CHARM-EU

D7.2

High-Level IT Architecture

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DELIVERABLE D7.2 – CHARM-EU: HIGH-LEVEL IT ARCHITECTURE

Project Acronym	**CHARM-EIGHT∞**
Grant Agreement	101089376
Project Title	**CHARM-EU Expansion, Inter-institutional campus, Governance, Higher education, Transformation**
Coordinator	University of Barcelona
Consortium	University of Barcelona Trinity College Dublin Utrecht University Eötvös Loránd University Budapest University of Montpellier Åbo Akademi University University of Würzburg Ruhr West University of Applied Sciences
Website	https://www.charm-eu.eu

Deliverable	**D7.2**
Title of Deliverable	**IT Architecture**
Work Package	WP7
Work Package Leader	Janina van Hees (Utrecht University)
Deliverable Type	Report
Dissemination Level	PU — Public
License	CC BY
Document Version	VX (FINAL)
Due Date	December 2024
Submission Date	Day December 2024
Authors (Main Beneficiary)	University of Utrecht
Other Contributors	All Consortium Partners

DOCUMENT HISTORY

Date	Revision No	Prepared By	Description
27-11-2024	0	WP-lead team	Draft document ready for review
9-12-2024	1	WP-lead team	Revision after comments from WP task group, Executive Board and Project Management Team

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EXECUTIVE SUMMARY: CHARM-EU HIGH LEVEL IT ARCHITECTURE

This deliverable presents the results of two years of work on **mapping the current IT-set up** in CHARM and discussing our **joint future vision** with the main stakeholder groups. It enables us to enter the next phase of the project with a well-supported outline of CHARM-EU's IT architecture vision that will optimally support our educational mission while addressing the complexities of a transnational IT ecosystem.

We applied the **Higher Education Reference Model** (HERM) to generate a shared understanding of the IT support of our CHARM Master's programme "Global Challenges for Sustainability", the principal educational offer that we are currently providing jointly.Using this modelhas helped us develop a **joint understanding** and **joint terminology** within the IT team of the project, including a clear picture of the **capabilities that are in scope** for the project. Subsequent **bilateral interviews** with the IT departments of all partner institutions helped us to identify **similarities** and **differences** between the contexts in which each of us operates. The interviews indicated **specific expertise** and priorities at partner institutions, and they also showed us potential **challenges** – such as national level system, rules and regulations.

In a **Student Journey Map,** we developed a comprehensive view of the entire student experience in the CHARM Master's programme, from recruitment to graduation. It highlighted **key bottlenecks** in important processes and systems at each partner institution, especially in areas such as admissions, enrollment, and cross-institutional mobility. The map also enabled us to make an **Architecture Workflow**, a visual representation of the key tools that we use to support the CHARM Master's Programme, including a depiction of which partner university is providing which capability.

This received an even higher level of detail in a **FIT-GAP analysis**, in which we continued the work of mapping and evaluating the current IT set-up of the CHARM Master's programme. The survey identified an **assessment of the status quo** of our key capabilities, focusing on organization, processes, information management, and technology within CHARM-EU. The findings from the analysis highlight several areas of **success** as well as opportunities for **improvement** across the student journey. We found that the core delivery of education is efficient and considered fit. Certain layers, such as technology and information, necessitate innovation to effectively cater to the diverse requirements.

Looking ahead, the team developed different potential visions on how the capabilities could best be supported and how CHARM partner institutions could distribute the work in this respect. **Four potential IT architecture scenarios** were developed: 1. One University, 2. Best of Breed, 3. Limited/Pragmatic, and 4. Everyone contributes. Each of these address challenges of interoperability and scalability with varying levels of innovation, cost, and complexity.

There was no immediate agreement on the preferred IT-Architecture scenario. This led us to the insight that decisions regarding IT architecture are influenced by a **variety of factors** beyond the technical aspects. These factors include local priorities, the balance between cost and benefit, and the alignment between CHARM-EU's educational vision and the individual ambitions of partner institutions. Therefore, the recommendation that concludes this deliverable is that we should adopt a **"Hybrid" Architecture Scenario.** Whenever a specific decision in relation to IT Architecture needs to be taken, we need to balance the strife for interoperability with the unique requirements of each partner institution to find a fit-for-purpose solution in the specific context. We set up a **checklist** with a number of **considerations** to help us keep all key considerations in mind during decision-making processes.

1. INTRODUCTION

The primary purpose of Deliverable 7.2 is to outline a high-level IT architecture that supports the educational objectives of CHARM-EU as an alliance. This effort required the nine partner universities to formulate joint guidelines, standards and building blocks, while addressing the challenges involved, such as interoperability and scalability.

Since the spring of 2023, a task group composed of architects, software engineers, and developers—representing diverse technical and cultural backgrounds, languages, and institutional contexts—has been working on this initiative. We decided to use the *Higher Education Reference Model* (HERM), as central guiding framework to help structure the discussions on CHARM-EU's IT architecture.

An important question at the beginning of this journey concerned the **scope** of this High Level IT_architecture. CHARM-EU is developing a diversity of educational offers. The Master's programme 'Global Challenges for Sustainability' is the most comprehensive offer that is already operational. More recently, the 'Transnational Online Learning' programme has been set up, and a micro-credentials offers, a doctoral programme and more are in development. The demands towards an IT-architecture between these types of education are rather different:

- The Master's programme requires a **joint** support structure for the entire student journey across the partner universities;
- Transnational Online Learning, by contrast, requires a **distributed** architecture, because the delivery of education remains within the partner university's local system.

The focus of this document will be on the desired architecture of a **joint offer**, with the current Master's programme as our starting point. It serves as test bed for a comprehensive IT architecture set up by all partners jointly. The exercise of creating this high-level architecture provides guidelines on how to make IT-architecture decisions for other educational offers in the future, depending on the structure and needs.

The work consisted of two main elements:

1. **Create overview and make a thorough assessment of current capabilities**

   Important groundwork for this task was the exercise in which we mapped the CHARM Master program's student journey to find bottlenecks in the current set-up. These insights received a further level of detail through a *FIT-GAP analysis*, which assessed the alignment between current capabilities and CHARM's strategic goals.

2. **Discuss potential work distribution across the partnership and define joint vision**

   Working towards agreement between the partners is a step that can be taken after we have a thorough overview of the status quo. Scenarios for a potential division of responsibilities

were developed and debated, laying bare differing priorities and perspectives while fostering agreement on the ideal path forward.

This report highlights the process of the work we have done and explains the insights we gained. It presents a recommendation on the IT-Architecture and gives practical guidelines for decision-making on IT tools and services in CHARM.

Reading guide

This document covers several steps taken over the course of the two-year term of this deliverable. Those primarily interested in the results may focus on Chapter 4: *Conclusions*. To ensure clarity and ease of navigation, the supporting information is organized into *Methodology*, *Results*, *Conclusions* and *Annexes*.

2. METHODOLOGY

The methodology employed for CHARM-EU's IT architecture development was designed to ensure alignment across all nine universities. Our approach combined collaborative **workshops**, bilateral **interviews**, targeted **analyses** and **surveys** to collect input. Each of these is described in more detail in the next section of this document.

TIMELINE OF KEY ACTIVITIES IN DEVELOPING THE IT ARCHITECTURE		
1	Hackathon for CHARM IT Professionals	May 2023
2	Bilateral Interviews with CHARM Partners	Sept 2023
3	User input to draw Student Journey Map	Dec 2023
4	Development and joint review of IT Architecture Scenarios	Apr 2024
5	Survey for FIT-GAP Analysis and Pace Layering	Nov 2024

Table 1: Timeline of key activities

The results and insights from these activities were plotted in strategically chosen frameworks. The two key frameworks that we used were the following:

Capability Model based on HERM

The Higher Education Reference Model (HERM) is a capability model that describes the total set of capabilities an organization needs to support their goal. It is a model developed by CAUDIT Higher Education Reference Models (HERM) Working Group with active collaboration and contributions from corresponding groups in EDUCAUSE (particularly through the Enterprise, Business, and Technical Architects Community Group, ITANA), UCISA (United Kingdom), and EUNIS (Europe).

For CHARM-EU, we've made a selection of the HERM business capabilities that are most relevant for us. Not all the HERM capabilities are within the scope of the CHARM-EU Master, as it operates within a focused scope. Therefore, we selected capabilities based on two key criteria, to ensure that our efforts were concentrated on areas with the highest potential for value and alignment with CHARM-EU's objectives:

- Capabilities that directly enhance CHARM's educational mission.
- Capabilities in which IT can provide significant support and innovation.

FIT-GAP & Pace layering

The Fit-Gap Analysis and Pace Layering model are key methodologies within enterprise architecture frameworks and is based on the TOGAF Architecture Development Method developed by The Open Group. The Fit-Gap Analysis methodology helps to assess the current architecture and identify gaps between the existing and desired future state. This enables the identification of components that require modification or replacement. Meanwhile, the Pace Layering concept, introduced by Gartner, a leading research and advisory firm, provides a framework for categorizing enterprise systems based on their rate of change. Pace Layering distinguishes between systems that evolve rapidly, such as customer-facing applications, and those that change more slowly, such as core systems, allowing organizations to plan and manage technology investments more effectively.

3. RESULTS

Application of the Capability Model "Higher Education Reference Model" (HERM)

On May 11 & 12th 2023, a Hackathon was organized by WP-lead Utrecht University. IT specialists from all CHARM partners met in person for the first time. During this two-day event, the groundwork was laid for the work of the ensuing task group.

The first **key decision** was to use the **Higher Education Reference Model** (HERM) to generate a shared understanding of how the CHARM Master's programme "Global Challenges for Sustainability" (and the required capabilities) was supported at that point. Designed specifically for the higher education sector, HERM enabled our IT staff across the CHARM-EU alliance to collaboratively define, evaluate, and prioritize the capabilities essential for achieving the educational objectives from an IT perspective.

The key capabilities that we considered are:

Design	**Setting up the educational programme and the curriculum**
Recruit	Student recruitment and admission into the program
Enroll	Matriculation of the admitted students, allocation to different study locations, timetable management
Deliver	Actual Teaching and Learning process, the delivery of the curriculum
Assess	Assessment/testing of the students' progress and learning results
Confer	Management of the completion of the programme, leading to diploma

Table 2: Key capabilities for CHARM

During this Hackathon, the task group jointly made a map of the CHARM Master programme's current IT-setup in relation to the selected capabilities. This led to the following picture:

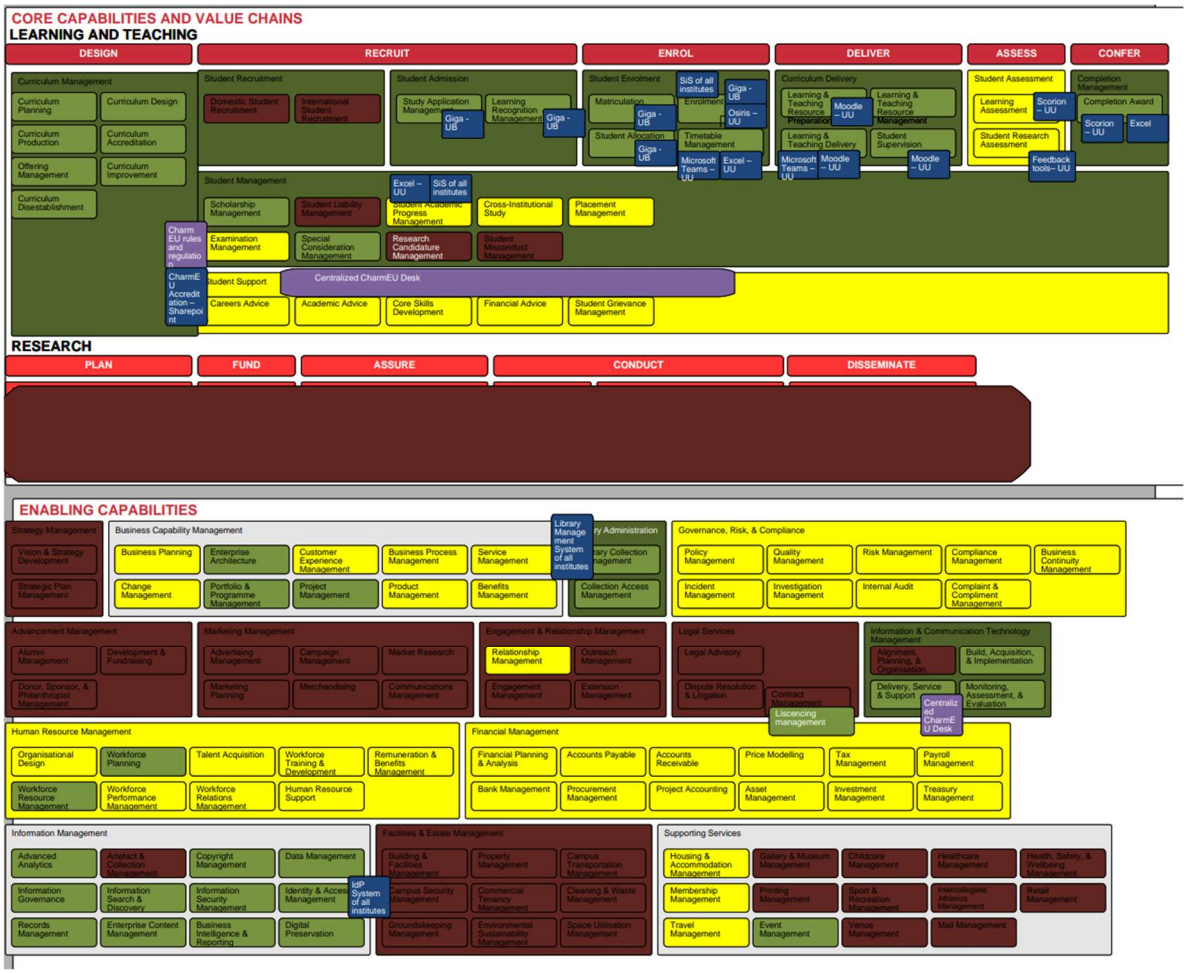


Figure 1: HERM Model & Capabilities Framework

Key outcomes of this joint mapping exercise included:

A first rough identification of the systems used across partner institutions (-> dark blue boxes in illustration 1)
- A shared understanding of capabilities that are in scope from an IT architecture perspective (-> green boxes in illustration 1)
- A shared understanding of areas that are outside of scope from an IT architecture perspective, such as support to Research (-> Dark red boxes in illustration 1)
- An identification of capabilities that are currently not in scope, but could potentially come into scope and will need recurring attention (-> yellow boxes in illustration 1)
- Centralized CHARM-EU desk mapped on capabilities (-> purple boxes in illustration 1)

Ever since this initial mapping exercise, the use of the Higher Education Reference Model (HERM) has been integral in the development of the IT architecture for CHARM-EU. It facilitated the development of a **joint understanding** and **joint terminology** within the IT team of the project. It helped us to ensure that **the attention** and **resources** of the task group – and of the individual partner institutions – were focused on the areas with the **greatest potential** to bring value to CHARM-EU's objectives. It also showed us in which areas we needed closer connections to our colleagues from the educational programmes, in order to **understand** the **educational needs** in more detail.

The discussions during the hackathon highlighted a number of challenges concerning a **lack** of **interoperability** between partner institutions' systems. Every university, situated in different countries, needs to operate within their **rules** and **regulations**. These a likely to differ, depending on the national legislation or even local procedures. An example is the **difference** in regulations regarding deadlines and data needs for admissions and enrollment. Our IT systems have been designed with our local/national needs in mind, and now that we want to set up collaboration, we find that **not all of these systems are suited to support our joint needs**. A custom approach for the enquiry of students to match each countries' needs may often be required, incidentally requiring manual interventions that slow down key processes. This led to the shared understanding that **more integrated, automated solutions** were needed to support the scalability of CHARM-EU's educational offerings.

Bilateral interviews with stakeholders from IT-departments

Following the Hackathon, bilateral interviews with stakeholders from the IT-departments of all CHARM partners were conducted. The interviews delivered a better understanding of the unique contexts in which each IT colleague operates. The interviews revealed both similarities and differences in how IT and administrative systems were structured:

- **Similarities** were found in the fact that all partner universities operate in a comparable context of having two levels of IT support: In most cases both a centralized IT organization exists as well as decentral IT-teams in faculties. Sometimes this leads to friction. Central IT management teams tend to prioritize standardization/optimization, whereas decentral IT management teams tend to allow for more innovation/variation.
- **Differences** displayed that certain countries operate within the framework of **distinct national regulations** that lead to specific IT choices, such as the mandatory utilization of nationally managed student information systems.
  Furthermore, certain partners have **additional national funding** available for CHARM

activities, whereas others must accommodate the work 'on top' of their regular workload. Another difference is seen in **the choice of IT solutions**, most notably the choice for Moodle vs Canvas for Virtual Learning Environment and Teams vs Zoom for video-conferencing.

The interviews helped to identify **potential challenges** in (future) collaboration. For example, they revealed that some partner institutions rely on a centralized (sometimes even national!) student information system. This can be a potential challenge when CHARM works towards an improved unified application process for CHARM educational offerings. Another potential challenge is the occasional dependency on technologies that have become outdated, and a lack of centralized platforms for data management, frequently due to national rules and regulations. These insights emphasize the need for **tailored solutions** that could address local challenges while promoting greater interoperability across institutions from different nations.

The interviews also revealed a number of institutional strengths and **specific expertise**, such as expertise in online learning at some universities (UM) and innovative uses of blockchain at others (UB).

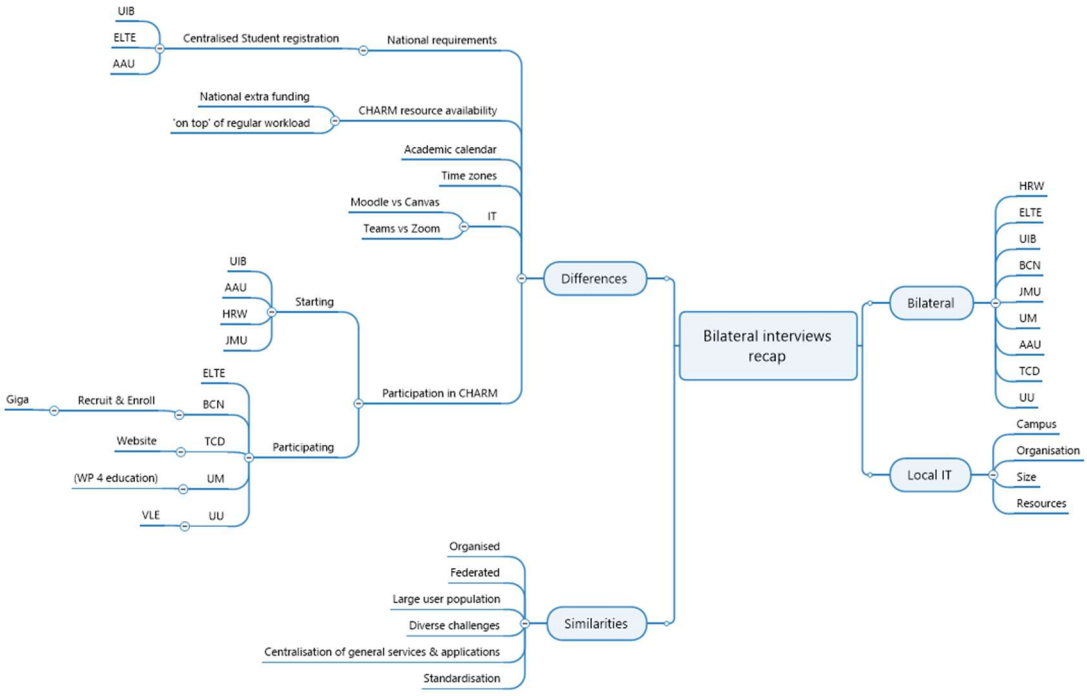


Figure 2: Mind map with summary of results of the bilateral interviews

Student Journey Map of CHARM Master's programme 'Global Challenges in Sustainability'

Another crucial piece in the puzzle was the creation of a Student Journey Map to provide a **comprehensive view** of the CHARM Master programme and the **processes** that we currently have in place for it. We created this map by drawing on feedback from a comprehensive student survey and insights provided by the Joint Virtual Administration Office.

In different 'swimming lanes', we mapped the actions the student takes throughout their participation in our programme, and we mapped the processes that this triggered in the back office. The objective was to provide a **complete picture** of the **student journey**, covering every phase, from enrollment to graduation. This enabled us to create a holistic view of the processes in the CHARM-EU Master's programme and gave us valuable insights into the relationship between the different **architectural layers**. It integrates organizational, technological, and informational perspectives into a single framework.

Figure 3: Overview of Student Journey Map
(cropped; see https://charm-eu.eu/studentjourneymap for detailed view)

The next step was to identify **concrete bottlenecks** both on the student side and from the back-office side. We wanted to understand the relationship between IT systems and student experiences, so we could propose potential **improvements** to alleviate those bottlenecks. This was done in close collaboration between business and IT, as improvements are seldom related to technology only; it is usually a combination of work processes, organization, information and technology.

This input for this journey map was collected through a number of bilateral interviews with key staff members who have a good overview of the current processes. These were mainly representatives of the JVAO in Barcelona and in Utrecht. Another source of input was the student feedback that could be gleaned from the six-monthly Phase survey sent by the CHARM Quality Office to all

CHARM-EU Master students[1]. Their input underscored the students' desire for greater consistency, more effective communication, and better integration across systems.

Key findings included:

1. **Recruitment and Admissions**:
    - Students noted some inconsistencies in information and delays in communication, suggesting the need for a more centralized platform to track applications and ensure timely updates.
2. **Enrollment**:
    - Variations in enrollment timelines across partner institutions can create confusion.
3. **Teaching and Learning Delivery**:
    - While hybrid and online learning setups are functional, students highlighted areas where system navigation and collaboration tools could be trimmed down or more streamlined to improve their learning experience.
4. **Timetable Management**:
    - Access to updated timetables of the CHARM Master's programme is not always straightforward, with students expressing a preference for a more user-friendly, centralized location for this information.
5. **Assessments and Results**:
    - Students appreciate the programmatic assessment approach but noted that clarity and consistency in methods and timelines for receiving feedback could further enhance their academic planning.
2. **Support Services**:
    - While support services are available, students would benefit from more uniform access to resources like career advice and grievance resolution tools across all partner institutions.
3. **Mobility and Interoperability**:
    - Students identified cross-institutional mobility processes as an area that could be simplified, particularly regarding smoother data sharing and consistent access to IT services across institutions.

Jointly with WP3 Education, we formed a task force that identified potential **improvements** and rated them according to urgency and complexity. We discussed **responsibilities** for these improvements across different bodies of CHARM. Some bottle-necks were referred to the Joint Virtual Administrative Office for resolution, others to the Communications Office or the CHARM

[1] Recurring survey conducted by Quality Office. Answers pertaining to Mobility come from survey among Student Cohort 1 (Phase 2 and Phase3) + Student Cohort 2 (Phase 2); total **n= 157**. Answers pertaining to Registration come from survey among Student Cohorts 1, 2 and 3 (pre-phase survey); total **n=158**.

Managers and yet others to the Joint Virtual IT Office. We also tracked the process of **implementation** of these improvements[2].

Key improvements that have strong relations to IT included:

1. **Adoption of a New Programmatic Assessment Tool**:
    - Implemented in the summer of 2024, we made a switch to a new platform programmatic assessment. The goal was to improve consistency and efficiency for students and staff but also to improve portfolio management for students.
2. **Streamlined Processes in the Student Support Team**:
    - The team discussed improved workflows and support mechanisms to better address student needs.

All in all, this exercise greatly contributed to a joint understanding in CHARM that **students' needs** should remain **central** to ongoing developments and to discussions on how we can best facilitate this. The student journey map has now become a **key tool** for aligning capabilities with the needs of CHARM students, making it an essential part of the broader strategy for CHARM-EU's educational innovation. This journey map is also proving to be a useful tool in the **onboarding** process for the new partner institutions that will be acceding to the programme in the course of 2025. In this way, the Student Journey Map has directly informed improvements and future development plans across CHARM-EU, particularly in the areas of Delivery and Assessment.

[2] Leadership for this lay with WP3 Education, in sub-task 'Advancing and Broadening CHARM Educational Practice'

Architecture Workflow Map

The Student Journey Map served as the foundation for the Architect Workflow Map, further embedding transparency and overview within CHARM-EU's operations. This Architecture workflow map is a **visual representation** of the **key IT tools and systems** that we use to support the CHARM Master's Program, including a depiction of **which partner university** is providing **which capability**. It is a quick overview of the Student Journey from an IT standpoint.

The **top two blocks d**isplay the architecture flow from Recruitment to Enrollment. Here, the IT solutions are managed by the University of **Barcelona**. Even though the **process** is managed by members of all alliance partner universities, the **IT solutions** are hosted managed by Barcelona.

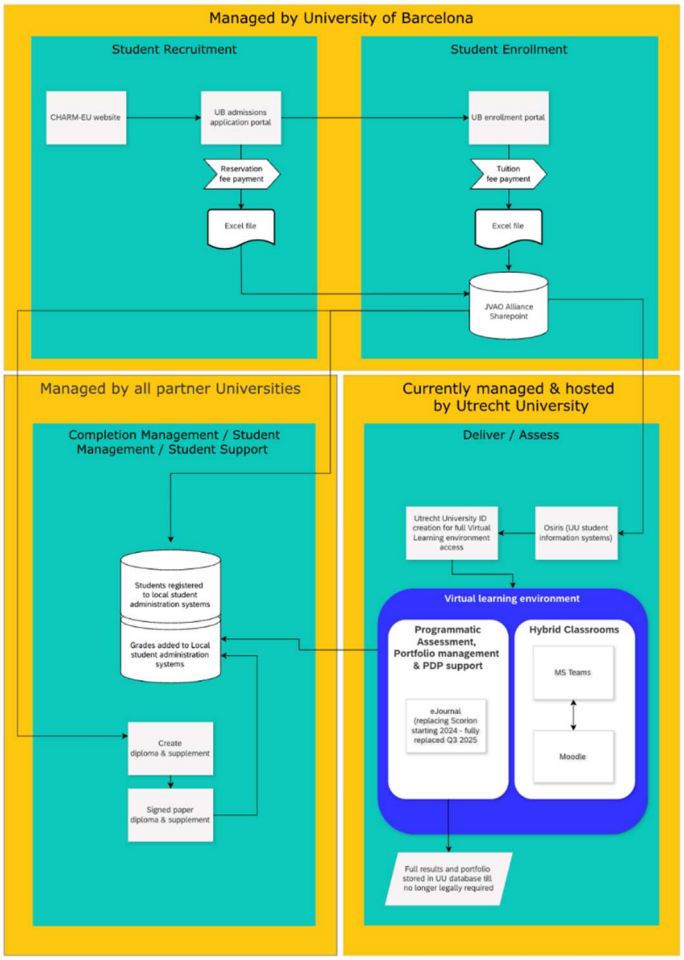


Figure 4: Current Architecture Workflow

After admission, students are provided with an Utrecht University student identity and therefore have access to the complete set of functionalities of the Virtual Learning Environment provided by **Utrecht** University. Throughout the programme, the capabilities Completion Management, Student Management, and Student Support are jointly provided by **all partner universities.**

While SharePoint, maintained by the University of Barcelona, serves as the main point of entry and central archive for the support staff, critical study data is shared among all partner universities to coordinate and support students at any moment during their studies.

Results FIT-GAP & Pace Layering

Despite these advancements, the findings from the Student Journey Map alone were not sufficient to establish a unified IT architecture scenario. To **complete the picture,** we initiated the FIT-GAP Analysis and Pace Layering project, which builds on these findings to ensure that IT systems evolve in alignment with strategic and operational goals. This survey provides both more **in-depth information** on current IT solutions, processes and organization, and helps to discuss the subject of

IT architecture in terms of **short, middle and long-term ambitions.** This approach underscores the alliance's commitment to **continuous improvement** and innovation in supporting transnational education.

To provide an extensive fit-gap and pace layering report, we **surveyed twenty CHARM-EU staff members in key positions** of supporting the current Master's programme. Mostly this concerned the local managers of the Joint Virtual Administrative Office (JVAO) of CHARM, but we also included key staff members from the Quality Office, the Academic Council and the Joint Virtual IT Office. The survey was conducted anonymously, but respondents were asked to identify their role at the start of the survey:

Respondents of the FIT-GAP survey, by role	**N=**	**Further info**
Staff member Joint Virtual Administrative Office	7	The Joint Virtual Administrative Office (JVAO) is responsible for the administration and organization of the CHARM Master's programme on a daily basis. They are the key respondents to this survey. Their answers to this survey were collected during a specifically organized workshop held during their face-to-face meeting in Budapest in November 2024.
Staff member Joint Virtual IT-Office or IT work package	9	The Joint Virtual IT-Office (JVITO) is is charge of the IT-support of all processes in the CHARM-EU Alliance. They support the CHARM Master with all IT-needs. For example, they performed the migration to the new platform for programmatic assessment.
Teaching staff of the CHARM Master's programme	1	This concerns teaching staff associated with the teaching in the CHARM Master's programme. They were invited to reply to the survey, especially because they can be expected to have a good view of the teaching delivery and the assessment.
CHARM Managers	1	This concerns the institutional coordinators of CHARM at each of the partner institutions. They were invited to reply, though several of them declined because they felt their area of work is not associated closely enough to the processes that the survey concerned.
CHARM Communications group WP16	1	The CHARM communications office was invited to contribute, especially with a view on their expertise about the recruitment section.

Other	1	The 'other' category concerns members of the CHARM community who were invited to reply to the survey but did not identify as a member of the other listed categories.

Respondents were asked to select those topic areas that they felt were relevant for their personal area of expertise and were asked to provide their input only to those. Questions from non-selected areas were skipped in the survey. This resulted in different amounts of respondents per question category:

Topic areas of the FIT-GAP survey	**N=**	**Further info**
Recruitment & Admissions	11	This category concerns the way we recruit new students for our Master's programme 'Global Challenges in Sustainability'. This section includes questions about the processing of applications.
Student Enrolment	11	Student enrolment is about the process of handling the admitted students administratively and finalizing the enrolment process.
Curriculum Delivery	9	This section concerns the way we prepare, organize and execute our teaching process, e.g. the work with the hybrid classrooms.
Student Assessment	8	This concerns the programmatic assessment set-up we use in CHARM. We have recently moved from the assessment tool Scorion to the new tool eJournal.
Completion Management	7	Completion Management confirms and recognises completion of study. In CHARM, this concerns the process for the final validation of the portfolio at the end of phase 3 and the granting of the diploma.
Student Management	9	This section refers to our administrative support to the Master's programme in general. Handling student queries, maintenance of records, archiving of student works. This is done by the JVAO.
Student Support	11	This section refers to any broad personal support that we provide to the students in our CHARM Master's programme. This is done by the JVAO.

The survey identified the respondents' assessment of the status quo of our key capabilities, focusing on **organization**, **processes**, **information management**, and **technology** within CHARM-EU. It was a combination of a quantitative and a qualitative analysis, in the sense that a lot of room was given for textual **comments** to explain their answer to the assessment in detail. The average time to complete the survey was 35 minutes, indicating that respondents dedicated significant time to the consideration of their answers. The detailed internal report will list key quotes from the open answer fields in which respondents placed their comments.

The **findings** from the analysis highlight several **areas of success** as well as **opportunities for improvement** across the student journey. These insights collectively inform the overall IT landscape and improvements necessary to enhance the student and institutional experience.
The analysis of the survey resulted in the following picture:

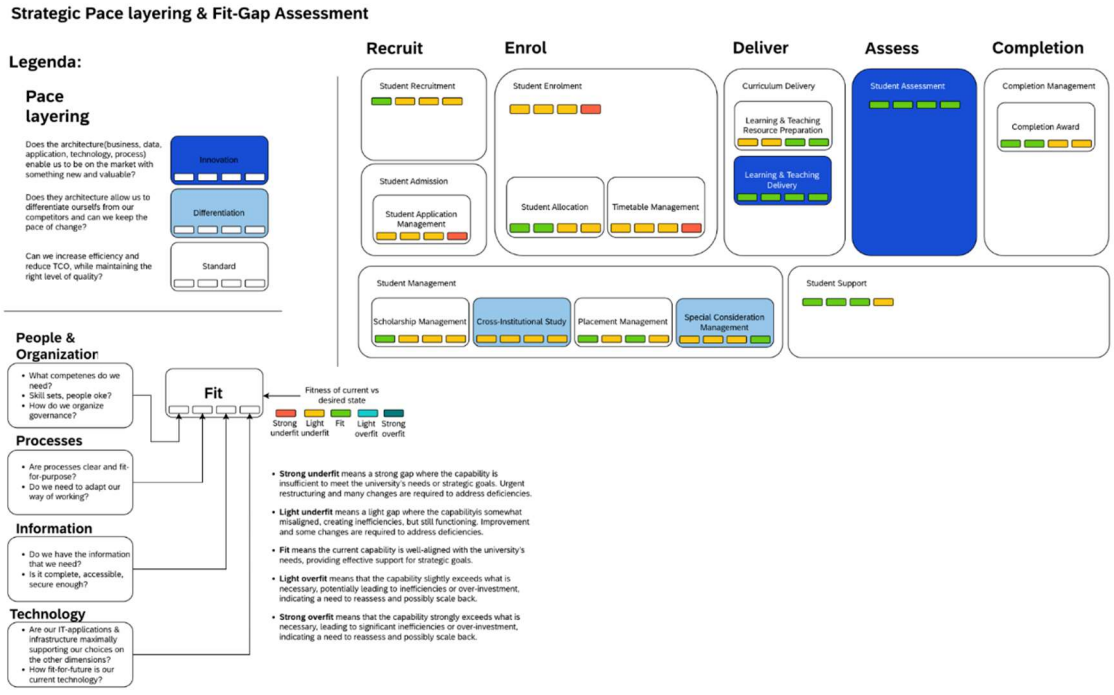


Figure 5: Results Fit-Gap analysis CHARM Master's programme

Key findings FIT-GAP analysis in relation to "Organization"

The layer "organization" refers to the **staff** that we have available to manage the respective capability, their competencies, skill sets and expertise and the governance of the respective capability.

Several capability areas are showing strong positive outcomes in terms of organization, due to good organizational structures and effective coordination. For instance:

- **Student Recruitment** has benefited from clear structures and responsibilities at the central level, leading to better oversight. Even though there are areas for improvement, there is already a solid foundation to build on.
- **Scholarship Management** is seen as well-established by our respondents. The existing framework allows for relatively smooth coordination of scholarship processes, making it easier to manage across different universities.
- **Learning & Teaching Delivery** is functioning well, due to established roles for teaching staff. The existing structure facilitates effective delivery of programs, particularly in hybrid and online settings.
- **Student Assessment** has a well-organized approach, where roles and responsibilities in assessment are well defined.
- **Student Support** benefits from a generally effective organization. The processes are in place to provide essential support, ensuring students have access to the resources they need.

In these areas, respondents indicate that the organization is relatively strong, due to clear roles, effective communication, and established systems.

Across the student journey, a few other areas such as Student Application Management and Student Enrolment are experiencing **challenges** in terms of organization, particularly due to under-resourcing in certain parts of the process. This leads to occasional communication gaps, inefficiencies, and difficulties in coordinating processes between institutions, often due to local blockers. The FIT-GAP Analysis highlights that sharing responsibilities across different institutions, while fostering collaboration and enriching the partnership, inherently introduces greater complexity. Clear communication and coordinated strategies are required to ensure smooth operations in a distributed set-up. At CHARM-EU, we highly value and thrive in this collaborative environment, and recognize that the diversity of expertise and shared ownership bring unique strengths to our alliance. However, the analysis shows the opportunities we can take to further tailor our approach to address operational challenges that come with this collaborative model.

Key findings FIT-GAP analysis in relation to “Processes”

The element “processes” refers to our **way of working** and whether the work processes are clear and fit-for-purpose.

According to our respondents, several areas across the student journey have well-established, efficient processes that ensure smooth and effective operations. Key processes indicate the following:

- **Learning & Teaching Delivery**: Processes for delivering the curriculum are seen as partially effective, with clear workflows supporting both in-person and hybrid learning formats. These processes have been enhanced with the integration of a portfolio and programmatic assessment tool, allowing for more flexible and responsive teaching that meets diverse student needs. However, timing within the process seems to occasionally present challenges.
- **Student Assessment:** The process of student assessment is generally well-defined and functional. Roles and responsibilities for both faculty and students are clearly established, ensuring smooth execution. The use of programmatic assessments is a highlight, offering transparency and consistency in evaluating student performance.
- **Placement Management:** This process is seen as generally effective, with clear workflows in place to coordinate placements between universities and external partners. The structure ensures that students are matched with opportunities that align with their academic goals and programme requirements.

While these processes are performing well, there remains room for further enhancement through automation and better system integration to continue improving efficiency and consistency.

- The work process for **Student Recruitment** is likely to improve if tasks can be automated and responsibilities are more clearly allocated.
- The survey indicates a need to cut down manual operations in the **Student Admission** work process to enhance efficiency and speed through process automation.
- **Student Enrollment** calls for system architecture that enables integration and response by partner institutions to be better coordinated to prevent delays in processing time.
- More effective structuring and a greater degree of standardized workflows for teaching staff to conduct **Learning** & **Teaching Resource Preparation** is desired.
- Finally, **Placement Management** desires clearer definition of roles and better consistency between different institutions in order to enhance placement coordination.

Key findings FIT-GAP analysis in relation to “Information Management"

The layer “Information” refers to the question whether we have **access** to all the **information** we need, and whether it's **complete, accessible and secure**.

Several areas of information management across CHARM-EU's student journey are already functioning well.

- Information related to **teaching delivery** is generally well-managed. Information about **assessments** is readily available and well-communicated, with a clear structure in place. And the overall information flow around student assessments and placement management is largely satisfactory, with information being accessible and organized.
- **Learning & Teaching Resource Preparation** benefits from the virtual learning environment in place and supports the overall information flow needed.
- **Placement Management** information is considered functional and supports CHARM-EU's goals by ensuring students have access to relevant opportunities.

Several other areas across the student journey require improvement in information management.

- The feedback suggests that **Student Recruitment** could benefit from better tracking of campaigns and demographics, simultaneously dealing with all the requirements regarding rules and regulations.
- **Student Admission, Student Enrollment and Student Management** require advanced data management and standardization across institutions.
- **Student Completion Award** would benefit heavily from a digital document management system for efficient processing and information handling.
- **Scholarship Management** could be improved with timely and clear information.
- Lastly, **Cross-Institutional Study Management** desires an improved integration for timely and clear information flow.

Key findings FIT-GAP analysis in relation to "Technology"

The element "Technology" relates to the IT-systems and infrastructure that we have in place to support our choices in other areas.

Technology is a significant strength in the areas that count the most for students once they have been enrolled.

- Technology is a significant strength for **Learning & Teaching Delivery**, where respondents reported positive experiences. The technology in these areas is seen as effective, appropriate and sufficiently advanced, supporting hybrid learning environments and enabling efficient assessments. However, there is still room for further integration and optimization.

- IT is a strong asset for **Student Assessment**, with systems supporting well-organized, transparent assessment procedures. Integrating programmatic assessment tools has improved the assessment process's effectiveness and efficiency.

- **Learning & Teaching Delivery** has been significantly strengthened by effective use of technology, particularly for hybrid and online learning. The tools currently in place for portfolio management, programmatic assessments, and online teaching are considered highly effective. However, there is still room for integration of advanced features and identity management to further enhance flexibility and support the diverse needs of students and teaching staff.

The capabilities that need the most improvements from a technical standpoint are as follows:

- **Student Enrollment** and **Student Management** face challenges due to the use of technology that needs adapting to the differentiating needs of the CHARM-EU Alliance, such as tackling rules and regulations, reliance on manual interventions, and limited integration between all partner universities. To improve efficiency, automation, and data accessibility, these areas would need a more agile approach. The survey indicates a clear desire for stable, reliable technology infrastructure in these areas to support their critical processes.

- The **Student Recruitment** process has benefited from clearer structures and responsibilities at the central level, but the supporting technology could be improved. Currently, there is a lack of a centralized system for managing recruitment campaigns, tracking demographics, and ensuring real-time data access. The technology in this area would need to be enhanced with more automation and centralized systems to improve efficiency, data visibility, and decision-making.

- **Scholarship Management** is functioning well, with an existing framework that allows smooth coordination across institutions. However, technology in this area is restricted by rules and regulations, leading to inefficiencies in data management and tracking. There is a wish to automate scholarship processing and ensure timely communication.

- **Timetable Management** has not yet made optimal use of existing IT tools which are already available, due to a lack of process adaptation. A gap that is easy to bridge but has not yet been done.

- **Student Completion Awards** rely heavily on manual processes, which leads to non-optimal efficiency whilst awarding diplomas.

Overall conclusions of fit-gap analysis

The overall result of the fit-gap analysis and pace layering displays the following:

The Fit-Gap analysis and Pace Layering model show that the **core delivery of education** is **efficient** and considered **fit**. Certain elements, such as technology and information, necessitate **innovation** and **modernization** to effectively cater to the diverse requirements of partner universities simultaneously, particularly in the head and tail areas of the student journey. Other aspects, such as processes and organization, need more **stability**, clear **structure**, and **automation**.

Building on these insights, we now have the ability to sketch an even more detailed ideal architecture scenario. Rather than focusing solely on the overall infrastructure and base needs, the framework enables a more granular approach that targets each specific capability. This allows for **tailored solutions** for each **capability**, ensuring that every part of the student journey—from recruitment through to graduation—receives the necessary technological, organizational, and process improvements to optimize the experience for all stakeholders involved.

By using the insights from these frameworks, CHARM-EU can make targeted improvements in both the foundational and innovative layers of its IT architecture, ultimately improving the student experience, the teaching staff experience, operations further, and collaboration across institutions.

IT Architecture scenarios

Using the output from the initial Student Journey Map, the task team came to the conclusion that several different visions were possible on how the capabilities could best be supported and how CHARM partner institutions could distribute the work in this respect. To facilitate the discussion on the best way forward, **four potential IT architecture scenarios** were developed that could each support CHARM-EU. These scenarios were shaped by data collected from the Hackathon, bilateral interviews, the Student Journey Map, and feedback from various stakeholders. They were mainly written with the CHARM Master's programme in mind, because this necessitates the broadest range of capabilities. However, a very comparable choice of guiding architectural principle would also apply to other educational offerings in CHARM as well.

The scenarios were designed to **address key challenges** identified in these activities, such as system interoperability, scalability, and user experience.

These four scenarios are:

1. **One University**	This scenario allocates all capabilities to one of the partner institutions, making use of the fact that **all components are likely to work together harmoniously**, as they already fit the local needs in a comparable manner. *Prerequisite*: need to accept that all partners get access to the one University IT landscape or accept manual effort
2. **Best of breed**	In this scenario, each required capabilities is looked at separately. A benchmarking is conducted to research which partner has the **best (technological) solution**. This solution is then made available to all partners. *Prerequisite*: need to accept that the elements in our IT-environment should be suitable for microservices and should allow (federated) access.
3. **Limited/pragmatic (current)**	In this scenario, the capabilities are **shared pragmatically** between a limited number of partners, making use of the solutions that are most **easily available**. *Prerequisite*: need to accept that all partners get access to the two Universities' IT landscape or accept manual effort

4. **Everyone participates**	This is the most 'principalist' scenario, in the sense that it matches the vision that in an alliance, **all partners should contribute**. This could theoretically be applied to the IT setup as well. *Prerequisite*: need to accept that the elements in our IT-environment should be suitable for microservices and should allow (federated) access.

Each scenario was evaluated for its alignment with CHARM-EU's objectives and the varying national, technical, financial, and operational needs of the partner institutions, and each scenario was rated on eight IT aspects as to its pros and cons. This resulted in the following picture:

Scenario	Innovative capability	University lock-in	Agility	Complexity	Implementation cost	Time to result	Vendor lock-in	Cost/effort of operations	Likelihood of alignment
	+ means better	+ means less lock-in	+ means more agile	+ means simpler	+ means cheaper	+ means shorter	+ means less lock-in	+ means less cost/effort	+ means more chance of po
One University	0	--	-	++	+	+	--	0	0
Best of breed	++	++	++	--	-	-	++	+	++
Limited / pragmatic (current)	+	-	0	+	++	++	0	-	0
Everyone participates	0	-	-	--	--	--	-	--	--

Table 3: Comparison of pros and cons per Architecture scenario;
see annex for more detailed version of this table

The decision on one of these scenarios is a **strategic decision**. Hence, the result of this analysis was presented to the IT Steering Board and the CHARM Executive Board. The ensuing discussion of these four scenarios revealed a range of perspectives among different stakeholder groups, each with its own priorities and considerations:

- The **WP7 task group**, which had developed the proposed scenarios, favored the "**Best of Breed**" approach. This scenario chooses applications from within each partner institution that best meets the technical needs of the project.

- The **IT Steering Board** was not able to reach a consensus on one scenario, but in majority expressed a preference for solutions that prioritize **cost-effectiveness**, long-term sustainability, **minimal complexity,** and enhanced stability and security, underscoring the significance of practical and dependable solutions. Surprisingly, this led to approximately equal votes for scenarios 1, 2 and 3, which reinforced that more (explicit) context or vision is needed. (See Annex for the results of our structured survey in which we collected the preferences of the IT Steering Board members.)

- The **CHARM Executive Board** tended to focus more on CHARM's **long-term strategy** and educational mission: “be innovative and different than others”. They emphasized the importance of innovation and the opportunities it provides, in line with the European Commission's digitalization agenda for university alliances. Assuring interoperability is their top priority, with a long-term vision for the future, while also acknowledging the need for clarity regarding the financial, technological, and organizational implications of any decisions.

- An additional discussion held with the **CHARM community** at the Sprint meeting in Budapest showed a preference for the following three priorities: **User-friendliness**, **innovation**, and **security** & **compliance**. (See Annex for the results of the discussion of this topic during the CHARM Sprint Meeting in Budapest in November 2024.)

Whilst we didn’t immediately reach a consensus on which IT-Architecture scenario we should choose, the main lesson learnt from this exercise is that decisions regarding IT architecture are influenced by a **variety of factors** beyond the technical aspects. These factors include differing local priorities, the balance between cost and benefit, and the alignment between CHARM-EU's educational vision and the individual ambitions of partner institutions. The **drive for innovation** in CHARM’s educational goals sometimes **conflicts** with the **desire for internal IT stability** and feasibility goals of partner universities. The challenge is to transform this into a unique opportunity towards finding common ground where all partner universities can benefit from the adoption of solutions within CHARM.

To come to practical guidance for the future, we **combined** the discussion on the **IT Architecture scenarios** with the analysis of the Student journey and the **Fit-gap** and pace layering. Combining the discussion on the IT Architecture with the insights of the Fit-gap analysis, gave us to a better view of the capabilities that need **attention** and supports an **objective** and **structured discussion** on the needed improvements, independent from which partner is providing which capability. For each capability that we address, we need to make a separate consideration of which set-up to choose. Taking into account the four different layers identified in the fit-gap analysis (organization, processes, information and technology) helps to see the complexity of the needed decision. The **guidelines** that we identified on this basis help to ensure that we make IT fit the needs of people, the organization and work processes. In essence allowing us to make faster and more strategic choices, based on guidelines. This led us to the conclusions described in the final chapter.

4. CONCLUSIONS

The CHARM-EU IT architecture project has effectively navigated a **complex landscape** of diverse institutional contexts, regulatory environments, and strategic objectives to address the difficulties aligning IT systems across nine diverse partner universities. The project was driven by the ambition to enable **seamless transnational collaboration**, **optimize delivery** of education, and enhance the overall **student experience** through a unique interplay between our universities. We delivered a high-level architecture that displays and supports the CHARM-EU alliance well and shows possibilities for growth and grasping new opportunities within the Master's programme and beyond. Despite the overall collaborative nature of the alliance to which each university contributes, we've also identified the potential **bottlenecks** we are jointly striving to overcome.

The project's **achievements** include the creation of a detailed Student Journey Map, a comprehensive Fit-Gap Analysis, and the exploration of architectural scenarios, which underscore the alliance's commitment to improving student mobility, interoperability, and scalability. The Fit-Gap Analysis & Pace Layering supports the Executive Board and IT Steering Board in working towards consensus on the direction of short term and long-term improvement and process management.

Project achievements:
1. Developed the Student Journey Map as a tool for identifying and resolving process inefficiencies.
2. Conducted FIT-GAP and Pace Layering analyses to align IT systems with strategic objectives.
3. Proposed IT architecture scenarios balancing innovativeness and operational feasibility.
4. Prepared guidelines for scaling the IT-support for Master program, ensuring that CHARM-EU's IT systems remain in sync with the broader mission.

The work that we have done leads us to the following **insights and conclusions.**

At the start of CHARM, work was **divided** among the **five original partners** the CHARM-EU alliance comprised at the time. The three most essential technically enabled capabilities were supported each as a whole by one partner: 1. Recruitment (website), Admissions and Enrollment by **UB**, and 2. Delivery and Assessment (Learning environment) by **UU**. The initial choice for the IT set-up of the CHARM-EU Master occurred under the time pressure necessitated by the pilot setting.

Throughout the first phase of CHARM, the solutions have proven **successful**. However, since many manual administrative activities are required and tasks have increased due to the expansion of the master and much welcomed additional partners to the CHARM program, the number of interfaces, manual and technical have **rapidly increased in difficulty.** Thus, naturally becoming lightly underfit and **in need of revisions or improvements**. For certain capabilities the current set-up is **difficult to scale,** due to the fragmentation of tools and technological functionalities imposed by local rules and

regulations. Therefore, improvements require a more **tailored solution**. Based on our findings, finding a fitting solution and adopting this doesn't always go together.

The Fit-Gap Analysis and Pace Layering models provide **critical insights** into the **strengths** and **challenges** of the current IT architecture, especially in the early and the late stages of the Student Journey. While the core delivery of education—specifically in areas such as Learning & Teaching Delivery and Student Assessment—is efficient and fit for purpose, other areas such as Student Recruitment, Enrollment, and Student Management display room for improvement in terms of scalability and integration. By **recognizing** the occasional restrictions posed by national rules and regulations, we can more easily choose an adjusted direction whenever this is necessary.

The project highlighted the **complex nature of aligning IT** over an alliance spanning multiple universities over several different countries. The unique requirement to maintain existing local systems and tailor adaptations specifically for CHARM-EU adds layers of complexity. Challenges with **national regulations**, **institutional autonomy**, and the **technological diversity** among partner institutions make it impractical to adopt a single, standardized scenario. As a result, pursuing models such as a "Best of Breed", which could introduce regulatory challenges, or a "One University" solution, which might foster unhealthy hierarchies, are both **not feasible long-term solutions**.

Instead, the **optimal path forward** is to tailor the approach to align with the specific needs of CHARM's capabilities and milestones, both in the near and distant future. By conducting the FIT-GAP analysis and applying pace layering, we have pinpointed key areas, identified barriers affecting IT decision-making, and outlined actionable solutions. These findings support the adoption of a **hybrid architecture scenario**, purpose-built to achieve the alliance's goals. This leaves room for compliance and adherence to all relevant rules and regulations, including local and national ones, while prioritizing a user-friendly experience for students and staff.

Based on these points of reference, we come to the following recommendation:

1. **Adopt a "Hybrid" Architecture Scenario**, that balances a strife for interoperability with the unique requirements of each partner institution, whenever a decision that relates to the IT systems needs to be taken.
2. **Focus on Goal-Oriented Solutions** that prioritize the needs of students and staff while meeting all GDPR and regulatory requirements. Next to that, ensure that solutions are adaptable to CHARM-EU's evolving capabilities and milestones.
3. **Align IT Development with Strategic Goals** and use fit-gap and pace layering to align IT investments with CHARM-EU's priorities, focusing on innovation where needed while maintaining stability for core functions.
4. **Foster a cohesive alliance while respecting institutional autonomy**, by developing systems that ensure seamless access and participation for students and staff across all partner institutions.

As practical help to support us in future decision making, we developed a draft checklist. This lists a number of considerations to take into account. We will discuss and review this checklist further in the coming months. In due time, we can finetune this checklist, if we find that more aspects need to be considered.

GUIDELINES/CHECKLIST WHENEVER DECISIONS ON IT TOOLS AND PLATFORMS NEED TO BE TAKEN	CHECK
1. **Does the intended solution fit the general vision and principles of CHARM? (for example DEI principles)**	☑
2. **Does the intended solution fit into our local IT ecosystem and does it meet local and national regulatory requirements? (for example GDPR)**	☑
3. **Does the intended solution contribute to a seamless user journey (Student/Teacher/Staff)?**	☑
4. **Does it contribute to a higher degree of interoperability between local systems? (including the use of open standards)**	☑
5. **Is the intended solution durable, future proof and scalable?**	☑
6. **Does it offer ease of maintenance and a low level of complexity?**	☑
7. **Does it enable digital sovereignty (e.g. preventing vendor lock-in and have strict requirements for data portability in the procurement process.)**	☑

Table 4: Checklist for decisions on IT tools and platforms

The ultimate goal is to establish a collaborative alliance based on a unified and flexible architecture that ensures seamless access, compliance and participation for all partner universities. This will enable CHARM-EU to deliver on its mission of innovation and educational excellence.

The insights and recommendations outlined above will be presented to the Executive Board and the CHARM IT Steering Board by the end of 2024 for their review and consideration.

ANNEX I: HIGHER EDUCATION BUSINESS CAPABILITY MODEL, ORIGINAL VERSION

HIGHER EDUCATION BUSINESS CAPABILITY MODEL

CAUDIT

EDUCAUSE

ucisa

DESCRIPTION

The Higher Education Business Capability Model describes a standard set of Business Architecture elements relevant to Higher Education. It can be used as a reference for Business Stakeholders, Enterprise Architects, and Technology Strategists to engage in discussion regarding business effectiveness, needs, and challenges. Standing alongside the accompanying Business Model Canvas, the Business Capability Model elaborates the core value chains for higher education and their underlying business capabilities.

UNDERSTANDING BUSINESS CAPABILITIES

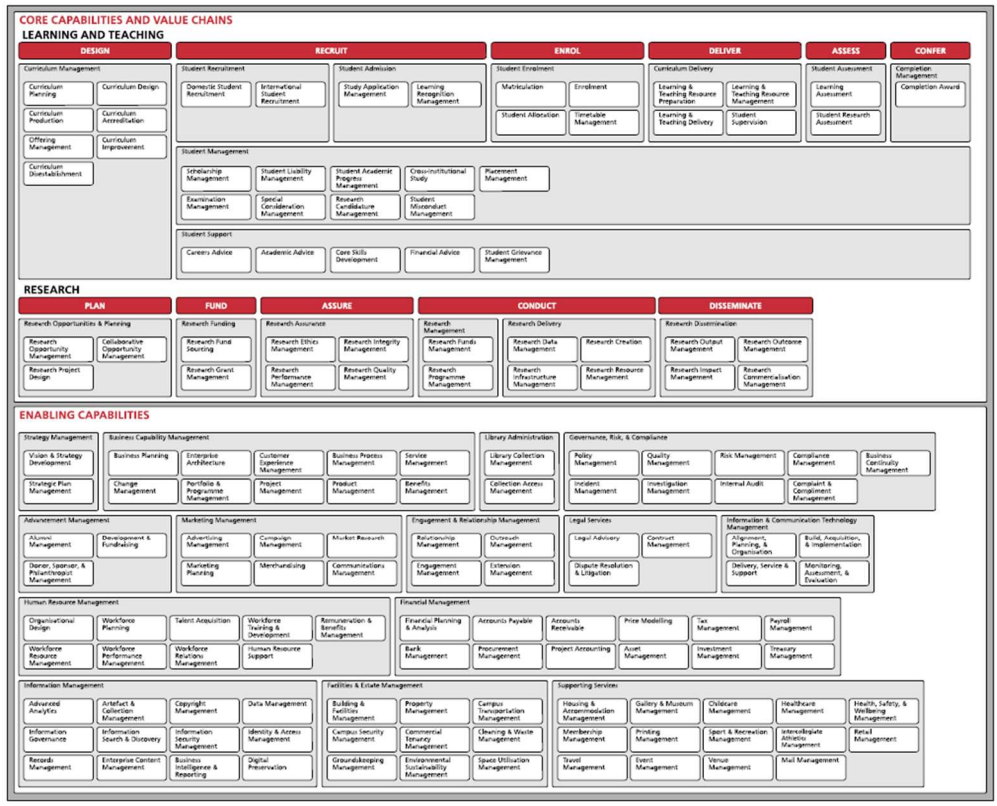
A capability model supports the development of strategies by viewing the business as a collection of capabilities that can be adjusted in response to the demands of the business environment. This models WHAT the organisation is capable of doing. It presents the business capabilities within the wider business context of WHO it serves, relies on, and answers to, extending beyond organisational boundaries. A Business Capability is a particular logical combination of People, Process, Information, and Technology necessary to deliver a discrete required outcome to achieve a specific business objective. The capabilities support the realisation of an institution's strategies.

USAGE

The Business Capability Model serves as an anchor for assessing perspectives such as strategic importance, maturity, business operational pain points, capital investment, and organisational structure. It presents a view of the organisation with traceability from business objectives through to the information, technology, and other resources required to support them.

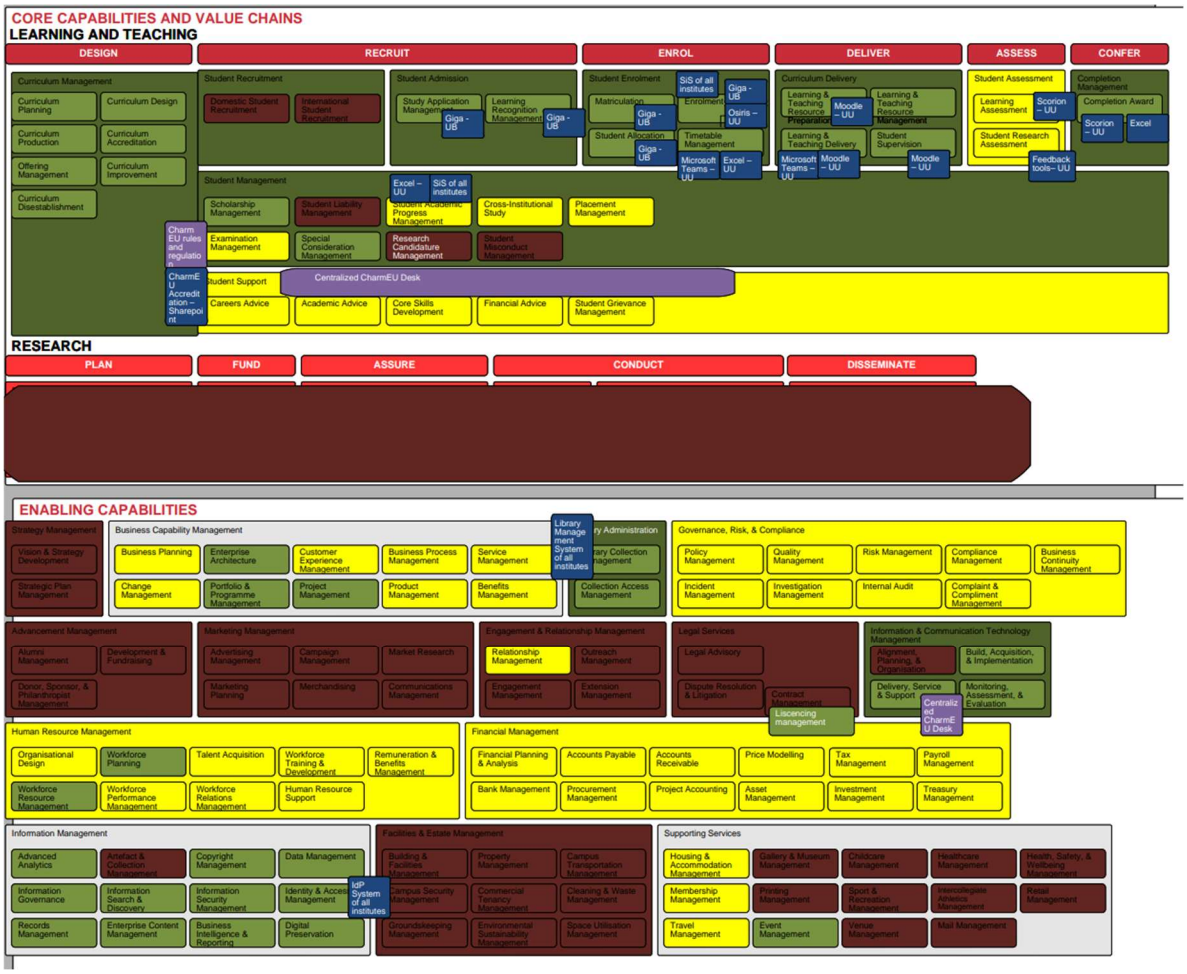
MAJOR CONCEPTS

Typically an ORGANISATIONAL STRUCTURE would be included to provide context for the scope of the model.
VALUE CHAINS capture how the institution generates value through Learning & Teaching and Research.
CORE CAPABILITIES that directly support the Value Chains are organised under the relevant Value Chain Segment.
ENABLING CAPABILITIES support the core capabilities across the value chains and keep the institution running.



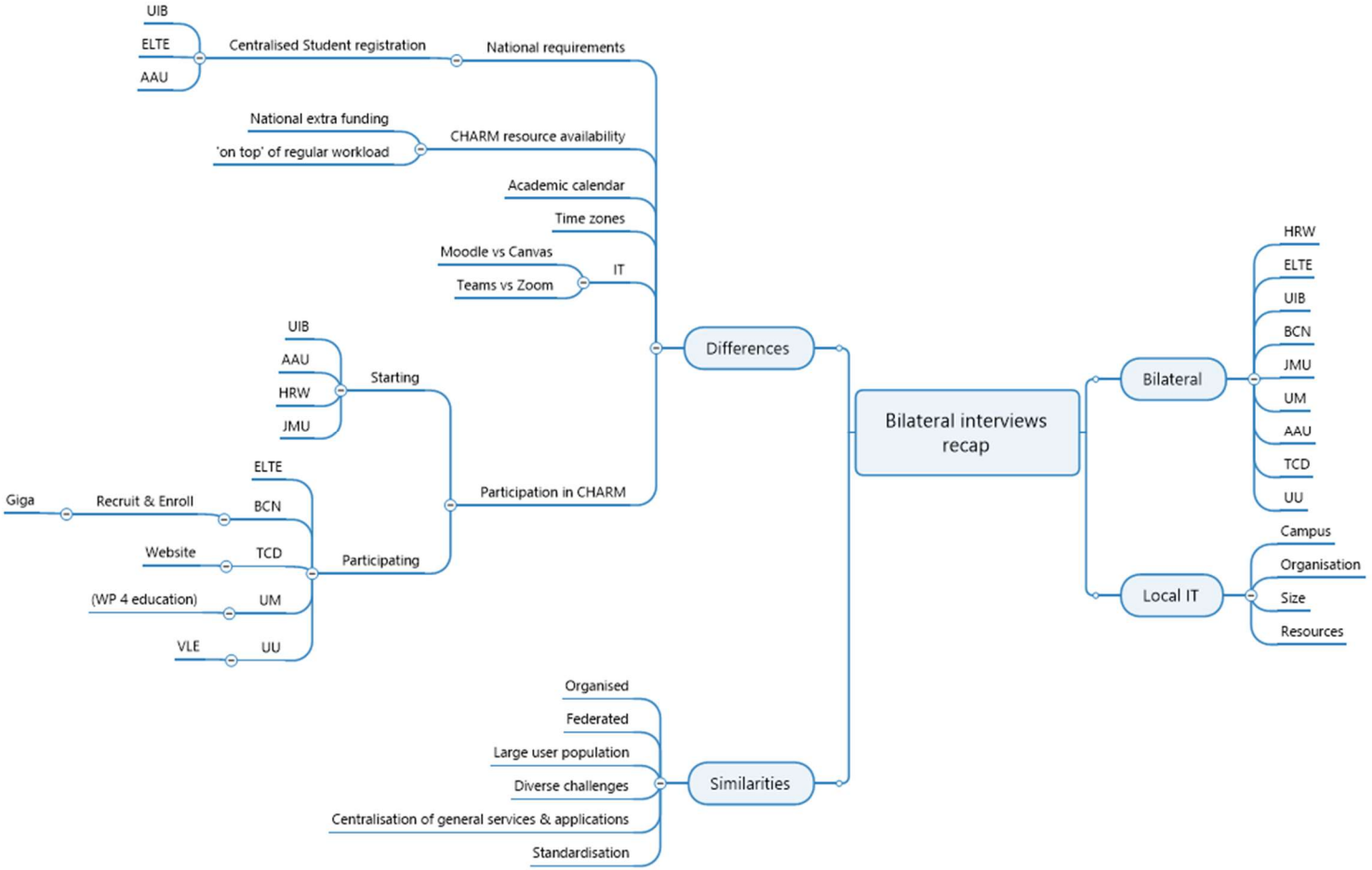
Version 2.6.1, © 2022 CAUDIT; The Higher Education Reference Model is maintained by the CAUDIT Enterprise Architecture Community of Practice. The model is offered under the Creative Commons 4.0 CC BY-NC-SA license, and may be used freely by educational institutions but may not be bundled, sublicensed, or used for commercial purpose. Extensions to the reference model must be shared with CAUDIT to enable ongoing evolution and to maximise benefit to the wider community. Elements of this model have alignment with the APQC open standard. CAUDIT acknowledges warmly the generous contribution of FromHereOn Pty Ltd to the Higher Education Reference Model. Please visit https://caudit.edu.au/ for more information.

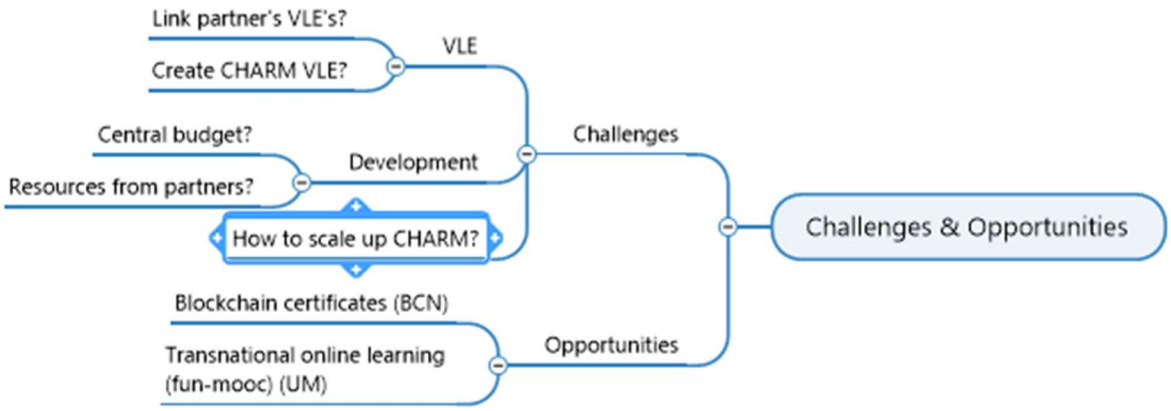
ANNEX II: HIGHER EDUCATION BUSINESS CAPABILITY MODEL, ADAPTED FOR CHARM

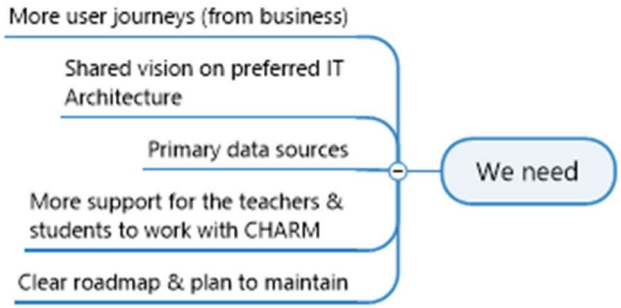


A first rough identification of the systems used across partner institutions (-> dark blue boxes in illustration 1)
- A shared understanding of capabilities that are in scope from an IT architecture perspective (-> green boxes in illustration 1)
- A shared understanding of areas that are outside of scope from an IT architecture perspective, such as support to Research (-> Dark red boxes in illustration 1)
- An identification of capabilities that are currently not in scope, but could potentially come into scope and will need recurring attention (-> yellow boxes in illustration 1)
- Centralized CHARM-EU desk mapped on capabilities (-> purple boxes in illustration 1)

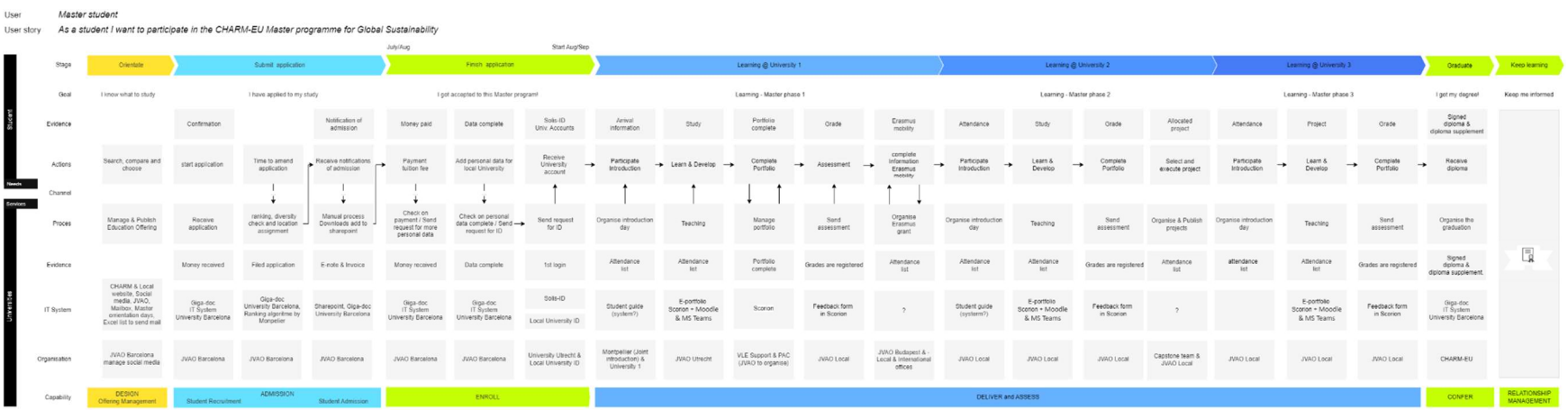
ANNEX III: CONCLUSIONS BILATERAL INTERVIEWS




Challenges & Opportunities
Challenges
VLE
Link partner's VLE's?
Create CHARM VLE?
Development
Central budget?
Resources from partners?
How to scale up CHARM?
Opportunities
Blockchain certificates (BCN)
Transnational online learning (fun-mooc) (UM)


We need
More user journeys (from business)
Shared vision on preferred IT Architecture
Primary data sources
More support for the teachers & students to work with CHARM
Clear roadmap & plan to maintain

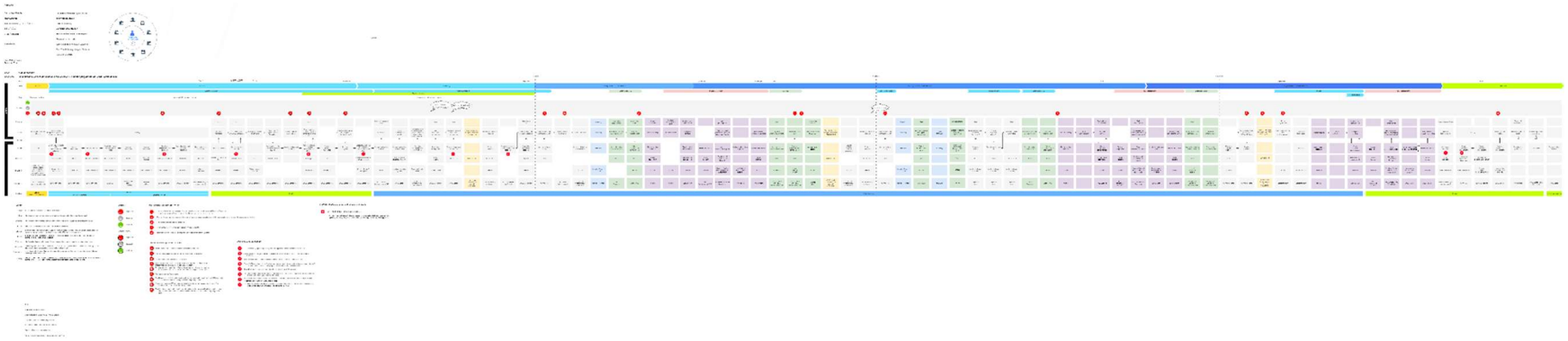
ANNEX IV: CHARM MASTER STUDENT JOURNEY MAP



Caption

Stage	a point, period, or step in a process or development
Goal	the object of a person's, or a group of persons', ambition or effort; the aim or desired result
Evidence	the factual and documented piece of information used as proof to support a certain reached status
Actions	the act of doing something, carrying out a certain aimed activity
Channel	a system, method or medium that is used for communicating between people, like emails, phone calls, text messages, portals, systems, social media or even face2face physical attendance
Proces	a series of activities necessary to transform inputs into a desired outcome, carried out by people and technology on a specific physical location
Evidence	the factual and documented piece of information used as proof to support a certain reached status.
IT System	software system that performs specific functions in support of specific business processes; it usually consists of a user interface, business logic and a database of some sort
Organisation	a certain organized group of people, often part of a larger organization, working together toward delivering specific predefined outcomes
Capability	the ability of an organization to achieve a specific outcome; it is the combination of the people, processes and technology necessary to perform the necessary tasks for reaching the desired outcome

Detailed CHARM-EU Master Student journey



It is recommended to consult this figure on the website of CHARM, where you will be able to zoom in:

https://charm-eu.eu/studentjourneymap

ANNEX V: IT ARCHITECTURE SCENARIOS

Scenario	Innovative capability	University lock-in	Agility	Complexity	Cost	Time to result	Vendor lock-in	Cost/effort of operations
	+ means better	+ means less lock-in	+ means more agile	+ means simpler	+ means cheaper	+ means shorter	+ means less lock-in	+ means less cost/effort
One University	0	-/-	-	++	+	++	-/-	0
Best of breed	++	++	++	-/-	-	+	++	++
Limited / pragmatic (current)	+	-	0	0	++	++	+	-/-
Everyone participates	0	-	-	-/-	-/-	-/-	0	-

1. One University	Give all partners access to the one University IT landscape or accept manual effort
2. Best of breed	Design and implement environment suitable for microservices; design and implement (federated) access
3.Limited/pragmatic (current)	Give all partners access to the two Universities' IT landscape or accept manual effort
4. Everyone participates	Design and implement federated access across all partners and accept manual effort, otherwise force best of breed

Scenario 1. "One university"

Innovative capability	Depends on innovative capability of the selected university
University lock-in	High threshold to switch University/IT landscape
Agility	University likely has differences in priorities compared to CHARM
Complexity	Only applies for the architecture, since it is already in place. Can still mean a lot of manual work, does not mean easy for all partners
Cost	Could be cheaper than current scenario
Time to result	Immediate, since it is already in place. Usage and configuration can still mean a lot of work
Vendor lock-in	High threshold to switch
Cost / effort of operations	Lottery, depends on universities' landscapes and how this is operated
Likelihood of alignment	Lottery, depends on universities' landscapes and how this is operated

Scenario 2. "Best of breed"

Innovative capability	Depends on innovative capability of the selected university
University lock-in	High threshold to switch University/IT landscape
Agility	University likely has differences in priorities compared to CHARM
Complexity	Only applies for the architecture, since it is already in place. Can still mean a lot of manual work, does not mean easy for all partners
Cost	Could be cheaper than current scenario
Time to result	Immediate, since it is already in place. Usage and configuration can still mean a lot of work
Vendor lock-in	High threshold to switch
Cost / effort of operations	Lottery, depends on universities' landscapes and how this is operated
Likelihood of alignment	Lottery, depends on universities' landscapes and how this is operated

Scenario 3. "Limited / pragmatic"

Innovative capability	Depends on innovative capability of the selected university
University lock-in	High threshold to switch University/IT landscape
Agility	University likely has differences in priorities compared to CHARM
Complexity	This only applies to the architecture, since it is already in place. Can still mean a lot of manual work, does not mean easy for all partners
Cost	Could be cheaper than current scenario
Time to result	Immediate, since it is already in place. Usage and configuration can still mean a lot of work
Vendor lock-in	High threshold to switch
Cost / effort of operations	Lottery, depends on universities' landscapes and how this is operated
Likelihood of alignment	Lottery, depends on universities' landscapes and how this is operated

Scenario 4. "Everyone participates"

Innovative capability	Lottery, depends on universities' landscapes and where innovation is desired
University lock-in	Complex environment for switching University / IT services, because of forced distribution of IT services
Agility	Complex environment for switching University / IT services, because of forced distribution of IT services
Complexity	Very complex environment, limited by the partner with least advanced IT landscape
Cost	Most expensive since all partners have to change their current IT landscape
Time to result	Most work, since all partners have to change their current IT landscape
Vendor lock-in	Lottery, depends on universities' landscapes and which application is changed
Cost / effort of operations	Complex environment with many dependencies will require work from all partners
Likelihood of alignment	Lottery, depends on universities' landscapes and which application is changed

ANNEX VI: REACTION OF IT STEERING BOARD TO IT ARCHITECTURE SCENARIOS

CHARM IT Architecture – Strategic scenario selection

Aggregated answers from members of IT Steering Board

The members of the IT Steering Board were provided with the analysis which we made of the 4 IT-Architecture scenarios. This was discussed in a meeting, and subsequently we gave them the opportunity to report their individual considerations and preferences to us through a written survey that we provided. The results of this survey can be found below.

1. Do you agree with the choice of criteria which we applied to the 4 scenarios?

AAU	**yes**
ELTE	[No response]
HRW	yes
JMU	yes
TCD	yes
UB	yes
UiB	Given the amount of partners in the alliance, and the spectre of different IT-solutions in use, we would also think that interoperability would be a relevant criteria.
UM	I agree with the choice of criteria applied to the four scenarios. I would suggest adding the sustainability of the solution as an explicit criterion, if it's not already implicitly covered by the existing criteria. Sustainability in this context should address the long-term viability and maintainability of the IT solutions, ensuring that they remain effective, secure, and cost-efficient over time, without requiring frequent, significant overhauls.
UU	IMHO: The criterion "University Lock-in" is the same as the first scenario and should therefore be ignored. Out of the 9 criteria; only 3 are really decisive: 1. Complexity (of IT infrastructure) 2. Feasibility (time, cost, effort) 3. Alignment (in-between alliance)

2. **Do you agree with our assessment of the 4 individual scenarios according to the respective criteria?**

AAU	yes
ELTE	[No response]
HRW	mostly
JMU	no
TCD	Perhaps too optimistic on Best of Breed / Agility and complexity. Slide 2 talks to Best of breed involving a nice integrated solution. Slides 5 and 7 centre on microservices. While ideal, existing legacy solutions may not be suitable to operate as loosely coupled systems for microservices.
UB	yes
UiB	In our experience, stability is also something that is relevant and could be considered
UM	Of course
UU	Scenario 1. We should not allow a University lock-in (from either side) Scenario 2. "Best of Breed" does not fit with the other scenarios of 1, 2 or 9 participating members. It's more a principal versus "Best of Suite" or "OpenSource". Scenario 3. If in accordance with the other members; the least complex and most feasible scenario. And by doing so; you automatically apply the "Best of Breed" principal out of what is available (or any other principal for that matter). Scenario 4. Unnecessarily complex

3. **What should be our main consideration when making the choice between the scenarios?**

AAU	**Agility, flexibility and easy maintenance & cost structure**
ELTE	[No response]
HRW	Complexity and Time to result
JMU	Reduced Management / Communication Overhead, clear responsibilities, best chances for successful implementation

TCD	Cost, Complexity and Risk. The choices as set out are – 1 University, 2 Universities, 9 Universities or something between 3 and 8 universities. Need to consider the implementation, operational, integration and support effort and risk for each additional university participating in the best of breed so can say when enough is enough for number of participating universities. Also risk (lock in or support) is reduced if 2 or more universities offer the same solutions and this should be factored in the decision about what is best of breed.
UB	Cost, both economic&HR
UiB	To reduce complexity should be a main concern
UM	In my perspective the main consideration should center on aligning the IT infrastructure with the universities long-term strategic goals. Furthermore, here are some aspects that should be considered: - Scalability: ensuring that the IT infrastructure can grow and adapt with every universities. - Security and compliance: adhering to the highest standards of data protection and regulatory compliance. - Total cost of ownership: Looking beyond initial costs to understand the long-term financial impact. - Technological ecosystem: Ensuring compatibility and integration with existing and potential future technologies especially about authentication. - User experience: providing an intuitive and seamless interaction for all stakeholders, including students, faculty, and staff.
UU	See: question 1

4. **Do you agree with our intended advice of choosing the "best of breed" of these 4 scenarios? Do you see any other relevant scenarios?**

AAU	**yes**
ELTE	[No response]
HRW	Considering "complexity" and "time to result", I do not agree. I'd advise for scenario 1 or 3.

JMU	No. I think that one university should provide the services and should be equipped with the relevant IT-Resources.
TCD	Agree. But additional selection criteria are needed for the partners solutions to be in 'best of breed' review, such as the technical and operational support capability, product roadmap and stage in the solution lifecycle.
UB	We need to take into account criteria such as cost, technical effort, agreement on decisions, etc. Scenario 1 might be more feasible from this point of view. Furthermore, we will probably move towards scenario 1 if Charm becomes a legal entity. Meanwhile, scenario 3 seems the most suitable.
UiB	Best of breed seems like a good scenario as long as the partner institutions can agree on dividing the different tasks between us and there is a clear agreement in who is doing what.
UM	Yes, the 'best of breed' choice seems to be the most appropriate.
UU	Without a reliable prospect of several thousand students every year; feasibility is the main criterion for the coming years (scenario 3).

5. **What is your preferred scenario?**

	Scenario 1 **One university**	**Scenario 2** **Best of breed**	**Scenario 3** **Pragmatic**	**Scenario 4** **Everyone contributes**
AAU		x		
ELTE				
HRW	x		x	
JMU	x			
TCD		x		
UB	x		x	
UiB		x		

UM		x		
UU			x	

6. **Are there any policies (national, institutional) or other considerations that would present a blocking issue to the "best of breed" scenario?**

AAU	**Not for the existing solutions. Whenever new systems are taken into use a risk assessment needs to be done, but I don't see any legal problems.**
ELTE	[No response]
HRW	no
JMU	Not that I am aware of.
TCD	Need to be aware that some universities may have a plan – or be forced to go to market because of national procurement regulations – that results in the chosen 'best of breed' solution being retired / replaced in the hosting university.
UB	Legal issues: admissions, data protection, ENS ("Esquema nacional de seguridad").
UiB	We have national regulations concerning admission to studies. Furthermore, there is a so-called export control for students from certain countries (outside the EU). Also, for students to physically access campus, they need to have an IT-account from UiB.
UM	There are indeed significant considerations to account for, which stem from ongoing strategic developments both at the university and national levels. Our university is in the process of adopting a new digital master plan for the next four years. Ensuring compatibility with the strategic initiatives and guidelines outlined in this master plan is imperative. At the national level, the COREALE project (Digital Committee for Student Success and Institutional Agility) presents another layer of policy that must be considered. As this project embodies a significant digital component and is leading towards a "best of breed" scenario at a collective level of

	French universities, it is essential that our scenario selection does not contravene the directions or decisions made at this higher level.
UU	An effective Identity and Access management solution or CHARM should first become a legal entity to overcome this obstacle.

ANNEX VII: DISCUSSION ABOUT IT ARCHITECTURE DURING CHARM SPRINT MEETING, NOV 2024

This divergence in perspective between the different stakeholders highlighted the need for a deeper conversation about relative priorities. We took the opportunity to devote a part of the plenary session with approximately 80 participants during the CHARM-EU sprint meeting in Budapest in November 2024 to the discussion of this topic. The goal was to increase awareness of the varying approaches and priorities that influence the development of a unified IT architecture, and how these differences play out in day-to-day IT tasks and decision-making processes. As well as provide extra context for the IT Steering Board and Executive Board moving forward.

During the plenary session, participants were asked to rank the key priorities for CHARM-EU's IT services. The options presented included:

- Innovation: Pushing boundaries with new technologies.
- User-friendliness: Focus on ease of use, especially for students and staff, with a focus on variety, fairness, and inclusion.
- Benefits for local universities: Ensuring each institution derives value from the solutions.
- Security and compliance: Guaranteeing systems are secure and meet regulatory requirements.
- Low cost: Prioritizing affordable solutions that are sustainable in the long term.
- Equitable sharing of work across the alliance: Distributing responsibilities fairly among all partner institutions.

The feedback from this session revealed the following priorities:

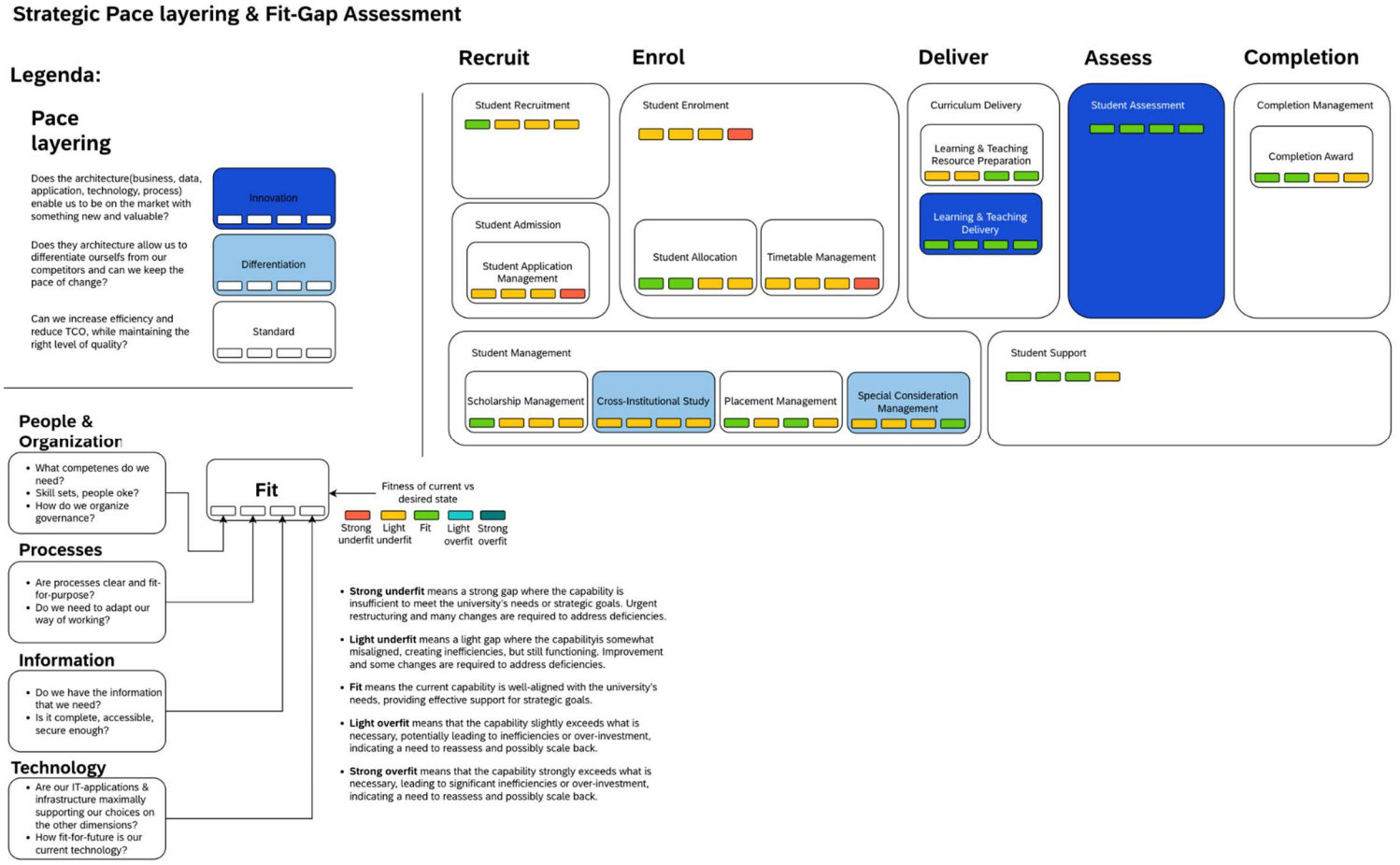
1. User-friendliness:
    a. IT systems should be intuitive and accessible, particularly for student and staff interactions.
    b. Systems must be inclusive and responsive to diverse needs.

2. Innovation:
    a. Strong desire for technological solutions that align with CHARM-EU's educational principles and vision.

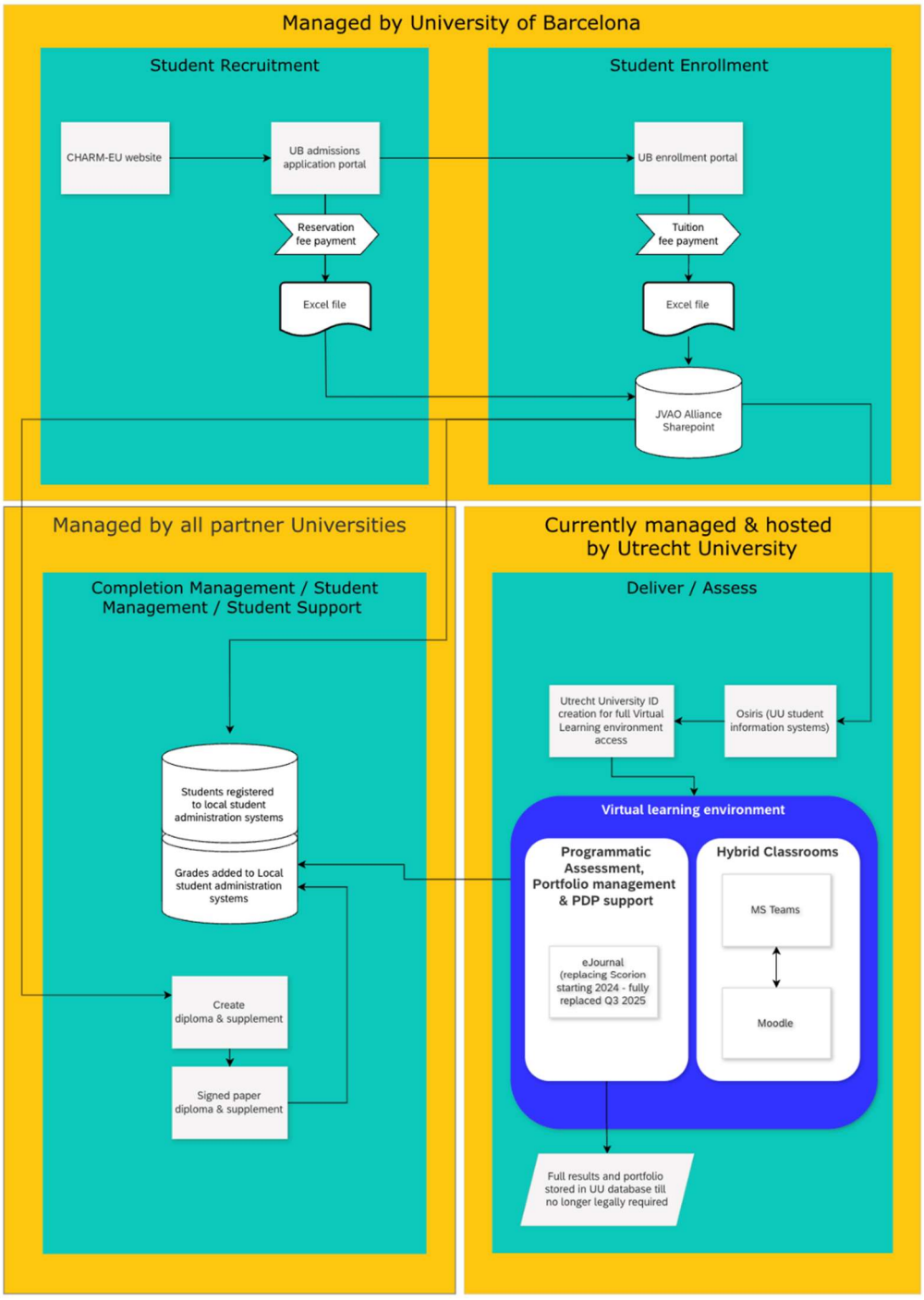
3. Security and compliance:
    a. Emphasis on safe, reliable, and compliant systems to protect sensitive data.
    b. Ensuring long-term viability through adherence to security and regulatory standards.

While these three priorities were identified as the most important, it's vital to note that all the principles presented were highly valued by participants. This shows that there is broad recognition of the importance of each principle in contributing to the success of CHARM-EU's IT solutions. Based on these insights, it became clear that more attention should be given to ensuring that solutions are user-friendly and accessible. This may require a shift away from more experimental or complex technological solutions that may not be as streamlined or intuitive. Moving forward, this balanced approach will be crucial in guiding decisions on IT development, making sure that all future initiatives align with the core values and long-term priorities of CHARM-EU.

ANNEX VIII: FIT-GAP DASHBOARD WITH RESULTS OF CHARM IT ARCHITECTURE SURVEY



ANNEX IX: HIGH LEVEL FLOW OF CURRENT IT ARCHITECTURE



ANNEX X: ANALYSIS RESPONSE FIT-GAP ANALYSIS

The FIT-GAP analysis was conducted in the month of October 2024. A total of 20 CHARM-EU **staff members from key positions** were asked to contribute to our survey in which they could rate and comment on our current IT set-up. It was a combination of a **quantitative** and **qualitative** approach; a key element of the survey was the textual explanation through which the respondents detailed the reasons for their answers in the quantitative part. These detailed answers and quotes are not included here in this document, for reasons of conciseness, but these will be reported and reviewed in-depth within the project itself.

Each respondent selected the exact **categories that matched their specific area of expertise**, which explains why the categories have different amounts of respondents. In this way, we ensured that only key staff with **well-founded knowledge** of the respective categories made their contribution.

Area	Average Rating	N=
Student Recruitment		
Student Recruitment - Organization	2.7	9
Student Recruitment - Processes	2.11	9
Student Recruitment - Information	2	9
Student Recruitment - Technology	2.1	9
Student Admission		
Student Admission - Organization	2.2	10
Student Admission - Processes	1.8	10
Student Admission - Information	2.1	10
Student Admission - Technology	1.4	10

Student Enrolment		
Student Enrollment - Organization	2.3	13
Student Enrollment - Processes	1.8	13
Student Enrollment - Information	2.3	13
Student Enrollment - Technology	1.5	13
Student Allocation		
Student Allocation - Organization	3.1	13
Student Allocation - Processes	2.5	13
Student Allocation - Information	2.4	13
Student Allocation - Technology	2.4	13
Timetable Management		
Timetable Management - Organization	2.1	10
Timetable Management - Processes	1.7	10
Timetable Management - Information	2	10
Timetable Management - Technology	1.4	10
Learning & Teaching Resource Preparation		

Learning & Teaching Resource Preparation - Organization	2.4	13
Learning & Teaching Resource Preparation - Processes	2.2	13
Learning & Teaching Resource Preparation - Information	2.6	13
Learning & Teaching Resource Preparation - Technology	2.7	13
Learning & Teaching Delivery		
Learning & Teaching Delivery - Organization	3.1	12
Learning & Teaching Delivery - Processes	2.9	12
Learning & Teaching Delivery - Information	2.6	12
Learning & Teaching Delivery - Technology	2.6	12
Student Assessment		
Student Assessment - Organization	2.9	13
Student Assessment - Processes	2.8	13
Student Assessment - Information	2.8	13
Student Assessment - Technology	3	13
Student Management		
Student Management - Organization	2.4	14
Student Management - Processes	2.5	14

Student Management - Information	2.3	14
Student Management - Technology	1.8	14
Student Completion Award		
Student Completion Award - Organization	2.6	14
Student Completion Award - Processes	2.6	14
Student Completion Award - Information	2.2	14
Student Completion Award - Technology	1.8	14
Scholarship Management		
Scholarship Management - Organization	2.7	11
Scholarship Management - Processes	2.3	11
Scholarship Management - Information	2.2	11
Scholarship Management - Technology	2.2	11
Cross Institutional Study Management		
Cross Institutional Study Management - Organization	2.1	10
Cross Institutional Study Management - Processes	2.2	10
Cross Institutional Study Management - Information	2.3	10
Cross Institutional Study Management - Technology	2.4	10

Placement Management		
Placement Management - Organization	2.5	10
Placement Management - Processes	2.3	10
Placement Management - Information	2.5	10
Placement Management - Technology	1.7	10
Special Consideration Management		
Special Consideration Management - Organization	2.4	17
Special Consideration Management - Processes	2.2	17
Special Consideration Management - Information	2.3	17
Special Consideration Management - Technology	2.6	17
Student Support		
Student Support - Organization	2.9	17
Student Support - Processes	2.7	17
Student Support - Information	2.8	17
Student Support - Technology	2	17