COGNITWIN

Cognitive plants through proactive self-learning hybrid digital twins

DT-SPIRE-06-2019 (870130)

Deliverable Report

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Executive Summary

This report presents an overview of the project management activities performed from M19 (March 2021) to M30 (February 2022) of COGNITWIN project. Most updated project information such as facts and figures along with some background information on Grant Agreement and amendments are provided. Further, the results from M18 project review, information on various meetings held in the reporting period and the status of deliverables, milestones, finances, and risks are presented. The report finally presents updated information on Scientific/Technical Coordination & Impact Measurement System and Innovation Impact Measurement and Governance.

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1 Introduction

In the COGNITWIN project, the working methods and implementation routes are being agreed and implemented under the project management activities. A summary of these project management activities carried out from M19 to M30 is provided in this report. The updated key information about the COGNITWIN project is presented in Table 1.

Table 1: COGNITWIN key project information.

Acronym	**COGNITWIN**
Grant Agreement No	870130
Starting date	1 September 2019
Duration	**42 Months**
Project total cost	€ 8 653 170,00
EC contribution	€ 6 982 431,38
Project Coordinator	Frode Brakstad
Project Officer	Giuseppina Lauritano

2 Agreements

The Grant Agreement (GA) and Consortium Agreement (CA) regulate all relevant issues concerning management (description of the action, governing bodies, roles, organization, resources, specific operational procedures for the consortium bodies etc.). The status of GA and CA is as follows:

2.1 Grant Agreement

The GA was digitally sealed by the European Commission (EC) on 30-July-2019 (before the project was started).

2.2 Consortium Agreement

All the partners have signed the CA. The signing process was completed on 22-Jan-2020.

2.3 Amended Grant Agreement

The following amendments in the GA have been made:

- Project Duration (The project will run for 42 months instead of originally planned 36 months)
- List of Deliverables
- List of Milestones
- Table of Efforts
- Modified Gantt Chart
- Any other inconsistencies informed by the partners

The project extension request was made by the consortium based on the risk assessment performed due to COVID-19 situation. During the COGNITWIN project status meetings held 06-May-2020 and 20-

May-2020, the consortium has evaluated potential risks of delays on various deliverables and milestones caused by COVID-19 restrictions. The project is driven by 6 industrial pilots. Two of these pilots were facing restrictions in their operations which was imposing delays in their M18 deliverables. Consequently, all the other deliverables and milestones are delayed by 6 months. The organization of workshops in WP7 that were planned for M15 and M35 are also postponed by 6 months. Apart from the delay caused by COVID-19 situation, some additional amendments were also requested by the consortium. These requests were mainly based on inconsistencies found in the Description of Action (DoA) after the project was started.

All the amendments in Grant Agreement (including 6 months project extension) proposed by the consortium were accepted by EC on 10-Nov-2020. An updated Gantt chart is shown in Appendix A. A detailed overview of the amendments, including updated list of deliverables and milestones, is available on SharePoint platform of the project. The link of SharePoint folder is as follows (the access is available to invited members only):

https://sintef.sharepoint.com/teams/work-8364/SitePages/Home.aspx

The consortium has not proposed any amendment in the project period of M19 - M30.

3 Result of M18 Project Review

According to the project review report, the project implementation until M18 is satisfactory. A set of recommendations were provided by the EC. These recommendations are being considered in the current reporting period and will be described in M30 project progress report. All the deliverables except 1 were accepted by the EC (Table 2). The rejected deliverable has been revised and submitted to the EC. The following milestones due until M18 were also achieved.

- Milestone 1: Project establishment and Conceptualisation of the COGNITWIN toolbox
- Milestone2: Database and digital platform - Initial prototype deployed as Digital Twins for the pilots -use of initial toolbox

All the public reports have been accepted by the EC. These reports are available on the following page of the COGNITWIN project website:

https://www.sintef.no/projectweb/cognitwin/public-reports/

The M18 financial report was accepted by the EC and the interim payment was released.

Table 2: Status of the submitted deliverables in the project duration of M1-M18.

Del Rel. No	Title	Lead Beneficiary	Nature	Dissemination Level	Month	Status
D7.1	Website portal	SINTEF	Websites, patents filling, etc.	PU	M2	Accepted
D8.3	IA Coordination and Performance Indicators Definition	SINTEF	Report	PU	M3	Accepted
D8.5	Risk Assessment and Management Action Plan	SINTEF	Report	PU	M3	Accepted
D1.1	A report on existing level of digitalisation and describing challenges for Non-ferrous pilots, incl. identification of novel sensors	Hydro	Report	PU	M6	Accepted
D2.1	A report on existing level of digitalisation and describing challenges for Steel pilots, incl. identification of novel sensors	SAG	Report	PU	M6	Accepted
D3.1	A report on existing level of digitalization, describing challenges for Engineering pilot, incl. identification of novel sensors and collected information for cognitive modelling	SFW	Report	PU	M6	Accepted
D4.1	Baseline Platform, Sensor and Data Interoperability Toolbox	SINTEF	Report	PU	M6	Accepted
D5.1	Baseline Hybrid AI and Cogntive Twin Toolbox	Fraunhofer	Report	PU	M6	Revised
D6.1	T0 baseline measurement of the KPIs	SINTEF	Report	PU	M6	Accepted
D7.2	Dissemination and communication plan and tools	Fraunhofer	Report	PU	M6	Accepted
D8.1	Data Management Plan	SINTEF	Report	PU	M6	Accepted
D8.2	Short Interim Management Reports	SINTEF	Report	PU	M6	Accepted
D1.2	A Database and digital platform for the Non-ferrous pilots	Hydro	Demonstrator	CO	M18	Accepted
D2.2	A Database and digital platform for the Steel pilots	SAG	Demonstrator	CO	M18	Accepted
D3.2	A database and digital platform for Engineering pilot	SFW	Demonstrator	CO	M18	Accepted
D4.2	Initial Platform, Sensor and Data Interoperability Toolbox	Fraunhofer	Demonstrator	PU	M18	Accepted
D5.2	Initial Hybrid AI and Cognitive Twin Toolbox	DFKI	Demonstrator	PU	M18	Accepted
D8.6	Short Interim Management Report - 2	SINTEF	Report	PU	M18	Accepted

4 Meetings

Several meetings have been organized during this reporting period. Minutes from all the meetings were recorded and approved by the participants. Documents related to these meetings are available at the SharePoint platform of the project.

4.1 Project Review Meeting

The COGNITWIN M18 project review meeting was held online via Microsoft Teams on 07-June-2021. The consortium presented the results achieve in the first reporting period (M1-M18) and discussed the future steps.

Along with the presentations from all WPs, the consortium also showed several online demos and videos illustrating the application of the project results in real-world use cases.

The M30 project review meeting will take place on 8-Mar-2022 online via Microsoft Teams.

4.2 Project Meeting

The COGNITIWN M24 project meeting was held online via Microsoft Teams on **5th and 6th October 2021**. The program on first day was mainly consisting of overall project progress, use cases and a company presentation from Elkem ASA (Norway).

The progress updates on toolbox components were provided on second day. Exploitation, dissemination, and communication activities were also presented. The meeting was concluded with a workshop on hybrid and cognitive digital twins.

The COGNITWIN M30 Project Meeting is scheduled to take place on 3rd and 4th May, 2022 in Mo i Rana (Norway).

4.3 Executive Board Meetings, Project Status Meetings and General Assemblies

Executive board meetings were organized on 17-Mar-2021 and 30-Jun-2021. All the work package and pilot leaders provided updates on the progress of their respective work packages and pilots. Meeting minutes of both meetings were recorded and accepted by all the participants. Since the project is having regular monthly status meetings where all the executive board members are also invited, the number of Executive Board meetings were reduced from 4 to 2. The Project Status meeting is regularly taking place on monthly basis. No General Assembly took place in this reporting period due to the lack of agenda points.

5 Financial

As mentioned in section 3, the M18 financial report was accepted by the EC and the interim payment was released. The M30 financial report will be submitted on or before 30-Apr-2022.

6 Status of Deliverables and Milestones from M19 to M30

Table 3 presents an overview of the deliverables from M19 – M30. A project progress report will be submitted to the EC on or before 30-Apr-2022.

No milestones were due to in the project period of M19-M30.

Table 3: Status of the deliverables from M19-M30.

D8.9	Risk Assessment and Management Action Plan - 2	SINTEF	Report	PU	M21	Submitted
D6.2	Initial Exploitation Plan: Process Industry Impact report and Initial Business Plan	CYB	Report	CO	M24	Submitted
D7.3	Intermediate report on dissemination activities	SINTEF	Report	PU	M24	Submitted
D8.4	IA Coordination and Performance Indicators Measurement	SINTEF	Report	PU	M24	Submitted
D4.3	Updated Platform, Sensor and Data Interoperability Toolbox	SINTEF	Demonstrator	PU	M30	Being Submitted on 28.02.2022
D5.3	Updated Hybrid AI and Cogntive Twin Toolbox	CYB	Demonstrator	PU	M30	Submitted
D8.7	Short Interim Management Report - 3	SINTEF	Report	PU	M30	Submitted

7 Document Sharing and Communication Platforms

Different communication methods are used depending on the purpose. SharePoint is primarily being used for sharing the documents among the project participants, while a Teams platform is established for meetings. The latter platform has dedicated channels for each WP/pilots and managerial bodies.

8 Risk

The COVID -19 related risks and the corresponding mitigation measure were addressed before M19. A brief description is provided in section 2.3 (Amended Grant Agreement).

Two other risks have been addressed in this project period. The details are provided in M30 Technical Progress Report to the EC.

9 Scientific/Technical Coordination & Impact Measurement System

The COGNITWIN project is developed with a pilot driven approach towards the priorities of the technology contributions. This is done to ensure a good coordination between the technical development related to the COGNITWIN Toolbox and business relevance for the pilots for the related technical project innovations. The six pilots and the technical work packages have organized regular meetings. More details are being provided in M30 Technical Progress Report to the EC.

10 Innovation Impact Measurement and Governance

There is a regular monitoring and update of the progress towards the planned impact based on the identified performance indicators for each of the pilot plants. There is also a monitoring of the progress of the planned exploitable assets from the project and how these can have impact on European process industries linked to SPIRE and P4Planet. More details are being provided in M30 Technical Progress Report to the EC.

11 Appendix A

The Gannt Chart presented in Table 4 is currently being followed in the project.

Table 4: Current version of the Gantt Chart in COGNITWIN project.

	Year 1												Year 2												Year 3												Year 4					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
WP1 Large scale pilot Non-ferrous																																										
Task 1.1 Co-innovative preparations						**D1.1**																																				
Task 1.2 Digital twin: Existing technologies																		**D1.2**																								
Task 1.3 Hybrid Twins: Merging old and new technologies																																**D1.3**										
Task 1.4 Cognitive Twins: Realizing the cognitive elements																																										**D1.4**
WP2 Large scale pilot steel																																										
Task 2.1 Co-innovative preparations						**D2.1**																																				
Task 2.2 Digital twin: Existing technologies																		**D2.2**																								
Task 2.3 Hybrid Twins: Merging old and new technologies																																**D2.3**										
Task 2.4 Cognitive Twins: Realizing the cognitive elements																																										**D2.4**
WP3 Large scale pilot Engineering																																										
Task 3.1 Co-innovative preparations						**D3.1**																																				
Task 3.2 Digital twin: Existing technologies																		**D3.2**																								
Task 3.3 Hybrid Twins: Merging old and new technologies																																**D3.3**										
Task 3.4 Cognitive Twins: Realizing the cognitive elements																																										**D3.4**
WP4 COGNITWIN Platform, Sensor and Data Interoperability Toolbox																																										
Task 4.1 COGNITWIN Interoperability Toolbox Architecture						**D4.1**																																				
Task 4.2 Digital Twin Cloud Platform, Data Space and Cyber Security																		**D4.2**																								
Task 4.3 Sensors, Understanding the Sensor Data & Quality Assurance																														**D4.3**												
Task 4.4 Realtime sensor/data processing																																										**D4.4**
WP5 COGNITWIN Hybrid AI and Cognitive Twin Toolbox																																										
Task 5.1 Plant Digital Twins with ML/AI						**D5.1**																																				
Task 5.2 Multivariate Sensor analytics with Deep Learning																																										
Task 5.3 Deep Learning Performance																																										
Task 5.4 Hybrid Digital Twins																																										
Task 5.5 Cognitive Digital Twins																		**D5.2**												**D5.3**												**D5.4**
WP6 Business SPIRE Industry Impact/Exploitation																																										
Task 6.1 Conduct the baseline KPI measurement based retrospective data						**D6.1**																																				
Task 6.2 Process Industry Impact																								**D6.2**																		
Task 6.3 Develop Best "Cognitive Twin" Practices																																										**D6.3, D6.4**
Task 6.4 Impact on education																																										**D6.5**
WP7 Communication, Dissemination, Standardisation																																										
Task 7.1 Communication plan and tools		**D7.1**																																								
Task 7.2 Industrial and scientific dissemination procedures and activities						**D7.2**																		**D7.3**																		**D7.6**
Task 7.3 International networking																																										**D7.4**
Task 7.4 Standardisation																																										**D7.5**
WP8 Project Management																																										
Task 8.1 Project Management, Coordination, Risk Assessment, Governance						**D8.1, D8.2**												**D8.6**												**D8.7**						**D8.8**						
Task 8.2 Scientific/Technical Coordination & Impact Measurement System			**D8.3**																					**D8.4**																		**D8.10**
Task 8.3 Innovation Impact Measurement and Governance			**D8.5**																		**D8.9**																						