- Automated/machine validation of IFC deliveries according to Statsbygg's BIM requirements - SIMBA 2.0

2 Building information modeling (BIM)

Statsbygg and project Ocean Space Center have high ambitions and requirements for BIM. The model will be the central information base for design and production. All design, including user equipment is prepared in the model, and the model must always have the latest updated material.

For a successful BIM project, it is necessary that everyone involved has an equal understanding of work processes, communication, and deliveries of BIM in the project. Some key documents to ensure such a common understanding are:

- This action plan with attachments; Indicates project-specific guidelines
- Information related to Statsbygg's BIM requirements - SIMBA 2.0
    - Machine validable requirements, adapted to project
    - General requirements
    - Guideline to requirements
- The supplier’s BIM implementation plan; Indicates the supplier's response to how implement the action plan.

Based on the project's complexity and high ambitions for BIM and other digital solutions, several requirements are set that affect the digital interaction in the design and construction process. Thus, suppliers must familiarize themselves with how the project requirements are to be fulfilled. Topics that are of particular importance are requirements for:

- Reporting of areas and area classification according to NTNU standard
- dRofus as TFM master
- Connecting BIM to DFO information
- Interaction between BIM, dRofus and FDV collection

Detailed requirements for BIM, as a process and delivery, see Appendix 1, BIM requirements.

2.1 Areas of use for BIM

The table indicates areas of use for BIM distributed by the project's current phases.

Table 1 – Areas of use for BIM

	Develop / plan	**Detail project**	**Implemen-tation**	**Delivery**
Room application	**x**	**x**	**x**	**x**
Maturity (MMI)	**x**	**x**	**x**	**x**
Mapping of subsoil (rocks) and mass calculations	**x**	**x**	**x**	
Interdisciplinary control	**x**	**x**	**x**	
Interdisciplinary labeling system		**x**	**x**	**x**

(TFM). dRofus is TFM master.				
Modeling of user equipment	x	x	x	x
Terrain model	x	x	x	x
Involving planning	x	x	x	
Product information (GTIN)			x	x
Electronic building search	x	x	x	x
Visualization (Vitual reality – VR)	x	x	x	
Rig planning	x	x	x	
Detailed withdrawal of quantities (NS3420 item level or improved)	x	x	x	x
ICE with focus on model	x	x	x	
Digital analyzes: • Acoustic • Technical fire analysis • Energy analysis • Light conditions • LCC cost • Accessibility analysis, UU • Green BIM	 x x x x x x x	 x x x x x x x		
Construction review in model	x	x	x	
Key indicators, KPI	x	x	x	
As-built - Routine for registration and modeling of acceptable deviations from the construction site			x	x
Systematic completion		x	x	x
Municipal buildings. Number of employees/number of man-years vs. the number of square meters pr. employee/pr. man-year	x			
BIM i byggesak – dibks dokument P13	x	x	x	x

3 Geographic Information System (GIS)

3.1 GIS-archive

A GIS archive will be created in the project with relevant available data sets for joint use in the project. Examples of this can be a basic technical map (FKB), orthophoto, cadastral map (matrikkel), plan map etc. These data sources are indicative, and suppliers are responsible for assessing, quality assurance and collecting of supplementary/updated data.

3.2 Simplified model

The design shall facilitate a simplified export of the models, which can be used for visualization and other GIS purposes. This mainly applies to ARK, RIB and LARK, but other disciplines may be included.

3.3 Terrain model

As a result of the engineering design, a model for the projected terrain and construction pit must be produced. The models must be available in a format that is readable by GIS tools.

4 Database for room and equipment (dRofus)

Ocean Space Centre will use dRofus as the database for room and equipment. It is a system for defining requirements setting, planning, data processing and the use of BIM for construction projects. dRofus contributes to ensure that all parties have interdisciplinary access to core data throughout the lifetime of the project all the way from the planning phase.

The system will be used throughout the project's lifetime to maintain an overview of required and projected rooms and equipment, as well as link this information and synchronize it with BIM models. The suppliers are responsible for development, updating and synchronization of the database and must therefore have expertise in dRofus.

4.1 Room and functional system

dRofus is used and held up to date to projected areas and requirements for rooms and areas. This denotes that suppliers in the next phases will take over and develop data from the previous phase. This applies to both room lists and requirements in RFP.

The details of data are different from the development and planning phase to different parts of the project, depending on the contract. Thus, there is a variation in how much data and the corresponding dRofus-database that needs to be developed.

4.2 Database for equipment

dRofus is used as a list of equipment for planning and set requirements for user equipment in this project. dRofus generates code for interdisciplinary marking system (TFM) for equipment. The equipment is also linked to projected rooms in the database.

4.3 TFM-master

This project use dRofus as master for TFM-codes. This applies that planning, generating and synchronization of TFM-codes for BIM objects takes place through the software. The supplier must have expertise to conduct these actions.

5 Digital infrastructure and collaboration

The digital infrastructure must support seamless interaction between different parties. The infrastructure includes exchange of stable information (requirements databases and models) and dynamic information (document management, deviations, orders), in addition to active collaboration (Teams, document management, etc.).

Ocean Space Centre will use *MS Office365*, (Word, Teams, etc.) for active collaboration. In addition, the project will utilize *Omega365 a*s the core system for document- and project management. Other collaboration tools are *MS Project Online* for planning purposes and *Dalux BIM-viewer* for modelling. The project is also in a process of evaluating other collaboration systems.

It is a prerequisite that communication and meetings in the project can be held both physically, at project locations in Trondheim and Oslo, and digitally in combination with web meetings. Web meetings must have user-friendly interfaces and are perceived as stable so that they constitute a

suitable alternative to physical meetings in the project. This will ensure a reduced climate footprint for the project with decreased travel activities.

Suppliers are responsible for establishing and operating their own proprietary model servers for internal collaboration, beyond the common infrastructure maintained by the client. The infrastructure for these systems will serve as part of a common infrastructure for the project.

The digital infrastructure will support interaction between parties, processes, and routines. Relevant areas for collaboration focus on interactions that provide effective communication and ensure progress in the project. Some key areas for collaboration in project Ocean Space Center are described below.

5.1 Change and deviation management

The purpose of changes and deviations from contracts is to ensure that this is managed in accordance with the contract's obligations. Procedures for changes and deviations in Ocean Space Center are described in more detail in the document « *F1 Administration Procedures* ».

Changes must be submitted as a change request (EF) or a change order (EO) with a written request from the client (BH) to the contractor. This announces the change that is desired. The contractor cannot make a change until there is an approved and/or signed change order from the project manager or client.

A discrepancy is the difference between planned and agreed results, and actual results. The operational processes in this project will mainly be directed at technical deviations for buildings, user equipment and/or SHA deviations.

The main processes for change and deviation are established and followed in the client's system for project management (*Omega365*). Representative processes for change proposals and deviation are illustrated in Figure 5-8. These processes also include routines for change proposals from the user groups *SINTEF* and *NTNU*. Underlying sub-processes can be established under these processes. If specific clarifications are needed during sub-processes, individual adjustments must be made to achieve the desired result.

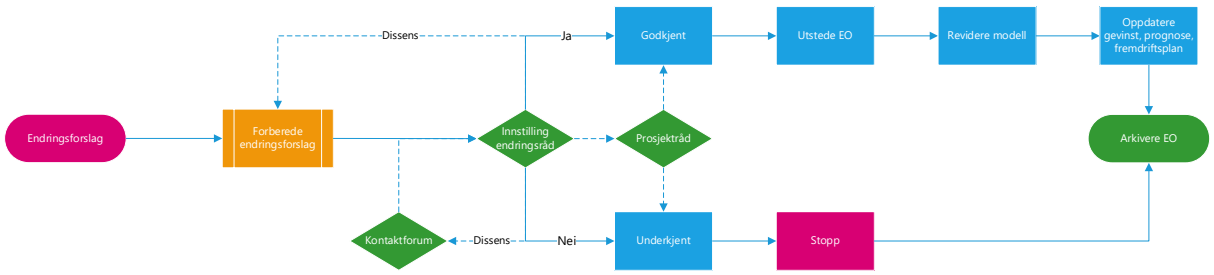
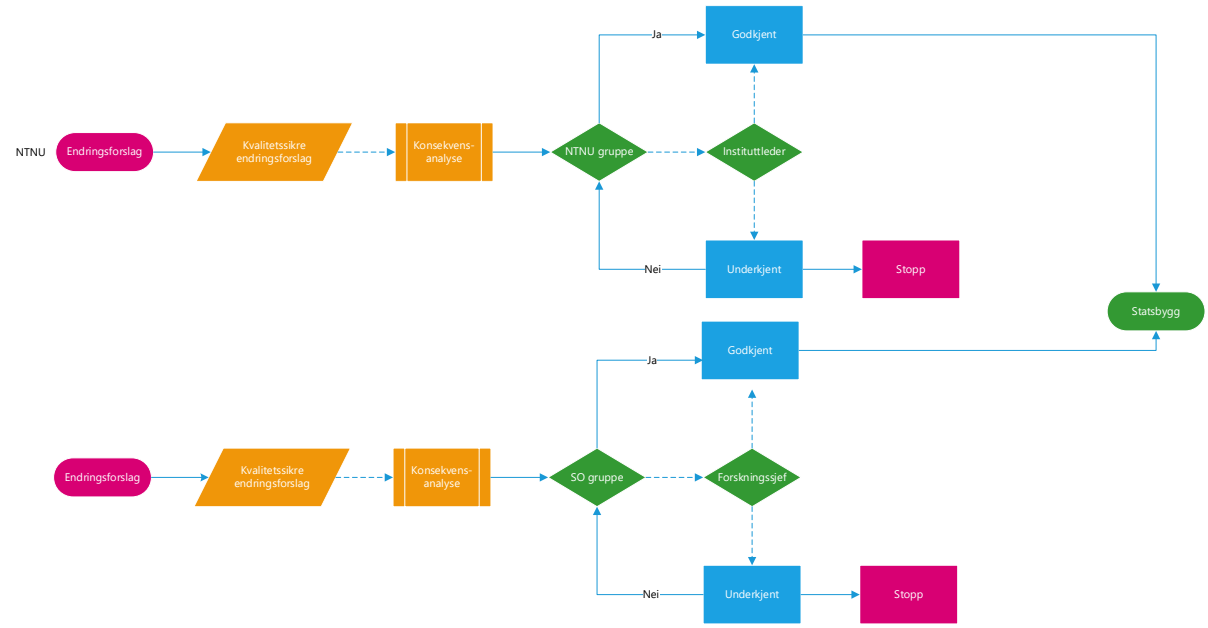


Figure 5 - Process for change management.



Figur 6 – Process for change proposals from SINTEF/NTNU.

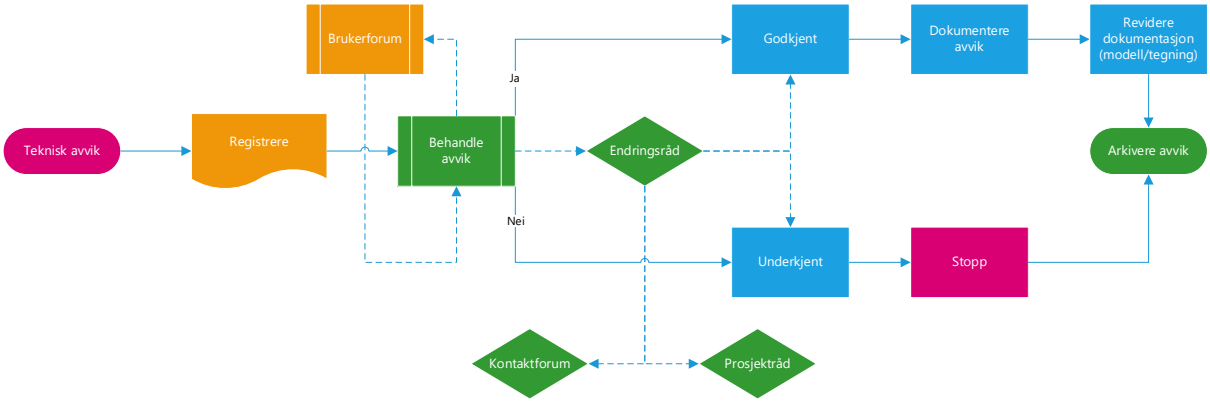


Figure 7 - Process for technical deviations.

Figure 8 - Process for SHA deviations.

5.2 Reporting

Contractors and suppliers must report on management structures in the project. This comprises reporting at management structure level 3.

Follow-up and reporting will be done through the clients reporting system. The project management tool *Omega365* will be used for this purpose and suppliers must report and notify the client in this system. With regards to completion, there may be requirements for reporting at a more detailed level on status and commissioning of the various contracts.

5.3 Planning

The client's planning organization follows the project's work breakdown structure, WBS. A simplified version is shown in the table 2.

Level 1	Milestone dates for start and finish for wings and central user equipment
Level 2	Milestones for dispatch, award, completion date per contract and critical dependencies for deliveries between contracts
Level 3	The contractors' own plan must be made available to Statsbygg

The Contractors' detailed plan at level 3, which is made available to Statsbygg, shall state how the scope of work of the contractor is fully reflected in a network plan.

Statsbygg and contractors must use the same tools for planning and comparing plans. Based on an assessment, all plans must be made available to Statsbygg with the planning tool *MS Project*. The contractor must make detailed plans available for Statsbygg by a cloud-based solution, *MS Project Online*. The contractor is required to provide this functionality through access control. Statsbygg can assist in facilitating this access.

Contract milestones must be linked to activities in the plan to ensure efficient planning and achievement of milestones in the contract. Critical lines must be presented.

The client will emphasize that contractors perform and prioritize efficient progress planning and reporting.

Reliable and verifiable reporting systems will be established for all disciplines, for detailed engineering and for subcontractors.

5.3.1 Progress

The contractor is responsible for planning his work and must participate in coordination meetings to coordinate their work.

Progress will be followed up in periodic progress meetings on the construction site and through monthly reporting.

An aggregated progress curve must be established as a S-curve for the entire contract with monthly percentage (%) indication. The methodology and calculation must be presented to the client before commissioning to have a common understanding.

5.3.2 Baseline

Adjustment of baseline must be assessed every six months and include new approved change orders. A new revised baseline must be coordinated and used for reporting after clarifications with the client.

5.4 Risk and uncertainty

The project will use the project management tool *Omega365* to manage risk and uncertainty. The system will be used to document identified risk, overview of measures, owner of the measure (s), matrices for probability/consequence for risk and opportunities. It also includes the possibility to extract the 10 most relevant risks so that these can be used for further reporting to ministries, steering committee and Statsbygg's management.

The contractor must incorporate necessary risk-reducing measures in accordance with the contract's overall and specific requirements.

The documentation must as a minimum include the following:

- Identification of undesirable incidents

- Description of incident
    - Consequences of the incident
    - Probability of the incident
    - Description of risk
    - Recommended measures:
        - Risk management
        - Safety measures

5.5 Documentation for Operations (DFO) & Systematic completion

Routines and processes for collecting DFO in Ocean Space Center must be handled systematically. A plan must be prepared for content and delivery of DFO documentation. Operating personnel must verify DFO information as complete before handover - agreed deviation list with specified action (responsible role for action and deadline for rectification) for minor matters is accepted.

The project follows principles for systematic completion and DFO collection, ref. PA 0701 and PA 0702. The BIM model must be actively used in the process of systematic completion and DFO collection, by linking it to the documentation.

The project will use *Omega365* as the project management tool for DFO collection and systematic completion. Suppliers are expected to become familiar with this system.

For a detailed description of requirements for DFO documentation and systematic completion, reference is made to "*B5 Requirements for supplier documentation including DFO*" and "*B9 Strategy and requirements for systematic completion*".

6 Appendices

- Appendix 1 - BIM requirements

7 References

Following references are used in this document.

- Sets of machine validable requirements. General requirements and guidance for requirements: https://sites.google.com/view/simba-bim-krav/simba-2-0
- Statsbygg design instructions: https://www.statsbygg.no/publikasjoner
    - PA 0701 Systematic completion
    - PA 0702 Systematic DFO collection