pharaon

PILOTS FOR HEALTHY AND ACTIVE AGEING

Grant Agreement: 857188

D4.2 Developer guidelines and templates- intermediate

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Editor(s):	Andrej Grgurić (ENT)
Contributor(s):	Alessandra Sorrentino (UNIFI)
	Andrej Grgurić (ENT)
	Cyriel Dreissen (MAIN)
	Elisabete Pitarma (CDC)
	Jose Maria Barriga Garcia (INDRA)
	Mariana Camacho (SCMA)
	Marike Hendriks (MAIN)
	Miran Mosmondor (ENT)
	Pasquale Vitale (ENG)
Reviewer(s):	Mariana Camacho (SCMA)
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0.2	3.8.2022	ENT	Initial content to all chapters including Introduction chapter, Pharaon DevSecOps phases technical work organization, Pharaon Technical One Stop Shop
0.3	11.8.2022	ENT	Pharaon Technical One Stop Shop all subchapters' initial entries and figures added
0.4	12.9.2022	MAIN	Overall proofread, pilot entry pages section inputs
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Executive Summary

This document reports on the work carried out within the task of the fourth work package (WP4) of the PHArA-ON (in further text "Pharaon") project.

This deliverable is the second one within task T4.1. aiming to provide support for technical activities in the Pharaon project (primarily conducted in WP3 and WP5). The main outcome of such support activities within Pharaon is the realization of the Pharaon Technical One-Stop-Shop which is the main entry point through which Pharaon personnel, mainly technical people, can access all the documentation, guidelines, different repositories, and the most important technical information needed to work on the Pharaon technical aspects. Only the preauthorized Pharaon personnel are allowed to connect to and access the Pharaon repositories. In autumn 2022 limited access has been allowed also to additional beneficiaries that are being onboarded into Pharaon pilots via WP6 cascade call 1.

The work in this task continues to advance the established Pharaon Developers Handbook (realized using Gitlab Wiki and available to registered developers through private Pharaon Gitlab at: https://gitlab.com/pharaongroup/developers-handbook), to provide focused survey and tools analysis to serve many different technical activities of the Pharaon partners who are adapting, integrating, testing, and validating their technologies within the Pharaon pilots. Pharaon technologies are hosted in a multi-cloud environment setting, meaning that every technology provider is responsible for hosting its technology. Thus, the Pharaon cloud-hosting infrastructure is distributed and Pharaon's main integration points are exposed on the public (web) addresses. The ownership and maintenance of the Software Development Life Cycle (SDLC) phases of each Pharaon technology are left to its corresponding Pharaon partners. The work within WP4 thus focused on sharing relevant knowledge, common (best) practices, processes, useful tools, and Pharaon-specific processes and key information to facilitate and further Pharaon's technical work.

In comparison with the last version of the Technical One Stop Shop (described in the previous D4.1), the Pilot Entry Pages have been added as a top-level entry and all parts of the Technical One Stop Shop have been extended with new content as well as updates of the previous entries following the needs of the Pharaon technical work.

Progress beyond the state of the art and play

Mapping of established industry common practices and newest software engineering trends to Pharaon to facilitate overall knowledge sharing and adoption of best practices. Structuring the relevant information to be easily accessible and especially useful for the day-to-day hands-on work of the Pharaon technical personnel. Work reported in this deliverable is agreed upon with all relevant personnel and technical work packages including WP3, WP4, WP5, but also WP7. Cross-WP coordination is done within the SWAT1 taskforce under the guidance of the TM (Technical Manager). Pharaon Technical One Stop Shop is updated and advanced in overall content, with the addition of Pilot Entry Pages as a newly added top-level entry adding to the existing top-level entries of the Developers' handbook, repositories, and tools (surveys and list).

Contents

Figures

Tables

Acronyms & Abbreviations

Term	Description
CI	Continuous Integration
DevSecOps	Development Security and Operations
DoW	Description of Work
SDLC	Software Development Life Cycle
TM	Technical Manager
UAT	User Acceptance Testing
WP	Work Package
WP3	Pharaon WP3 Secure Interoperability Solution
WP4	Pharaon WP4 Technology Support Tools
WP5	Pharaon WP5 Technology Ecosystem Integration
WP6	Pharaon WP6 Ecosystem Evolution
WP7	Pharaon WP7 Pilot Deployment, User Validation, Optimisation and Evaluation

1 Introduction

1.1 Overview

This deliverable is the second one within task T4.1. aiming to provide support for technical activities in the Pharaon project (primarily conducted in WP3 and WP5).

1.2 Relation to other tasks and deliverables

The main inputs to this deliverable come mostly from WP3, WP5, and WP6 activities but other project activities related to the technical aspects influenced this work as well.

The specific inputs and outputs are shown in the following figure (Figure 1.1).

Inputs to D4.2 coming from
- D2.1 User and pilot requirements
- D2.2 Initial ecosystems architecture
- D10.2 Ethical and legal requirements
- D10.4 Security, integrity, trust requirements
- D3.1 Interoperability Platforms Descriptions – intermediate
- D3.3. Semantics and Usability Report – first
- SWAT1 task force
- WP3, WP5 activities

Outputs from D4.2 to be used in
- WP4 Technology Support Tools
- WP5 Technology Ecosystem Integration
- WP6 Ecosystem Evolution
- WP7 Pilot deployment
- SWAT 2

Figure 1.1 Inputs and outputs of D4.2 concerning other project work

1.3 Structure of the deliverable

After the initial chapters, namely the executive summary and the list of acronyms used in the document, an Introduction to the document is given, including how it relates to other project tasks and deliverables.

In Chapter 2, Pharaon DevSecOps phases are summarized and an overview of the Pharaon technical work organization is given.

In Chapter 3 the WP4 support of Pharaon technical work is elaborated under the Pharaon Technical One Stop Shop umbrella term.

Chapter 4 discusses data governance, chapter 5 discusses analytics and chapter 6 concludes the report.

2 Pharaon DevSecOps phases and work organization

2.1 Pharaon technical support tools inputs

Since the WP4 acts to support the technical work in Pharaon, the technical support tools inputs were indirectly derived from different sources, as summarized at a high level in the following figure (Figure 2.1).
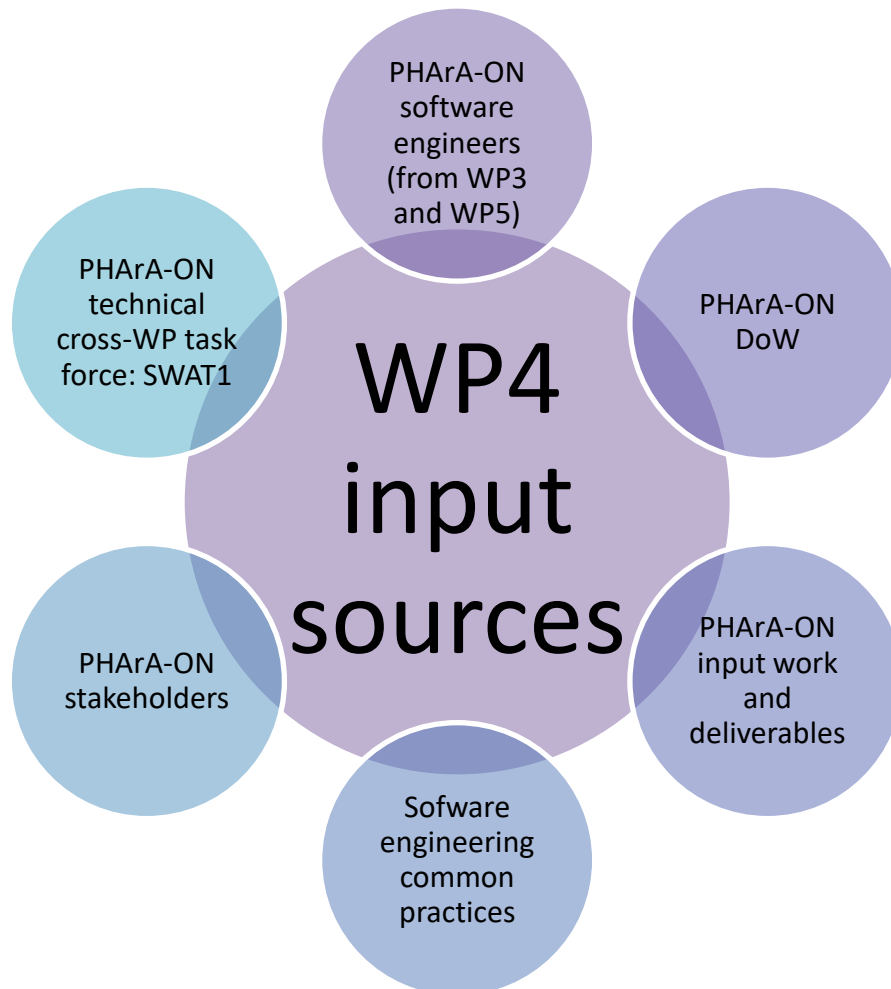
Figure 2.1 Pharaon technical support tools (WP4) inputs sources

2.2 Pharaon DevSecOps phases

In the previous version of the deliverable, the following figure (Figure 2.2) was presented to give a short overview of the shortlisted tools already used or in close consideration to be used in Pharaon with regard to different Software Development Life Cycle (SDLC) phases.
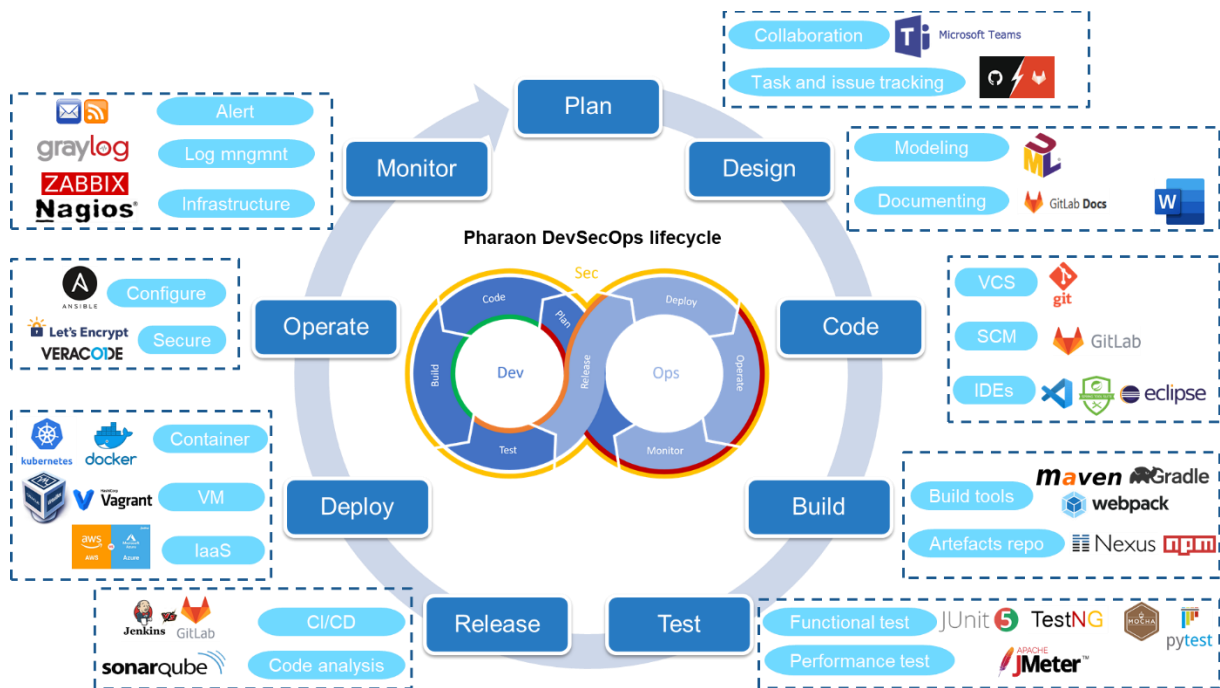
Figure 2.2 Selection of tools mapped to Pharaon DevSecOps lifecycle phases (from D4.1)

2.3 Pharaon technical work organization

WP2
- user and pilot requirements collection
- ecosystem architecture
- Pharaon reference architecture

WP3
- pilot concrete architecture design and implementation
- input technologies adaptation and integration into the pilot technical subecosystem (according to the pilot concrete architecture)
- work in development sandboxes (as described in D4.10)

WP5
- pilot technical subecosystems integration testing and validation
- work in integration sandboxes (as described in D4.10)

WP7
- pilot deployment and validation
- work in production sandboxes (as described in D4.10)

Figure 2.3 Short overview of technical work organization in Pharaon

The following figure (Figure 2.4) illustrates the WP4 support activities in support of the Pharaon technical work (conducted primarily in WP3 and WP5).

WP3 technologies adaptation and integration	WP5 pilot technical subecosystems testing and validation	WP7 pilot technical subecosystems production deployment

WP4 technical support activities

Figure 2.4 WP4 in support of technical work in Pharaon

Mapping of Pharaon sandboxes (together with their characteristics) to Pharaon workpackages (i.e. WPs) is given in the following figure (**Figure 2.5**). More information on Pharaon sandboxes can be found in D4.10 and the new D4.11 (delivered in parallel with this deliverable D4.2).

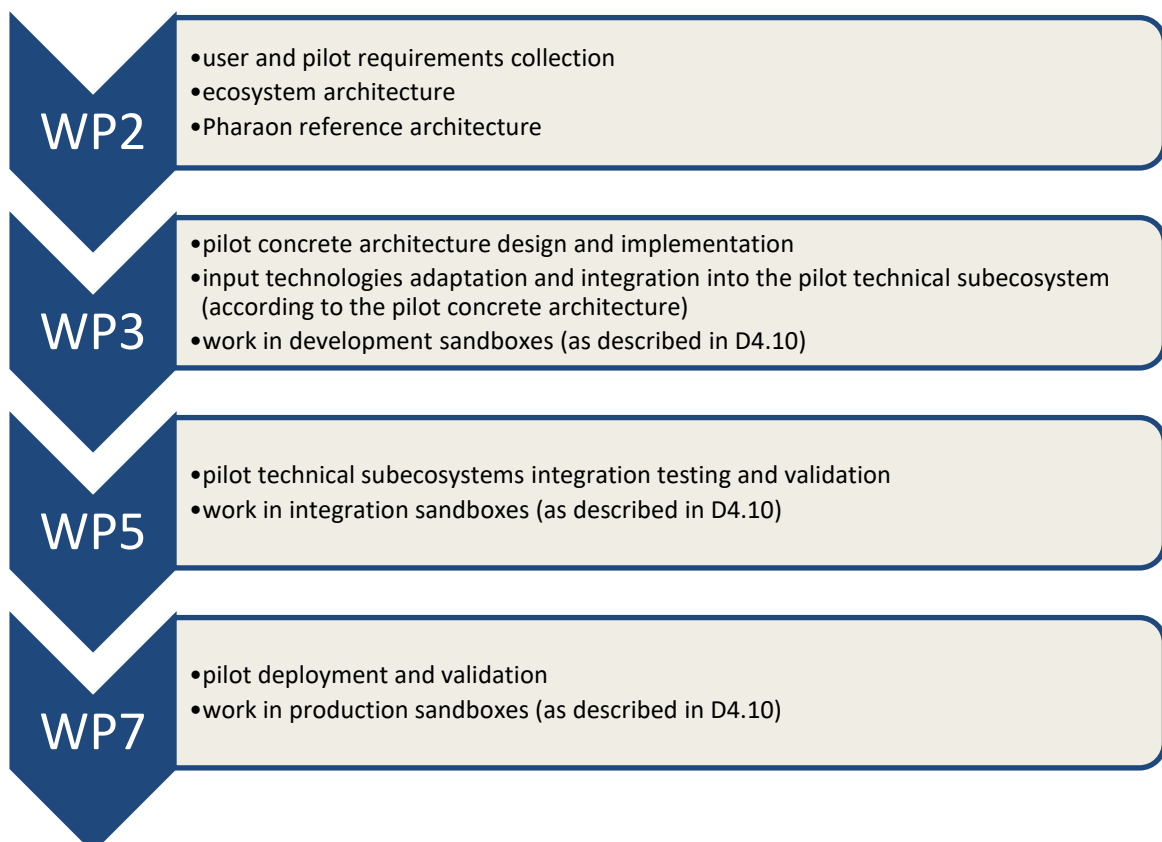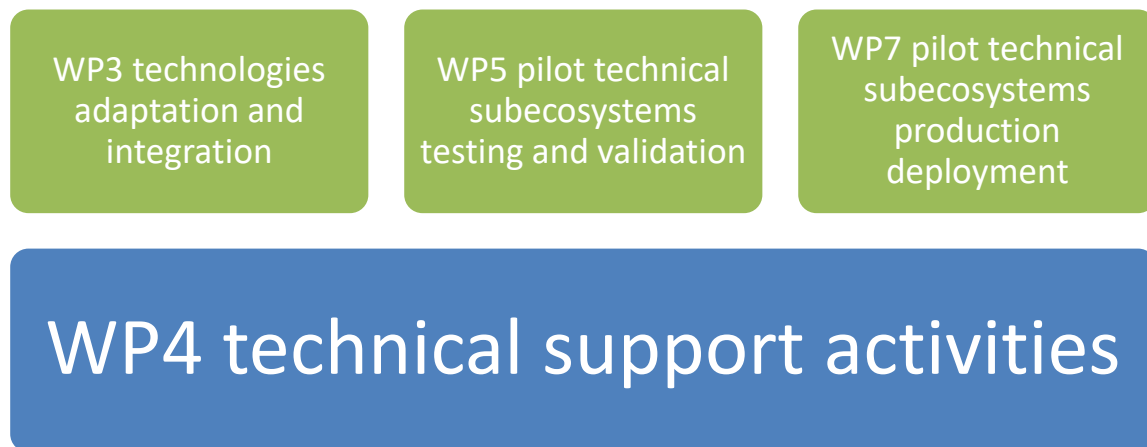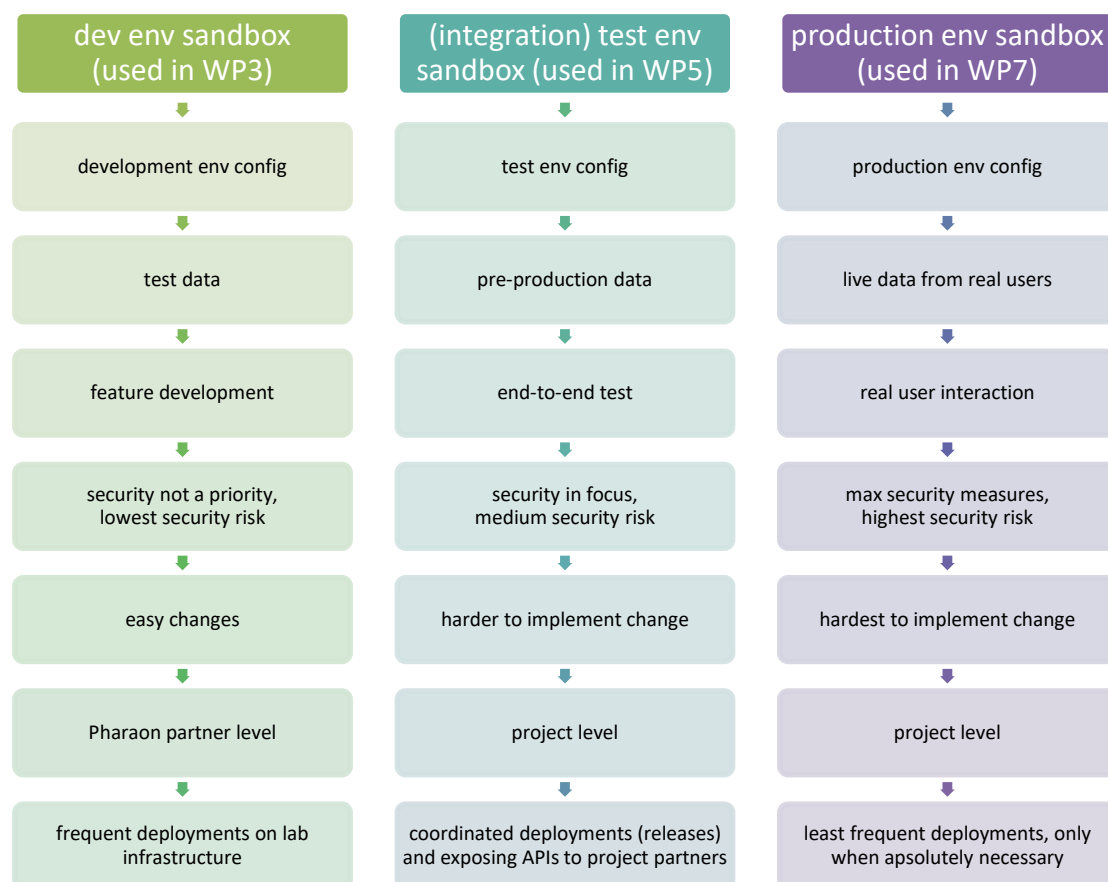| dev env sandbox (used in WP3)	(integration) test env sandbox (used in WP5)	production env sandbox (used in WP7)
development env config	test env config	production env config
test data	pre-production data	live data from real users
feature development	end-to-end test	real user interaction
security not a priority, lowest security risk	security in focus, medium security risk	max security measures, highest security risk
easy changes	harder to implement change	hardest to implement change
Pharaon partner level	project level	project level
frequent deployments on lab infrastructure	coordinated deployments (releases) and exposing APIs to project partners	least frequent deployments, only when apsolutely necessary

Figure 2.5 Comparison of the Pharaon sandboxes mapped to Pharaon workpackages

3 Pharaon Technical One-Stop-Shop

3.1 High-level overview

The main outcome of WP4 technical support activities within Pharaon is the realization of the Pharaon Technical One-Stop-Shop. It is the main entry point through which Pharaon personnel, mainly technical people, can access the documentation, guidelines, different repositories, and the most important technical information needed to work on the Pharaon technical ecosystem.

Pharaon Technical One-Stop-Shop is hosted on GitLab as a private repository, available only to authorized personnel at the following web address: https://gitlab.com/pharaongroup. User and access management are done by the WP4 leaders (ENT) and there are currently 80+ user accounts with granted access to Pharaon Technical One Stop Shop with access to 56 different Pharaon repositories.

The structure of the Technical One-Stop-Shop is illustrated in the following figure (Figure 3.1). It is an evolution of the initial version, presented in the D4.1, where some aspects have been already explained in more detail. Concerning the previous version of the high-level structure of the One-Stop-Shop (described in the previous D4.1), the Pilot Entry Pages have been added as a top-level entry (further explained in Section 3.5). Furthermore, each part of the Technical One-Stop-Shop has been extended and new contents have been added following the needs of the Pharaon technical work.

Figure 3.1 Pharaon Technical One-Stop-Shop structure

3.2 Developers' handbook

Hosted on https://gitlab.com/pharaongroup/developers-handbook/-/wikis/home#pharaon-developers-handbooks, the current structure of the Developer's handbook is summarized in the following figure (Figure 3.2). Content structure and links are explained in more detail in the previous D4.1., so, the content is not repeated in this document. However, it is worth mentioning that with respect to D4.1, some content has been finalized and additional content has been integrated. The improvements in the Developers' handbook are also highlighted in Figure 3.2.
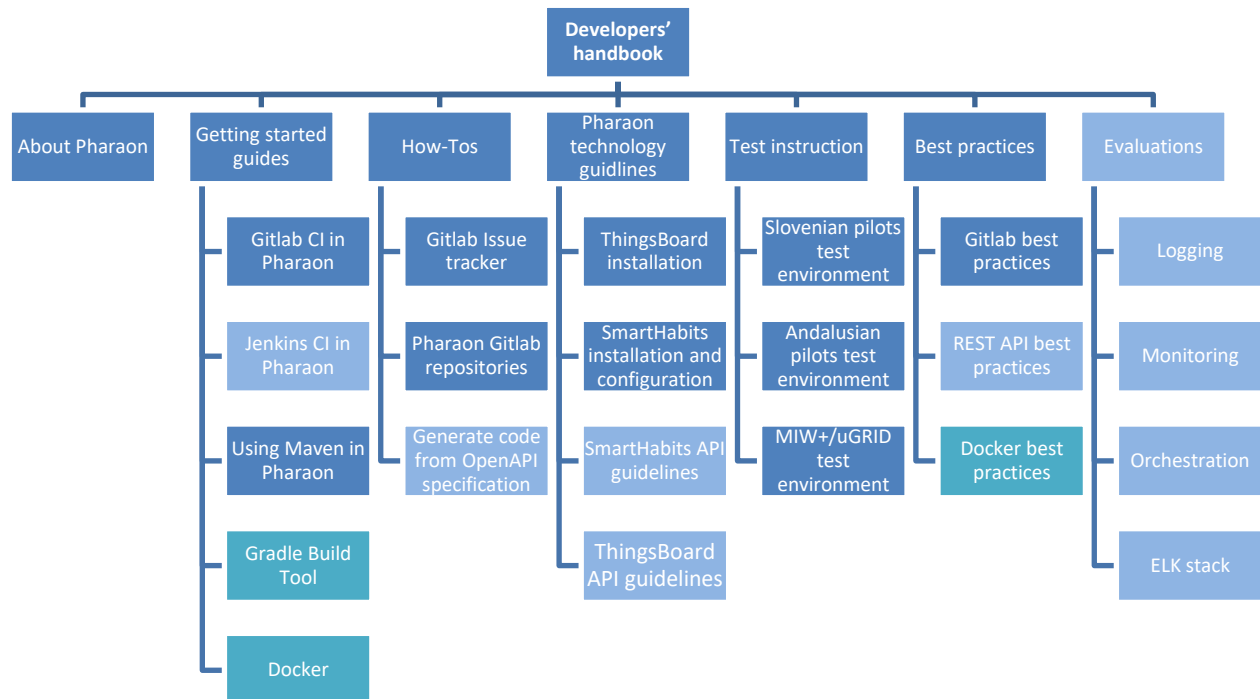
Figure 3.2 Developers' handbook overview. The light blue boxes highlight the new contents included in the Pharaon Developers' Handbook. The aquamarine boxes highlight the handbook's sections that were reported as "in progress" in D4.1 and now are completed.

3.3 Code repositories and registries

Hosted on   https://gitlab.com/pharaongroup in October 2022 there are 45 private Pharaon repositories.

3.4 Tools

Hosted on https://gitlab.com/pharaongroup/developers-handbook/-/wikis/home#tools current tools categories are summarized in the following figure (Figure 3.3).
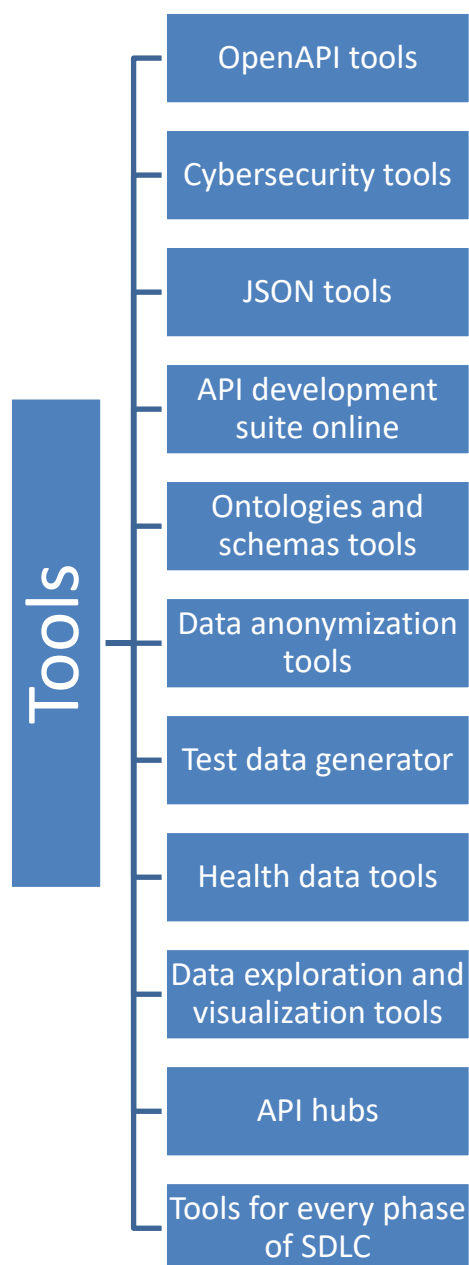
Figure 3.3 Tools overview

The tools survey is being continuously conducted, mostly focusing on free and open-source tools to support different needs of the Pharaon technical work, especially considering the different environments from which various Pharaon technical providers operate.

The survey framework, as shown in the following table (Table 3.1), was used as a template for the Tools survey (uploaded in Pharaon GitLab) containing more than 160 tools.

Table 3.1 Template for tools survey

SDLC phase	Tool category	Tool name	Short Description	License/ Price	Link	Selected for use on the Pharaon project	Comment

Table 3.2 presents the mapping of the Pharaon DevSecOps phase to related WPs, outcomes, and tool categories. This table is given also as an answer to one of the fruitful discussions with project reviewers to give a clearer connection between the Pharaon SDLC and DevSecOps phases and work done in the WP4 tools survey to support different Pharaon work packages and technical activities.

Table 3.2 Pharaon tools outcomes mapped to DevSecOps phases

| SDLC and DevSecOps phase	Short Description	Related WP	Pharaon outcome	Pharaon tool category
Plan	Involves requirements and feedback gathering from stakeholders and users. It is the first phase of the DevSecOps lifecycle that involves understanding the scope and purpose of the project.	WP1, WP2	Documentation, Wiki	Communication (MS Teams, Zoom) Task and issue tracking (GitLab issues, Excel sheets)
Design	The purpose of the Design Definition process is to provide sufficient detailed data and information about the system and its elements to enable the implementation consistent with architectural entities as defined in models and views of the system architecture. [ISO/IEC/IEEE 12207:2017]	WP2, WP3	Architecture, program languages, UIs, platforms, Samples, tutorials, discussion forum, email topic-specific threads	Documentation (MS Word, Visio, MS Power Point, UML..)
Code	Related to developing the source code for the system	WP3, WP4	Code standards per programming language, code documentation, code generation, version management Code samples; Pharaon adapters	VSC (Version Control System) SCM (Source Code Management) IDEs (Integrated Development Environments) Source code editors
Build	Related to an automated process which builds the codebase and runs a series of end-to-end, integration and unit tests to identify any regressions.	WP3, WP4	Build management, Continuous Integration	Build automation tool Automate dependency updates

				Package (Binaries) repository General purpose repository
Test	Manual (i.e. UAT) or automated tests. Automated tests might run security scanning against the application, check for changes to the infrastructure and compliance with hardening best-practices, test the performance of the application or run load testing.	WP5	Debug management, Test management, unit test, white box, black box testing, integration test, stress test	Code test frameworks Code quality tools Data generators Load test tools API testing tools Security testing tools Penetration testing
Release	The point at which developers can say a build is ready for deployment into the production environment. By this stage, each code change has passed a series of manual and automated tests, and the operations team can be confident that breaking issues and regressions are unlikely. The organization then manually or automatically deploys any build that makes it to this stage of the pipeline.	WP5	Release management	CI/CD tools
Deploy	In this phase, a build is ready and released into production. Several tools and processes can automate the release process to make releases reliable with no outage window.	WP7	Config management, installation, instantiation, provisioning; device management, service management	Containers Web application servers Configuration management tools
Operate	In the operation phase, the deployed system in the production environment is	WP7	Update management; data analysis	Secret Management

				Service Discovery
	being managed and making sure that everything is running smoothly. This also includes receiving feedback from users			IAM (Identity and Access Management tools)
				Antivirus
				Network analyzers
				Network defense
				Password security auditing and recovery
				Web vulnerabilities scanning
				Network Intrusion detection and prevention
Monitor	The 'final' phase is to monitor the environment by collecting data and providing analytics on user behavior, performance, errors and more.	WP7	Log management, notifications, alerting, 1st, 2nd, 3rd lines of support	Logging tools IT Infrastructure Monitoring

3.5 Pilot entry pages

Pharaon external developer's onboarding will follow the process as shown in the following figure (Figure 3.4).
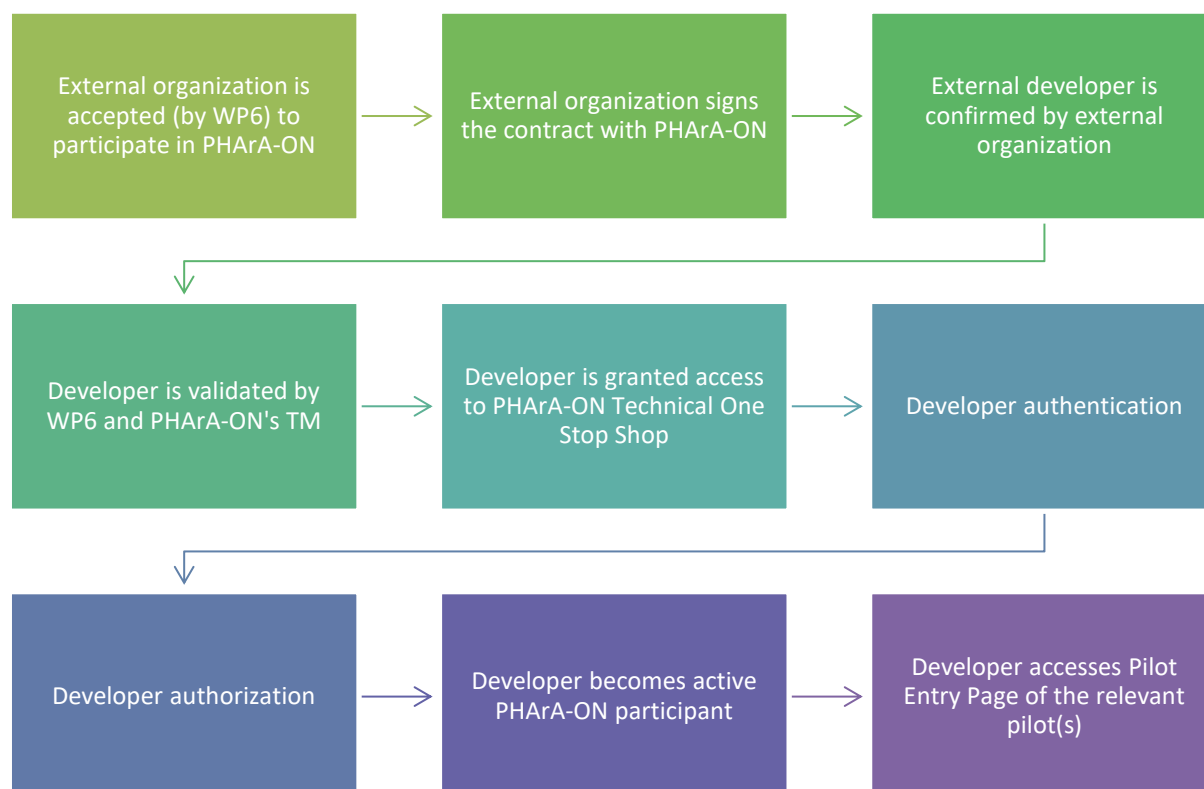
Figure 3.4 Pharaon external developers onboarding process

For the new partners onboarded through the WP6 Cascade Call to get familiar with the pilot, the Pilot entry pages have been established as quick and step-by-step guidelines. Each Pilot entry page summarizes the most important information, and contacts of the Pilot, as well as describe the steps to undertake to fulfill the onboarding process and to take part in the Pharaon pilots. The goal was to improve efficiency, save time, and always have clear, succinct, and up-to-date information about the pilots.

The initial page is an overview page that functions as a starting point for new parties, providing a summary of the different pilots. This landing page forwards the new partner to the separate pilot pages using specific URL links, identified in the respective Pilot's section.

The Pilot Entry page environment (Welcome/Landing page and pilot-site specific pages) is set up as a wiki and hosted on the Pharaon private repository (within Pharaon Technical One Stop Shop) at the following web address: https://gitlab.com/pharaongroup/Pilot-entry-pages. The content can be seen in the following table (Table 3.3) providing an overview of all Pharaon Pilot Sites including some basic information and a step-by-step onboarding process for all Pharaon Pilot Sites.

Table 3.3 Pilot entry pages welcome screen content

Pilot	Pilot sites	Onboarding Process	Description	More Information
Spain: Andalusia	Andalusia	Onboarding Spain: Andalusia	The Andalusian pilot aims to make technology more accessible and user friendly to older people, building people's confidence on technologies and involving them in the evaluation of products and services, to further improve and adapt them.	https://www.pharaon.eu/about/pharaon-pilots/#andalusia
Spain: Murcia	Murcia	Onboarding Spain: Murcia	The Murcia pilot aims to establish the basis of a new TeleCare Model for the Public Health Care Service of the region starting with patients with chronic heart failure, improving their health and care services and detecting emergency situations to reduce the dependency of older adults.	https://www.pharaon.eu/about/pharaon-pilots/#murcia
Italy	Tuscany, Apulia	Onboarding Italy	The Italian pilots aim at proposing personalized integrated care for frail older adults. In doing so, the pilots emphasize the monitoring of important parameters, the physical and cognitive stimulation, the social interaction, and the work of formal and informal caregivers.	https://www.pharaon.eu/about/pharaon-pilots/#italy
The Netherlands	Many locations across The Netherlands	Onboarding The Netherlands	The Dutch pilot focuses on the PlusBus of the National Foundation for the Elderly. This a mobility service for older adults with almost a hundred locations across the Netherlands. It brings older people together by organizing trips to the supermarket, but also cultural and social activities, such as summer days at the beach and museum visits. Older people using the PlusBus want the service to be enriched with the possibility to stay connected online after an activity, and to remain physically fit to be able to continue to join activities of the PlusBus. The	https://www.pharaon.eu/about/pharaon-pilots/#netherlands

			Dutch pilot's aim is to support the users of the PlusBus in these goals of staying connected and staying fit by extending the services of the PlusBus.	
Portugal	Coimbra, Amadora	[Onboarding Portugal](#)	The Portuguese pilot aims to develop and implement citizen-focused solutions and design an integrated care system (planning, integrated infrastructures and processes, knowledge sharing).	https://www.pharaon.eu/about/pharaon-pilots/#portugal
Slovenia	Izola, Ljubljana, Lucija, Koper, Domžale	[Onboarding Slovenia](#)	The Slovenian pilot aims at improving well-being through passive monitoring using a variety of sensing devices like wearables, sensors embedded in furniture, and environmental sensors and TV video conferencing to caregivers.	https://www.pharaon.eu/about/pharaon-pilots/#slovenia

The structure of Pilot entry pages follows the Pharaon pilots (that are explained at the publicly accessible web address: https://www.pharaon.eu/about/pharaon-pilots/) and are organized as follows:

- Onboarding Spain: Andalusia (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-Spain-Andalusia)
- Onboarding Spain: Murcia (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-Spain-Murcia)
- Onboarding Italy (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-Italy)
- Onboarding The Netherlands (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-The-Netherlands)
- Onboarding Portugal (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-Portugal)
- Onboarding Slovenia (https://gitlab.com/pharaongroup/Pilot-entry-pages/-/wikis/Onboarding-process-%7C-Slovenia)

3.5.1 Structure of the Pilot Entry page

The page structure was established on several iterations which comprehended research, identification, and collection of all the relevant available information regarding the Pilots and extensive coordination with project relevant parties to ensure all needed topics were addressed and all of the data was accurate, in this way establishing a common template to be followed by every pilot. The initial research took into account the identification of several pieces of information throughout the project's available deliverables and website descriptions, to identify which topics were essential and provided a

sufficiently clear overview of the pilots. This would be helpful for the onboarding process without overloading the new partners with unnecessary content. This allowed for the development of a preliminary table of contents and page structure template. After extensive coordination with relevant parties in the project (e.g., pilot leaders, pilot technical managers, technical partners, etc) the common template to be followed for every pilot was established and the respective pages were created on GitLab.

Preliminary versions of the Pilot-site-specific pages were filled in for all the Pilots using the data previously collected for the design of the Pilot entries' structure and ToC. Taking into account that this data had been collected from the deliverables available at the beginning of the task and that much changed across all the pilots throughout the months this task was conducted, contact was established with the pilot leaders (pilot coordinators and/or pilot managers) requesting them to check the information and to update it, or further consolidate it, if need be.

The **pilot entry page template** is structured as follows:

- Pilot Description: a brief description of the Pilot, reporting basic information (e.g., information from the Pharaon website).
- Use Case Scenarios: the list of use case scenarios defined in the Pilot. Each use case scenario is explained with a brief description.
- Selected Technologies: list of the technologies selected by the Pilot. For each technology, a brief description is provided.
- Relationship between selected technologies and use case scenarios: an overview of the relationship between the selected technologies and their employment in the use case scenarios.
- **Onboarding process**: a detailed step-by-step description of the onboarding process. In this section, the new partner will be guided through the onboarding process step by step using checkboxes, which highlight the activities and the essential information to onboard the pilot. Namely, this section includes:
  o Contact Information: e-mails and links to reach the pilot leader, the pilot technical leader, the pilot site's managers, and the other technology providers.
  o Legal section - project: list of activities that the new partner should perform from a legal point of view within the project (e.g., sign project consortium agreement).
  o Organizational: list of activities that each partner should complete. In each activity, it is also mentioned the Pharaon members involved in the task (e.g., New partner + pilot leader)
  o Legal section – data transfer: list of activities that the new partner should perform from a legal point of view within the data transfer (e.g., Sign a Joint Controller Agreement with the Pilot manager).
  o Realization of the Pilot pre-validation: list of activities related to the pre-validation phase of the technology in the Pilot. This is a step-by-step process to validate the new technology.
  o Realization of the Pilot deployment: The final step, is that the new technology is used during pilot deployment.

The Pilot Entry Pages' common onboarding structure is established as of now. However, as a support tool, and following an action research approach, it is always open to suggestions, as well as to

improvements. It is expected that after the actual usage of this tool additional needs might be identified.

4 Data governance

Data Governance is the management of the availability, integrity, usability and security of data used in an organisation. It includes the definition, organisation and implementation of policies, procedures and roles (including responsibilities) for the effective management of data-based assets (products, both tangible and intangible).

A data governance strategy should address the following aspects:

- Create, collect and align rules on data accountability, use, storage and monitoring.
- Solving data problems using appropriate technology tools.
- Monitor and enforce the rules while providing ongoing support to data stakeholders.

When do we know we need a data governance strategy?

Let's answer the following key questions based on the three main pillars of information security. If there is no positive answer, a data governance strategy needs to be implemented.

Data availability	Data security	Data integrity
What data does the organisation/product need	Is your data protected?	Do you have duplicate data?
What is the data needed for?	How do you ensure data reliability?	Do you have incomplete data?
How is that data acquired?	Do you comply with data protection laws?	Do you have erroneous data?

DAMA International is the leading reference organisation for modelling and best practice in the implementation of data governance. There is a lot of documentation on the subject so we only include the DAMA wheel which summarizes the areas involved in data governance.
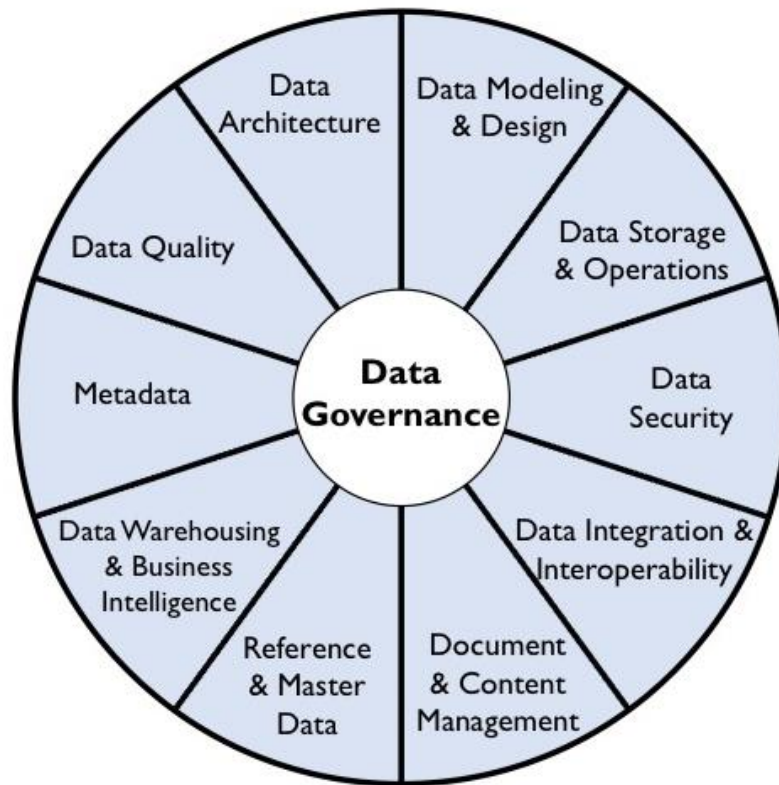
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Figure 4.1 DAMA wheel (image from https://www.dama.org/cpages/dmbok-2-wheel-images)

They even offer evolved wheel as presented in the following figure (Figure 4.2).

Both images are licensed under a Creative Commons Attribution-NoDerivatives 4.0 International License meaning they are free to download and share as long as DAMA International is credited.
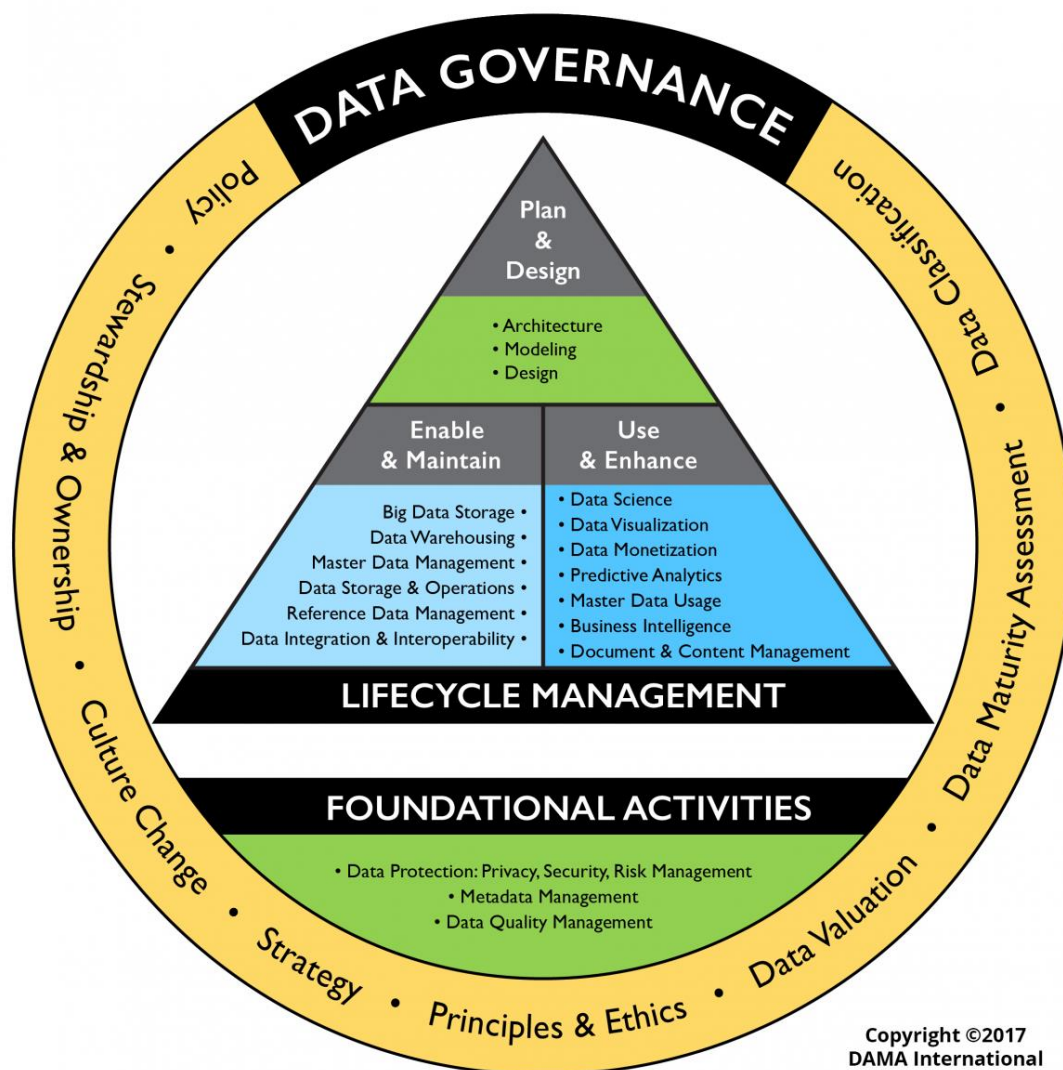
Figure 4.2 DMBOK 2 Evolved Wheel (image from https://www.dama.org/cpages/dmbok-2-wheel-images)

5 Analytics

Before applying data analytics to the developments, we must ensure that the input data is of good quality. Otherwise, the results of the analysis would not be valid. The data analyst, therefore, assumes that the necessary data governance procedures have been properly implemented. This is why the active role of the data manager in the whole process is necessary, as the quality of the results will depend more on him than on the developer himself.

Having defined the framework of the technologies used for the design of the data architecture, the question arises as to how we can make the most of the data once we have it hosted and available to be exploited. This is where the discipline of analytics and algorithms, or what has more recently come to be known as data science, comes into play.

It is important to note the difference between data analysis (whether descriptive or more classical business intelligence) and the use of algorithms in the flow of a data science project. In the latter case,

the aim is to build a system that is as autonomous as possible (capable of learning from the data available through these algorithms) to be able to make predictions for the future, estimates that are not possible with a descriptive exercise of past data alone, and to make decisions based on the information provided by the models built.

Main pillars of the data analysis for the developer:

- **Theoretical stack:** theoretical component is necessary to know how the algorithm to be applied behaves, what mathematical tools we need to prepare the data to be modeled, and even what tools we have to acquire a better understanding and explainability of the data describing the business problem to be solved. This section will also include the necessary points to define how to try to follow a certain rigor in the data science framework.
- **Good practice guide:** considerations to take into account when applying algorithms for products (lines of action, problem definition, modeling phases, evaluation and monitoring of results, capacity to react to unforeseen events...).
- **Technological stack:** tools available to be applied in this process, from programming languages focused on data processing and modeling, through accelerator tools for this process, to software development guides focused on the discipline of data science.
- **Terminology guide:** it is no less important to establish a common language to understand each other and not fall into the abuse of language, so we can use the same terms when referring to certain important concepts, especially in disciplines where much knowledge is generated in the short term.
- **Modeling pipeline:** it encompasses the application of all phases from the understanding of the business problem to the implementation of the model by use cases.
- **Presentation of results** the importance of whatever the application of our models is, being able to present the results obtained in an intelligible way.

6 Conclusion

Providing the technical support for such vast and often heterogeneous technical activities in a project without a common and shared hosting infrastructure is not a straightforward task. For this reason, the work was focused on identifying and sharing the common (best) practices and the newest software engineering trends related to Pharaon to facilitate overall knowledge sharing and adoption of best practices. Structuring the relevant information to be easily accessible and especially useful for the day-to-day hands-on work of the Pharaon technical personnel was one of the major activities. Technical One Stop Shop with Developers' handbook, tools, source code repositories, and Pilot Entry Pages has advanced to serve both as a reference to Pharaon partners and also as an entry point for Pharaon external partners.