



MORPHEMIC

Validation framework design

Modelling and Orchestrating heterogeneous Resources and Polymorphic applications for Holistic Execution and adaptation of Models In the Cloud

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Editor(s)
Alexandros Raikos

Reviewers
Adam Flizikowski
Kyriakos Kritikos

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Executive summary

This document presents a holistic approach to the validation process of the MORPHEMIC platform. In particular, the validation framework design deliverable provides a plan for validation, which consists of all the necessary validation guidelines and validation processes put in place by the consortium in order to systematically catalogue, define, quantify and map them to key performance indicators (KPIs) related to the project's objectives.

The groundwork supporting the design of this framework is largely based upon the “Goal, Question, Metric” approach for interpreting software metrics. This document provides apt coverage of this approach and the underlying methodologies, along with all the ways they have been revised for the MORPHEMIC development and testing pipelines.

Each use case provider for the MORPHEMIC platform has also contributed in providing detailed information regarding the specifics of the validation procedure as it will be performed internally and independently.

Author(s)

Alexandros Raikos, Dimosthenis Kyriazis, Jean-Didier Totow, Robert Gdowski, Sebastian Geller, Ferath Kherif



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List of Abbreviations

Abbreviation	Explanation
GQM	Goal, Question, Metric
KPI	Key Performance Indicator
TO	Technical Objective
IO	Impact Objective
IR	Impact Result
DoA	Description of Action
UTAUT	Unified Theory of Acceptance and Use of Technology
TRA	Theory of Reasoned Action
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
C-TAM-TPB	Combined Technology Acceptance Model and Theory of Planned Behaviour
IDT	Innovation Diffusion Theory
SCT	Social Cognitive Theory
MM	Motivation Model
CRUD	Create, Read, Update, Delete



1 Introduction

1.1 Scope of the document

This document provides all the necessary guidance for the MORPHEMIC project's consortium in order to perform a complete validation procedure on the platform. The validation framework, as designed and explained in detail in this deliverable, concerns the definition and a higher-level mapping of all measurable validation aspects. The following plan for validation is a collection of processes, requirements and guidelines put in place by the consortium partners, in order to ensure the reliable operation of the MORPHEMIC platform, the fulfilment of the project's goals and compliance with regulations and standards both on a technical, as well as a business level.

1.2 Deliverable structure

The deliverable is structured following a three-step pattern. Beginning in **chapter 2, Context**, the first step, is responsible for determining the basic technical and management-related aspects, along with fundamental variables, referred to as topics and scenarios, that must be measured. The second step is specified in **chapter 3, Definition**, and it offers a complete breakdown of the GQM (Goal, Question, Metric) [1] approach in the context of the MORPHEMIC platform validation and the project's goals. **Chapter 4** details the *Validation*, in which scheduling details are presented, while specifics regarding the enactment of the validation process and expected benefits for each of the use case providers are supplied. Finally, **Chapter 5** follows with a conclusion of the document's contents.

1.3 Target audience

This deliverable defines key components and processes of the validation framework of the MORPHEMIC platform, which will be carried out by the project consortium's use case partners solely and independently. The main intended audience are appointed evaluators within each use case provider, such as MORPHEMIC platform administrators, DevOps, CAMEL developers, testing engineers, etc., which will make use of the defined templates and questionnaires in this document, in order to perform the validation of the platform.

2 Context

This chapter defines a set of basic contextual definitions, upon which the GQM process described in the next chapter will be based for a successful validation procedure. Planning requires, as input, the analysis of all directly involved parties and a clear distinction of all functionalities provided by the MORPHEMIC platform. The following subsections outline the corresponding groups, perspectives and scenarios which are directly affected by any singular or composite, technical or administrative performance aspect of the platform and the project's goals.

2.1 Validation groups

The MORPHEMIC project is focused mainly on adapting and optimizing Cloud computing applications by introducing the novel concepts of polymorphic architecture and proactive adaptation. On a higher level, the project's extended value network includes industry applications, IT research and cloud providers, all the way to the end users of a single MORPHEMIC deployed cloud application. In the context of the platform's validation, we are not directly measuring the impact it has on the end user experience, as this information is heavily dependent on each use case application. Instead, we are focused on measuring the impact of the platform on people who are directly involved.

Specifically, the validation groups tasked with validating the MORPHEMIC platform's operational reliability and efficiency are defined as follows:

- **DevOps** – The group concerned with the development of application models for the platform, the service design of the use case applications themselves and the specifics of platform's operation.
- **Administrators** – The group concerned with usability, performance, stability, maintainability and overall reliability of the platform on a technical level.
- **Business managers** – The group concerned with the measurable business impact of the platform's operation in their business environment.

The platform's validation will be carried out for each of the three use cases solely and independently by each use case provider. Subsequently, the business managers and administrator groups will be comprised of relevant roles appointed by the project's use case providers for each use case respectively. A preliminary listing of appointed evaluators and their roles for each use case is provided in Chapter 4.

2.2 Validation perspectives

The scenarios defined in the next subsection of this document are validated by applying the following two perspectives:

- **Technical perspective** – Examining validation objects against a set of technical criteria, including but not limited to: operational efficiency and direct performance metrics of technical components, software quality, security etc.
- **Business perspective** – Examining validation objects against a set of business and business management criteria, including but not limited to: end user requirement satisfaction overall business impact, usefulness, feasibility, return on investment etc.

These perspectives are represented adequately from the validation groups previously mentioned. The following diagram (Figure 1) visualizes the exact mapping between groups and perspectives in the planning phase of the validation framework.

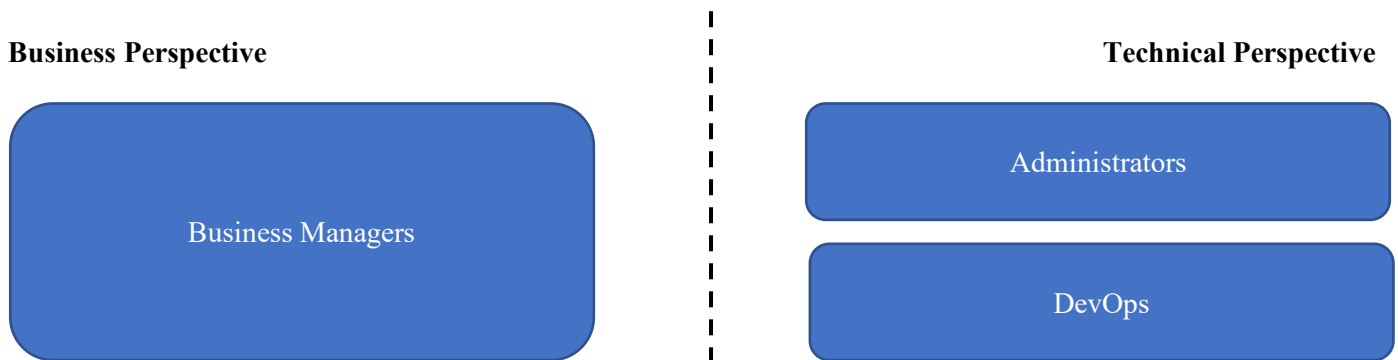


Figure 1 – A mapping of validation groups to validation perspectives

During the initial deployment stages of the MORPHEMIC platform, validation is more likely to be focused on the technical perspective. As the project progresses and more technical features are finalized and integrated, equal focus will be applied on the business and technical perspectives, given the maturity of the entire architecture.

2.3 Validation scenarios

In previous subsections, the groups which will carry out the platform's validation along with their relevant perspectives were introduced. This subsection outlines the exact technical scenarios¹ the project's use case partners will be reviewing during the validation phase.

A preliminary listing of all the MORPHEMIC platform validation scenarios through use case execution can be found in D6.1, Industrial requirements analysis, where a preliminary listing is present in Table 12. These scenarios also represent a catalogue of required MORPHEMIC functionality by the use case providers and will be used during validation.

Due to the complexity between each perspective, a common approach involves a functional interpretation, based on the functional requirements of the platform. This has led to the cataloguing and use of *features* (as also described in the deliverable *D6.1, Industrial requirements analysis*), which, from a validation perspective, involves the grouping of validation scenarios into functional domains. This ensures the following:

- From a purely technical perspective, all components of the high-level software component architecture of the platform will be included and mapped in the process.
- From an administration perspective, the concept of scenarios represents distinct, actionable, and reproducible operations.

The following subsections provide more details about the platform's features and their relation to the validation process and overall plan. A preliminary list of the primary aspects each feature covers and the respective support status of each use case is provided and will be possibly expanded by the final validation since some aspects are still being defined.

¹ The validation scenarios analysed are also mentioned as the "fit criteria" in D6.1, Industrial requirements analysis.

2.3.1 Polymorphic adaptation

The *Polymorphic adaptation* feature represents all functionality related to the adaptation of a given application's software architecture for the optimisation of its deployment plan, and consequently, its execution. This feature also includes end-to-end *polymorphic* support, separated into the following categories: modelling, optimisation, deployment, reconfiguration as well as hardware support and integration with the MORPHEMIC platform.

The following table describes all the aspects of the polymorphic adaptation feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 1 - Polymorphic adaptation examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
Polymorphic application modelling	Verified	Verified	Verified
Application profiling – deriving knowledge about alternative deployment ways for application components	Partially Verified	Verified	Partially Verified
Multi-level deployment reasoning – ability to reason over multiple levels (e.g., component forms, service offerings)	Partially Verified	Partially Verified	Partially Verified
Runtime resource scheduling – resource-reuse across deployments	Partially Verified	Partially Verified	Partially Verified
Polymorphic application deployment – support for deploying different forms of application components	Verified	Verified	Verified

2.3.2 Proactive adaptation

The *Proactive adaptation* feature represents all functionality related to the dynamic adaptation of a given application's configuration overall – both in terms of available resources and architecture variants – based on forecasted service level objective violations. This feature set also includes end-to-end proactive reconfiguration support, separated into the following categories: modelling, advanced forecasting modules, utility functions, deployments, and reconfigurations.

The following table describes all the aspects of the proactive adaptation feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 2 - Proactive adaptation examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
High-level utility policies – deriving the utility function formula in more user-friendly way	Verified	Verified	Verified
Proactive utility modelling – creating utility function that can proactively optimise application	Verified	Verified	Verified
Forecasting of the execution context: future resource needs	Verified	Partially-Verified	Partially Verified
Performance module – predicting the performance metrics for the proposed future application deployment configuration	Partially-verified	Partially-verified	Partially Verified
Proactive adaptation of the application – support for performing reconfiguration in anticipation of the future workloads and usage	Verified	Verified	Verified

2.3.3 Self-healing capabilities

The *Self-healing capabilities* feature represents functionality related to the detection of component failures, application performance deterioration and triggering of reconfigurations, while it covers important aspects of monitoring system resilience.

The following table describes all the aspects of the self-healing capabilities feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 3 – The “self-healing” capabilities examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
Deployment of real-time performance monitoring	Verified	Verified	Partially Verified
Autonomous deployment of event processing agents	Verified	Verified	Verified
Autonomous recovery of platform’s monitoring agents	Partially-Verified	Partially-Verified	Partially-Verified
Efficiently processing heterogeneous and dispersed monitoring data in multi-cloud and fog environments	Verified	Verified	Partially Verified
Issuing alerts and triggering application reconfigurations	Verified	Verified	Verified

2.3.4 Hardware accelerators support

The *Hardware accelerators support* feature represents all functionality related to the efficient usage and provisioning of hardware accelerators for the optimisation of a given deployed application.

The following table describes all the aspects of the hardware accelerators support feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 4 - Hardware accelerators support examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
Application profiling – Profiling of the applications to identify the most computationally intensive tasks that can be parallelized and offloaded to the accelerators efficiently	Verified	Verified	Verified
Deployment of accelerators – Deployment of accelerated tasks on the cloud accelerators	Partially Verified	Verified	Not verified
Application integration – Integration of the accelerated tasks on the application high level framework and/or the Proactive schedulers	Partially Verified	Verified	Not verified
Application accelerator assessment – Performance evaluation of the integrated accelerators to identify the overall speedup compared to contemporary general-purpose processors	Partially Verified	Verified	Not verified

2.3.5 Security concepts

The *Security concepts* feature represents a set of operations which provide an adequate security level for the MORPHEMIC platform in terms of secure communications between clouds, platform components, deployed applications, as well as authentication and authorization modules.

The following table describes all the aspects of the security concepts feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 5 - Security concepts examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
Platform Security – Authentication	Verified	Verified	Verified
Platform Security – Authorization	Verified	Verified	Verified
Platform Security – Deployment Environment Access Client	Verified	Verified	Verified
Platform Security – Access Logging	Not Verified	Verified	Not Verified

The Deployment Environment Access Client is the functionality that enables MORPHEMIC to access secure deployment environments supporting different access control mechanisms (e.g., username password authentication, X509 certificates etc). MORPHEMIC will also provide a credential storage mechanism to support this functionality which will be verified on-field.

2.3.6 Unified user interface

The *Unified user interface* feature represents all functionality related to the user interface elements provided for application modelling, management, monitoring and other administrative operations (e.g., resource management).

The following table describes all the aspects of the unified user interface feature that will be examined during the validation process after the test case assessment, as well as their relation to the provided use cases.

Table 6 - Unified user interface examined aspects during validation

Aspect	Use Case Support Status		
	ISW	CHUV	ICON
CAMEL modelling – creating and specifying CAMEL models	Verified	Verified	Verified
Applications management – deploying CAMEL models	Verified	Verified	Verified
Resources status visualization – adding cloud provider, setting constraints, showing resources usage	Verified	Verified	Verified
Application and resource status visualization – checking status of specific application and cloud resources	Verified	Verified	Verified
User management – Create, Read, Update, Delete (CRUD) of users	Partially Verified	Partially Verified	Partially Verified

3 Definitions

This chapter lays out the methodology enacted by all involved parties in the Validation Framework in order to map objective performance measurements to their higher-level context. This measurement scheme will be based on the business and technical perspectives, as well as the validation scenarios discussed previously in the planning phase.

The Goal, Question, Metric (GQM) method is specifically designed to model such an approach using a pre-defined template. This proven approach was preferred by the MORPHEMIC project consortium partners due to its inherent simplicity and its bottom-up assessment flow of mapping individual measurements to high level goals. Other approaches such as KAOS [2] and GQM+Strategies [3] were not considered due to their added complexity and further redundant parameterisation. The following subsections will clarify the goals and the questions that will be part of the validation scenario assessment template.

3.1 Defining goals

The MORPHEMIC project's Description of Action analyses objectives under two distinct categories: *Technical Objectives* and *Impact Objectives*. During the validation phase of the platform, it is imperative that each Key Performance Indicator (KPI) defined by the objectives is evaluated against quantified measurements.

Furthermore, the deliverable *D6.1 Industrial requirements analysis* outlines the complete and comprehensive MoSCoW (*Must, Should, Could, & Won't*) extended list of requirements related to the platform in an industrial environment, in cooperation with the industrial partners of the project's consortium. These requirements represent use-specific goals of the MORPHEMIC platform that need to be evaluated.

3.1.1 Technical objectives

These objectives rely on the technical and administrative aspects of the validation process. A table is presented below with the KPIs as defined in the DoA:

Table 7 – Technical Objectives of the MORPHEMIC project

ID	Description
TO1	To extend a Cloud application modelling language with polymorphic capabilities
KPI01	CAMEL 3.0 able to model the three use case applications and their deployment platforms.
KPI02	All use case developers (DevOps) satisfied with modelling tools.
TO2	To predict confidently the application behaviour
KPI03	Monitoring system working in all use cases.
KPI04	95% prediction accuracy interval long enough to allow adaptation to be enacted when needed.
TO3	To predict and model adaptive utility
KPI05	Predicted utility should be accepted as representative in 95% of the cases by a human DevOps.
KPI06	The algorithms are successfully evaluated in all use cases.
TO4	To morph the model for optimized deployment
KPI07	Successful reconfiguration of all use case applications.
TO5	To provide an application lifecycle operational environment
KPI08	Definition of the tool chain and interfaces among the tools.
KPI09	Tools considered to be efficient and useful by the use case developers.

These Technical Objectives represented a starting point for the MORPHEMIC platform. The complete list of the requirements' fit criteria presented in Table 12 of D6.1 now represents a deeper analysis of the project's objectives and the KPIs and it will be formally used during the validation phase for measurement mapping.

3.1.2 Impact objectives

These objectives rely on the business management and administrative aspects of the validation process. A table is presented below with the relevant KPIs and their relation to the defined Impact Results, as defined in the DoA:

Table 8 – Impact Objectives of the MORPHEMIC project

ID	Description
IO1	To ensure sustainability of the MORPHEMIC proactive pre-processor
KPI10	Viable business model identified by M18.
KPI11	At least 5 developers outside of the consortium accepting the governance by M36
KPI12	At least 3 organisations use MORPHEMIC before the end of the project.
IO2	To demonstrate the usefulness of MORPHEMIC for dynamic applications
KPI13	Demonstration of benefits of MORPHEMIC for at least 3 applications
KPI14	Commitment from at least 2 organizations outside the Consortium to use MORPHEMIC platform.
IO3	To integrate commercially MORPHEMIC into existing Cloud offers
KPI15	Presentation of the MORPHEMIC enhanced Cloud offers to at least 20 SMEs or public sector organisations.
KPI16	Two contracts for MORPHEMIC enhanced Cloud offers concluded before the end of the project.
IO4	To create new opportunities to develop and offer cloud-based services
KPI17	At least 3 new cloud-based services created by use cases partners in the project.
KPI18	At least 1 new cloud-based service created by an organisation outside the consortium within the project's timeline.
IO5	To leverage research and innovation projects
KPI19	At least three new, innovation projects based on the concepts created by MORPHEMIC.

The KPIs related to the Impact Objectives will be assessed at their respective referenced time frame and at the end of the project's timeline.

3.1.2.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

An assessment of the user acceptance of the platform from a business perspective will be conducted using the Unified Theory of Acceptance and Use of Technology (UTAUT) model [4]. This Technology Acceptance Model (TAM) will provide insight into the perceived usefulness, perceived ease of use, as well as the behavioral intention of use of the MORPHEMIC platform for the consortium's industrial use case partners.

The UTAUT has been selected as it is quite extensive and expressive, integrating eight established user acceptance models: Theory of Reasoned Action (TRA) [5], the Technology Acceptance Model (TAM) [6], the Motivation Model (MM) [7], the Theory of Planned Behaviour (TPB) [8], a model combining the Technology Acceptance Model and the Theory of Planned Behaviour (C-TAM-TPB) [9], the Model of PC Utilization (MPCU) [10], the Innovation Diffusion Theory (IDT) [11], and the Social Cognitive Theory (SCT) [12].

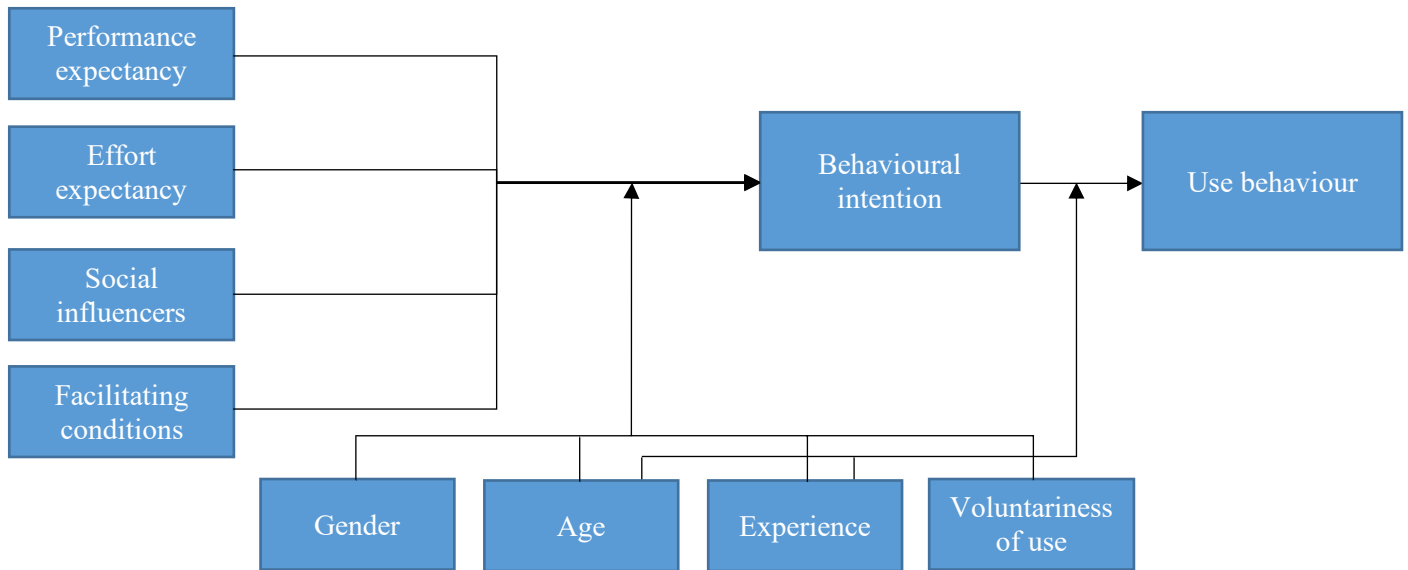


Figure 2 – The Unified Theory of Acceptance and Use of Technology (UTAUT) model

This approach will provide initial valuable insight into the impact of the MORPHEMIC platform across administrators, developers and business managers, and consequently become a preliminary indicator of consideration by industries and organizations in the future.

3.2 Defining questions & metrics

This subsection defines the assessment templates (questionnaires), which must be filled out during the validation phase of the platform for the technical and the UTAUT assessments. This is a vital process involving active participation which ensures each validation object adheres to a specific requirement defined by the goals of the project.

In continuation of the pattern followed by the validation framework, technical and UTAUT assessment questions are categorised into the technical and administration aspect as well as the aspect related to business management and the larger scale impact of the platform, respectively.

3.2.1 Technical assessment

During this assessment, project partners will fill out the questionnaire described below. The template requires filling in:

- A **validation scenario** – The industrial or project requirement which the topic represents. The complete list of requirements currently is located in deliverable D6.1, Industrial requirements analysis.
- The **use case** currently **under assessment**.
- The relevant **Feature** with optional added information related to a specific aspect, as described in section 2.3.
- The relevant **technical objective** of the MORPHEMIC project.
- The **technical result** of the validation scenario under assessment, denoting **Success** or **Failure**.

Table 9 – Object assessment template

Analysing	<i>Validation scenario</i>
For the purposes of	<i>Use case under assessment</i>
With respect to	<i>Feature – Aspect of Feature</i>
In the context of	<i>Technical objective</i>
Which resulted in	<i>Technical result</i>



3.2.2 Impact assessment

This procedure requires an evaluation of the Impact Objectives defined in subsection 3.1.2, as well as filling in a questionnaire for MORPHEMIC based on the UTAUT model previously described in subsection 3.1.2.1 with the following information:

- **Personal anonymous details and relevant experience** – Information about the age, gender and overall experience regarding the administration, development or business management involving similar cross-cloud automated DevOps platforms.
- **Usage related questions** – Based on *Performance Expectancy (PE)*, *Effort Expectancy (EE)*, *Social Influencers (SI)*, *Facilitating Conditions (FC)* and *Behavioural Intention (BI)*.

Table 5 outlines all the statements regarding the usage and acceptance of the MORPHEMIC platform, with answers being represented by a score in the range of 0 (*Strongly disagree*) to 9 (*Strongly agree*). This will be the main part of the template assessment questionnaire during impact assessment.

Table 10 – UTAUT assessment questionnaire

Statement	ID	Score (0-9)
Performance Expectancy (PE)		
<i>I would find MORPHEMIC useful in my job.</i>	PE1	
<i>Using MORPHEMIC enables me to accomplish tasks faster.</i>	PE2	
<i>Using MORPHEMIC increases my productivity.</i>	PE3	
<i>If I use MORPHEMIC, I increase my chances in getting a raise.</i>	PE4	
Effort Expectancy (PE)		
<i>My interaction with MORPHEMIC is clear and understandable.</i>	EE1	
<i>I find it easy becoming proficient in MORPHEMIC.</i>	EE2	
<i>I find MORPHEMIC easy to use.</i>	EE3	
Social Influencers (SI)		
<i>People who influence my behaviour think that I should use MORPHEMIC.</i>	SI1	
<i>People who are important to me think I should use MORPHEMIC.</i>	SI2	
<i>In general, my organisation has supported the use of MORPHEMIC.</i>	SI3	
Facilitating Conditions (FC)		
<i>I have the necessary resources to use MORPHEMIC.</i>	FC1	
<i>I have the knowledge necessary to use MORPHEMIC.</i>	FC2	
<i>MORPHEMIC is compatible with other aspects of my work.</i>	FC3	
<i>A person or group is available for assistance with MORPHEMIC.</i>	FC4	
Behavioural Intention (BI)		
<i>I would use MORPHEMIC in the next six months.</i>	BI1	
<i>I should use MORPHEMIC in the next six months.</i>	BI2	
<i>I must use MORPHEMIC in the next six months.</i>	BI3	

3.3 Semantic overview

All types of assessments demonstrated in the previous subsection will be conducted under their corresponding validation perspective by appointed evaluators. The MORPHEMIC project’s goals are attainable through the fulfilment of technical and impact objectives.

- The **Technical Objectives** are recorded in a directly quantifiable manner using technical assessments, as described in 3.2.1.
- The **Impact Objectives** are recorded using the UTAUT assessment, as described in section 3.2.2, and by directly assessing the state of impact KPIs.

The following diagram illustrates the relationships formed between the validation scenarios context outlined in subsection 2.3, the predefined impact KPIs and the validation definitions of this chapter, from metrics to goals:

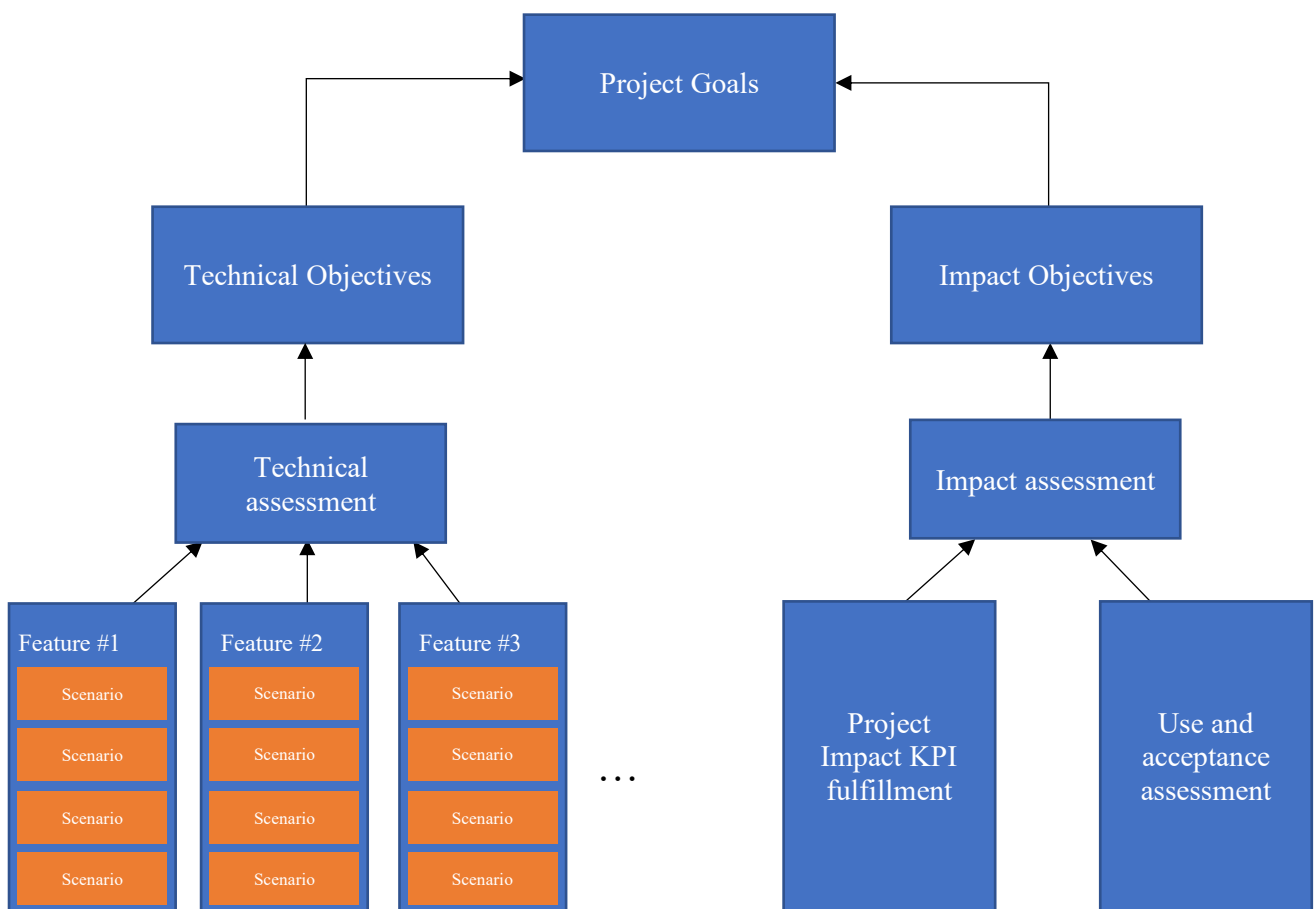


Figure 3 – Overview of the validation process

4 Validation

The validation phase is the process of carrying out the validation of the MORPHEMIC platform given the approach and definitions described in the previous chapters.

4.1 Timetable

The MORPHEMIC platform development has 3 major release milestones, each expected to be released at the end of each calendar year. The minor release milestone *RC1.5* is aligned with the intermediate project review, scheduled to be carried out on M18.



Table 11 – MORPHEMIC release timetable

	Month 1	Month 12	Month 18	Month 24	Month 34
RC1		Official release			
RC1.5			Official release		
RC2				Official release	
RC3					Official release

The validation process will be carried out before each release, pending the availability, and following the guidelines of this document, the design of the validation framework. The final release of the MORPHEMIC platform is due on month 34 of the project.

4.2 Use case applications validation

The consortium partners providing use case applications for the enactment of the validation will carry out their testing solely and independently. In the following subsections, each use case will demonstrate:

- A contextual overview of the business environment.
- A list of predefined validation roles.
- A preliminary list of appointed evaluators.

For a complete description of the use cases, including a detailed technical overview and the specific benefits of their integration with the MORPHEMIC platform, refer to the deliverables *D6.1 Industrial requirements analysis* and *D6.3 Use cases definition and preparation*.

4.2.1 Virtualized base station for 5G Cloud-RAN by IS-Wireless

4.2.1.1 Business environment

Table 12 – IS-Wireless business environment

Business role	Involved partner	
Deployed application end user	Who is the end user of the deployed application?	Telcom integrators and operators providing 5G connectivity to the end user (mobile subscribers, IoT devices).
Application provider	Who is providing the application to be deployed?	IS-Wireless
Resource provider	Who is providing the computational resources?	Public cloud providers: (AWS, Azure, Google Cloud, etc.), client’s local data centres (private clouds), IS-Wireless data centre
MORPHEMIC platform user	Who is starting the deployment execution and who provides the model?	IS-Wireless
MORPHEMIC platform administrator	Who is administering the platform?	IS-Wireless

4.2.1.2 Validation roles

Table 13 – IS-Wireless validation roles for the MORPHEMIC platform

Validation Group	Role in MORPHEMIC	Role description
Administrators	System administrator (MORPHEMIC administrator)	Installs and maintains the MORPHEMIC platform.
DevOps	Application model designer (CAMEL DevOps)	The person is able to define the application deployment requirements, application configuration and topology to include it in the CAMEL model.
DevOps	Metric model designer (CAMEL DevOps)	The person is able to define needed metrics required for the constraint and utility function. It is also able to extract needed metrics from the application and provide it to MORPHEMIC platform in the form of timeseries.
DevOps	Constraint model designer (CAMEL DevOps)	The person is able to design the constraint and utility function required for the target deployment scenario of the application
DevOps	Test engineer	Deploys an application with a CAMEL model and verifies whether the deployment is operational.
Business Managers	Application evaluator	Verifies whether the 5G services deployed with help of MORPHEMIC satisfy his/her business and operational requirements

4.2.1.3 Appointed evaluators

Table 14 – IS-Wireless appointed MORPHEMIC platform evaluators

Last name	First name	Profile	Company Unit	Specific role(s)
Kulesza	Piotr	Developer	R&D	System administrator, Test engineer
Gdowski	Robert	Project Lead	R&D	Application model designer, Metric model designer, Constraint model designer
Flizikowski	Adam	System Architect	R&D	Application evaluator

4.2.2 e-BrainScience by Lausanne University Hospital

4.2.2.1 Business environment

Table 15 – CHUV business environment

Business role		Involved partner
Deployed application user	Who is the final user of the deployed application?	Clinical researchers and neuroscientists
Application provider	Who is providing the application to be deployed?	CHUV
Resource provider	Who is providing the computational resources?	Public cloud- community cloud Private cloud (Research institution, hospitals, pharmaceutical labs)
MORPHEMIC platform user	Who is starting the deployment execution and who provides the model?	CHUV
MORPHEMIC platform administrator	Who is administering the platform?	CHUV

4.2.2.2 Validation roles

Table 16 – CHUV validation roles for the MORPHEMIC platform

Validation Group	Role in MORPHEMIC	Role description
Administrators	Administrator (Lab manager)	Responsible that the resources (compute and data storage) are available. Add and manage users (developer and end users).
DevOps	Application developer (Clinical researchers, neuroscientists)	Model designers and developers configure and modify the workflows, add tasks, remove tasks, and implement new methods (new neuroimaging application of machine learning methods).
Application end-user	Application end-user (Clinical researchers, neuroscientists, Clinicians, pharma, students)	Upload his/her data, set input and workflow parameters and run workflow & download the results.

4.2.2.3 Appointed evaluators

Table 17 – CHUV appointed MORPHEMIC platform evaluators

Last name	First name	Profile	Company Unit	Specific role(s)
Riedo	David	Administrator	System Information	Administrator system engineer User management, security
Jane	Margewa	Devops	Brain research unit	Administrator Responsible of the cloud operation (planning, management, operation) and integration to Morphemic
Latypova	Adeliya	Developer	Brain research unit	Application Developer (DevOps) Develop and maintain the application and workflows according to the needs of the users within the cloud and morphemic.
Kherif	Ferath	Principal investigator Project lead	Brain research unit	Application End-user - Neuroscientists responsible of the validation, testing of the application. Propose new clinical applications

4.2.3 Computational Fluid Dynamics simulation by ICON

4.2.3.1 Business environment

Table 18 – ICON business environment

Business role	Involved partner	
Deployed application user	Who is the final user of the deployed application?	ICON's iconCFD Platform clients
Application provider	Who is providing the application to be deployed?	ICON
Resource provider	Who is providing the computational resources?	ICON, ICON's iconCFD Platform clients, HPC centres
MORPHEMIC platform user	Who is starting the deployment execution and who provides the model?	ICON
MORPHEMIC platform administrator	Who is administering the platform?	ICON



4.2.3.2 Validation roles

Table 19 – ICON validation roles for the MORPHEMIC platform

Validation Group	Role in MORPHEMIC	Role description
DevOps	Application developer (MORPHEMIC developer)	CAMEL
Administrators	System Administrator (MORPHEMIC administrator)	Install, setup Morphemic platform
DevOps	Application tester (MORPHEMIC tester)	Test deployments
Business Managers	Application evaluator (ICON CTO)	Evaluates application and platform

4.2.3.3 Appointed evaluators

Table 20 – ICON appointed MORPHEMIC platform evaluators

Last name	First name	Profile	Company Unit	Specific role(s)
Geller	Sebastian	Developer	Operations	Application developer
Warren	Lee	Administrator	Administration	System administrator
Papper	Jacques	Manager	Operations	Application evaluator
Taucher	Christian	Consultant	Operations	Application Tester



5 Conclusions

This document sets the guidelines for the validation process and defines the validation plan of the MORPHEMIC platform. All the assessment templates present in Chapter 3 will be used in D6.5, Validation Results, for mapping the validation technical scenarios and other assessments of the platform to the defined project goals.



6 References

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