LCAMP

Learner Centric Advanced Manufacturing Platform

PLATFORM ROADMAP

Deliverable 8.1, Work package 8

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LCAMP partners:
TKNIKA – Basque VET Applied Research Centre, CIFP MIGUEL ALTUNA Centro Integral de Formación Profesional; DHBW Heilbronn – Duale Hochschule, Baden-Württemberg, Curt Nicolin High School, Da Vinci College, AFM – Spanish Association of Machine Tool Industries, EARLALL – European Association of Regional & Local Authorities for Lifelong Learning, FORCAM, CMQE: Association campus des métiers et des qualifications industrie du future, MV: Mecanic Vallée, KIC: Knowledge Innovation Center, MADE Competence Center Industria 4.0; AFIL: Associazione Fabbrica Intelligente Lombardia, SIMUMATIK AB; Association HVC Association of Slovene Higher Vocational Colleges; TSCMB:Tehniški šolski center Maribor, KPDoNE: Kocaeli Directorate Of National Education: GEBKİM OIZ and CAMOSUN college.

Project name	Learner Centric Advanced Manufacturing Platform for CoVEs
Acronym	LCAMP
Start date	15/06/2022
End date	15/06/2026
Budget, maximum grant amount	3,999,988.00 €
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Partners	P1: TKNIKA and MIGUEL ALTUNA, DEPARTMENT OF EDUCATION, BASQUE GOVERNMENT P3: AFM P4: DHBW P5: FORCAM P6: CMQ P7: MECANIC VALLEE P8: DA VINCI COLLEGE P9: KIC P10: MADE P11: AFIL P12: EARLALL P13: KPDoNE P15: GEBKIM OIZ P16: CNG P17: SIMUMATIK P18: TSCMB P19: SKUPNOST VSŠ P20: CAMOSUN COLLEGE
Project summary	The fifth industrial revolution is built upon the technologies of the fourth, with an increased emphasis on a human-centric, sustainable and resilient industrial base, emphasising the digital and green transitions. A key pillar of this economic transformation is the role played by Advanced Manufacturing systems such as Robotics, 3D & 4D printing, artificial intelligence and high-performance computing. I5.0, requires VET to develop 'learning centric approaches' that focus on the holistic competences of humans that plan, manage, oversee or operate technologies. LCAMP will tackle this by incorporating a permanent European Platform of Vocational Excellence for Advanced Manufacturing, seeded from a consortium of 20 partners and over 50 associate organisations including leading VET/HVET centres, companies, regional government, R&D centres, associations of companies and clusters. By collaborating across borders, LCAMP's goal is to support and empower regional AM CoVEs to become more resilient, innovative, and better equipped to train, upskill, and reskill young and adult students to successfully face the digital and green transitions. We will help regions grow and be more competitive through their VET systems. The Alliance is service-oriented, planning to establish permanent structures for:

	• Teaching & Learning: establishing AM skills frameworks and curricula; launching or revising AM programmes (including micro-credentials); creating or capacity building learning factories (special AM labs, jointly run by VET and industry) • Cooperation and Partnerships: launching a skills & jobs observatory for advanced manufacturing; accelerating industry/VET/region cooperation ideas via an open innovation community and providing consultancy to SMEs on integrating SME/VET connections. • Governance & Funding: creating a one-stop-shop portal for all our services; ensuring a business case for continuing services to stakeholders in the long-term, while enhancing participation
Work Packages	WP01: Project management and coordination. WP02: Learner Centric Advanced Manufacturing CoVEs Alliance. WP03: Observatory. WP04: Open Innovation Community. WP05: Human-Centric Learning for Advanced Manufacturing. WP06: Industry 4.0 technology absorption through the Collaborative Learning Factory. WP07: SME-VET connection. WP08: Advanced Manufacturing Excellence Discovery Platform. WP09: Dissemination. WP10: Roadmap for Continued Development Learner Centric Advanced Manufacturing CoVEs Alliance.

Glossary and acronyms

Acronyms

AI - Artificial Intelligence

AM - Advanced Manufacturing

Cedefop - European Centre for the Development of Vocational Training

CoVE - Centres of Vocational Excellence

EAfA European Alliance for Apprenticeships

EC European Commission

ECVET European Credit System for Vocational Education and Training

EntreComp The Entrepreneurship Competence Framework

EQAVET European Quality Assurance in Vocational Education and Training

EQF European Qualifications Framework

ESCO European Skills, Competences and Occupations

ETF European Training Foundation

EU European Union

HE Higher Education

HVET Higher Vocational Education and Training

I4.0 Industry 4.0

KET Key Enabling Technology

OECD Organisation for Economic Cooperation and Development

SWOT Strengths, Weaknesses, Opportunities, Threats

TVET Technical and Vocational Education and Training

VET Vocational Education and Training

WBL Work Based Learning

Content table

1 EXECUTIVE SUMMARY

This is a working document, which is used to prepare the complete roadmap for the LCAMP platform. As such, it is subject to change, whenever necessary in order to prepare the best roadmap possible.

In its final form, this document will incorporate:

- a high level development roadmap, including prioritization of features,
- detailed sprint planning with technical requirements for all user journeys / stories and
- instructions for a bug tracking and resolution report system.

It will also include the content management strategy with definitions of:

- types of content to be uploaded to various parts of the platform,
- list of people and teams responsible for generating content, in which format and volumes the content shall be generated and according to which schedules,
- quality assurance / acceptance criteria for content and
- policies for localization and translation of content.

A good roadmap leads to a good product development process, which in turn leads to a good LCAMP platform. All of this however, depends on how the work package partners can cooperate to ensure the proper data required and the proper needs that need to be met with the LCAMP platform.

2 INTRODUCTION

The LCAMP Platform roadmap is a reflection of the user journeys predicted. As such its structure follows the predicted use cases:

- Employers publishing job openings
- Educators publishing courses and
- Users looking for job openings

Our goal is to create easy to use and intuitive LCAMP tools and a stable and secure infrastructure for the platform. These will allow both the partners who are providing the data and the end users, who will ultimately ‘give life’ to the LCAMP platform, to populate the platform and ensure its real-world usability.

This document is also created so that the reader doesn’t need a computer science degree to understand it, as it contains a lot of explanations of terminology used.

The IT architecture is divided into two parts: the infrastructure and application layer, which are in turn segmented further with more detail.

Keep in mind that this document is a working document, directly connected to the development of the platform and as such, it is subject to change. In other words: we are developing a big IT platform and if during this process, which is still in the initial stages, we find that we need to change some things to better serve the platform, we reserve the right to do so in the interest of the LCAMP project.

3 INFRASTRUCTURE

3.1website infrastructure basics

The most basic representation of a website infrastructure is split into the infrastructure and application layer.

Infrastructure layer:

The infrastructure layer consists of the physical and virtual components used to host and run a web application. Examples of infrastructure layers within famous websites include:

cloud providers (such as Amazon Web Services used by Netflix),

hosting services (such as GoDaddy used by Microsoft), and

application servers (such as Apache used by Facebook).

Application layer:

The application layer consists of the programs and components that are used to build a web application. A typical website includes the following application layers:

content management systems (CMS),

web frameworks, and

database systems.

Examples of application layers within famous websites include WordPress (used by The New York Times), Rails (used by Airbnb), and MySQL (used by Twitter).

If we break these down further, the layers comprising a website and its entire infrastructure are the following:

Web Server:

A web server is a system that stores, processes and delivers web pages to the users when they request them. Examples of web servers include Apache, Nginx, IIS, and Microsoft Azure.

Database:

A database is a collection of data that is organized and accessible to users. Examples of databases used for websites include MySQL, PostgreSQL, MongoDB, and Microsoft SQL Server.

Application Server:

An application server is a program that supports the execution of applications on the web. Examples of application servers include JBoss, Tomcat, and GlassFish.

User Interface:

The user interface is the graphical layer of the website that allows users to interact with the web application. Examples of user interfaces include HTML, CSS, JavaScript, and Flash.

Network Infrastructure:

The network infrastructure is the hardware and software that enables communication between the different components of the website. Examples of network infrastructure include routers, switches, firewalls, and load balancers.

Security:

Security is the measures taken to protect the website from malicious attacks. Examples of security measures include authentication, encryption, and firewalls.

3.1.1 How a website infrastructure is stacked:

Bottom to top:

1. Web Server - stores, delivers the webpage
2. Database - data used by the webpage and its users/visitors
3. Application Server - separate server that supports apps on the web.
4. User Interface - graphical layer of websites - what the users see and click on
5. Network Infrastructure - bundle of hardware and software connecting the whole stack
6. Security - various levels of access protected by passwords

For example,

WordPress is built on a web server such as Apache, with a database such as MySQL, and an application server such as JBoss. It is then served to the user through the user interface made with HTML, CSS, and JavaScript, and is secured by authentication and encryption.

Google is built on a web server such as Nginx, with a database such as PostgreSQL, and an application server such as Tomcat. It is then served to the user through the user interface made with HTML, CSS, and JavaScript, and is secured by authentication and firewalls.

3.1.2 CMS

A CMS (Content Management System) is a software application designed to create, manage and publish content for websites and web applications. LCAMP is using Wordpress, a popular open source content management system.

Wordpress is one of the best and most popular CMS solutions due to its ease of use, scalability and large number of plugins and themes. It has a wide range of features and plugins that make it easy to create and manage websites. Because of its versatility and reliability, it is very popular and can therefore be serviced by many developers. This significantly lowers the maintenance risk factors due to lack of qualified developers. More information can be found at *https://wordpress.org/*.

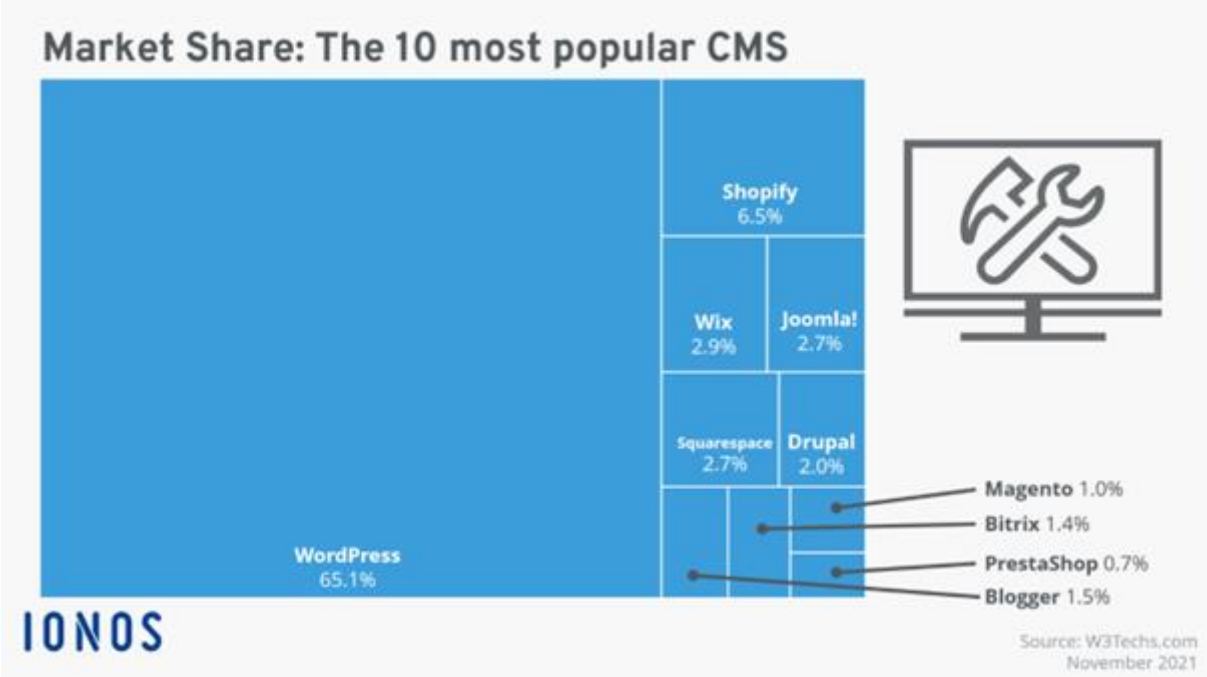

Figure 1 CMS market share, why Wordpress is a great choice

3.1.3 Development stages

Stages through which a typical web-based project goes through: Development --> Staging --> Production

Development: The development layer is the initial layer where all the content is created and tested prior to being released. This layer is typically used for content creation, testing, and debugging.

Staging: The staging layer is the middle layer in the lifecycle of a website. It is used to prepare content for publication and to ensure that it functions correctly. This layer often includes a copy of the website that is hosted on a staging server.

Production: The production layer is the final layer in the lifecycle of a website. This layer is used to host the live version of the website and is typically the version of the website that is publicly available.

3.2 LCAMP WEBSITE INFRASTRUCTURE

3.2.1 LCAMP INFRASTRUCTURE LAYER

At infrastructure level, we are using a scalable cloud instance deployed on the Google Cloud in Amsterdam. All management operations are done through the Siteground Control Panel. More information about the Google Cloud Platform can be found at *https://cloud.google.com/* and information about Siteground can be found at *https://www.siteground.com/*.

We are running a LAMP infrastructure (linux, apache, mysql, php). The servers are configured to auto-scale based on demand, meaning they will increase or decrease the resources available to the server in response to changes in traffic or usage. The LAMP infrastructure is a combination of open source software technologies that are frequently used in web development. It stands for Linux, Apache, MySQL, and PHP.

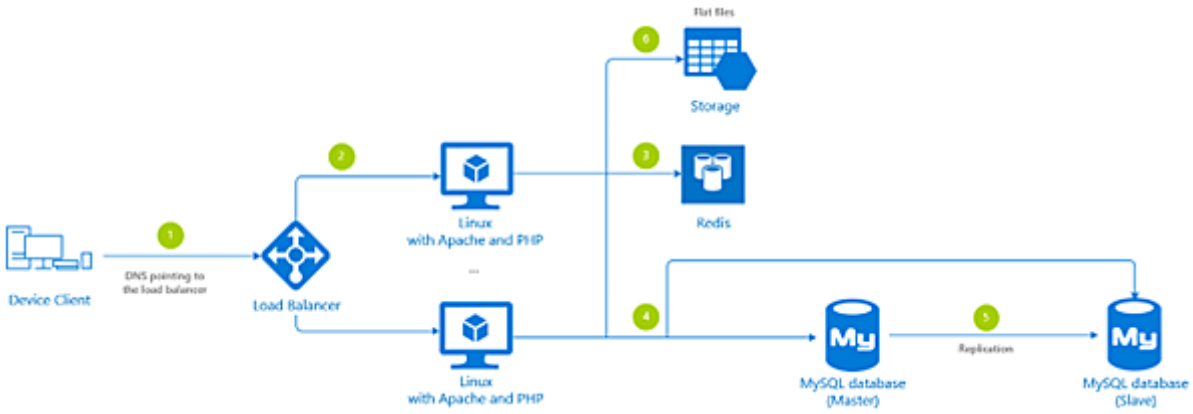

Figure 2 An example of a LAMP architecture

Linux is the operating system. It is a secure and reliable operating system that can be used to host a variety of applications.

Apache is the web server. It is a popular web server that is capable of serving static content as well as dynamic content.

MySQL is the database. It is a powerful database that is capable of handling complex queries.

PHP is the scripting language that is used to build dynamic web pages and applications.

LAMP is a good choice for web development because it is reliable, secure, and easy to use. It is also cost-effective, as all of the components are freely available. Some of the popular sites built on that type of infrastructure include Wikipedia, Amazon, Facebook and Google.

Additionally, we implement the Siteground content distribution network to enable delivering assets from edge servers around the world and have a security firewall enabled also via Siteground.

3.2.2 SCALABILITY

Scalability means being able to decrease or in most cases increase the scope and size of a project infrastructure OR data layer like being able to add a lot of new users or content etc. In

case of LCAMP that means adding new ADMA courses, skills, educators, students, job seekers;

When talking about scalability of cloud infrastructure, it is one of the main advantages of using cloud computing. With cloud-based solutions, businesses can easily scale up or down to meet their changing needs. This is done by adding or removing resources such as processing power or storage capacity. Cloud infrastructure can be scaled in both vertical and horizontal directions to accommodate increased demand. Vertical scaling involves adding resources such as more servers or storage, while horizontal scaling involves adding more nodes to the cloud system. The scalability of cloud infrastructure also allows businesses to easily adjust their computing resources as their needs change, enabling them to quickly respond to market changes or customer demands. Additionally, cloud-based solutions are cost-effective and efficient, offering businesses more flexibility and control over their IT budgets.

3.2.3 LCAMP APPLICATION LAYER

At application layer this is set up as a Wordpress multisite instance, with the ability to create subsites for each LCAMP sub-application. With the multisite feature, administrators can create a network of sites with shared users, content, and themes. For more information about Wordpress multisite, visit https://wordpress.org/support/article/wordpress-multisite/.

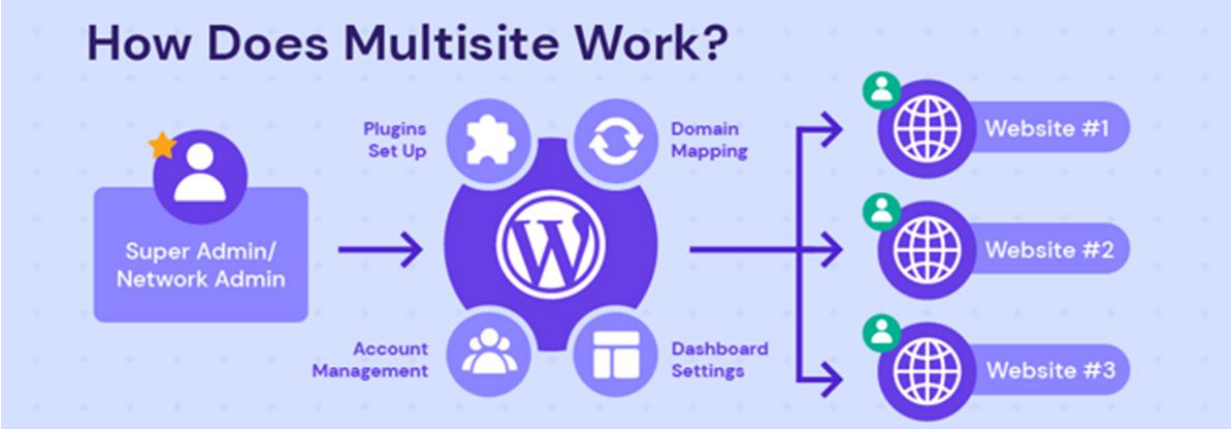

Figure 3 Example of a Multisite architecture

3.2.3.1 DAAS, IAAS

DAAS (Desktop as a Service) is a cloud-based service that allows users to access their desktop environment from any device with an Internet connection. It allows users to access their desktop applications, data, and settings from any location.

IAAS (Infrastructure as a Service) is a cloud computing model that allows websites to access and use computing resources such as storage, networks, and servers without having to

manage the underlying infrastructure. IAAS allows websites to scale their infrastructure and access resources on demand.

For applications which are deployed in the Cloud in Zoho data centres in Amsterdam, we are implementing a low-code solution via Zoho Creator. Additional information is available in the 'Components' section of this document.

One of the applications created using Zoho Creator aPaaS is the Course Tool. As described in User Journeys and Use cases chapters, it will allow Course organizers to add lists of courses or each course manually, in accordance with the EC standards.

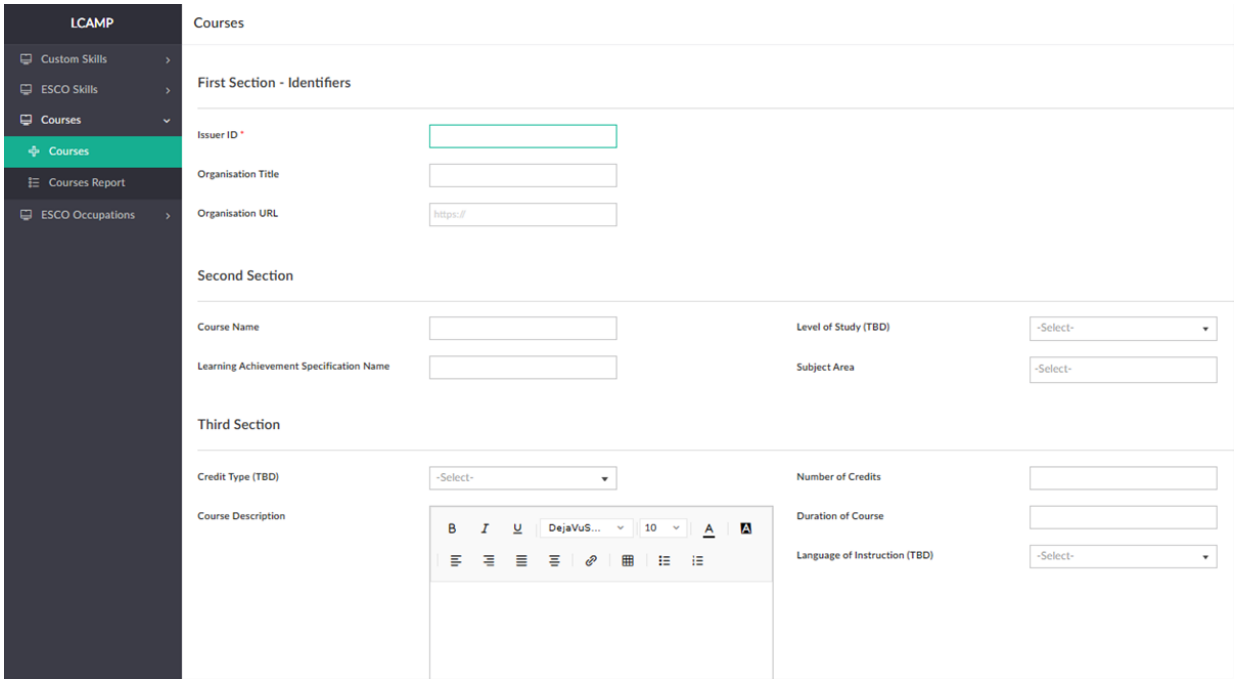

Figure 4 PrtScr from our Creator-based Courses app

3.2.3.2 STATISTICS

For statistics we implement a Matomo Analytics server, also running as an application on the same Siteground server described above. Matomo is an open-source analytics platform that provides website owners with detailed reports on visitor interactions. More information about Matomo Analytics can be found at *https://matomo.org/*.

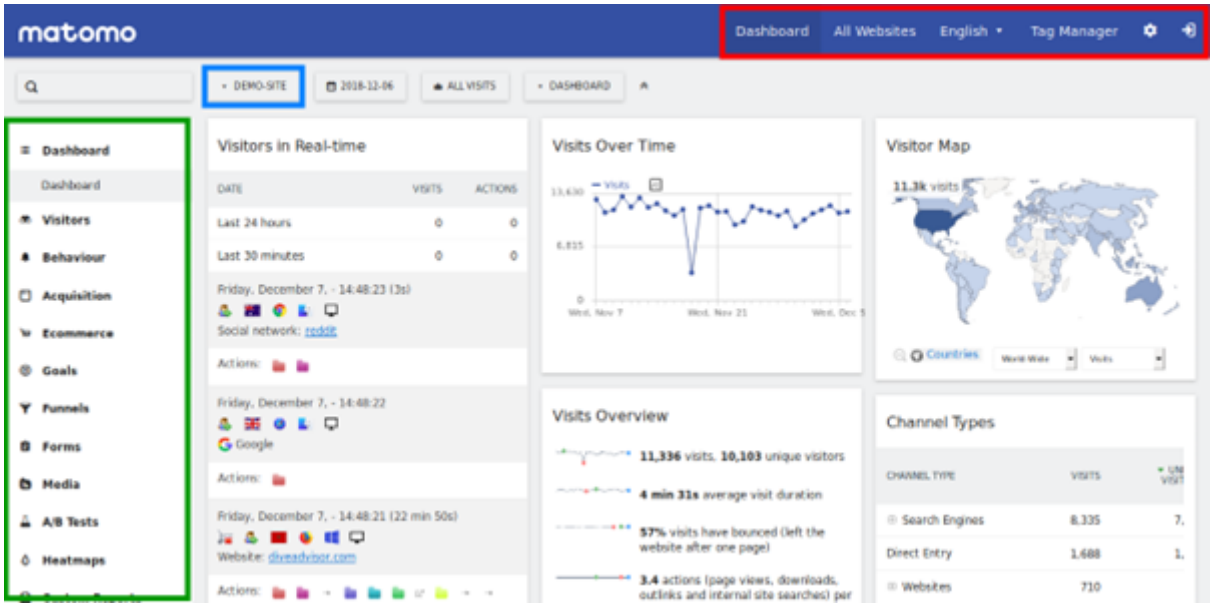

Figure 5 example of a Matomo dashboard

3.2.4 LCAMP DEVELOPMENT

The LCAMP platform is currently in the development stage. Because of the large amount and variety of data LCAMP will have to handle and localize, we are also working on parts of staging in parallel. The development stage for LCAMP consist of setting up the entire infrastructure layer for further development as well as setting up ways of gathering the standardized data about courses and skills from the partners.

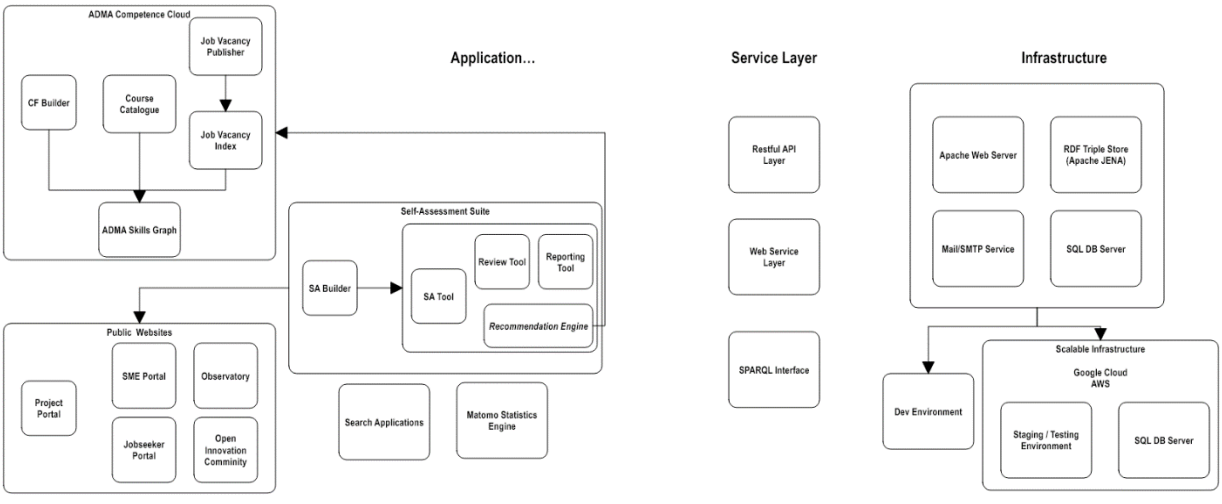

Figure 6 LCAMP complete architecture overview

4 USER JOURNEYS

IT tools user journeys are a structured, visual representation of a user's experience with an application.

They are used to help designers understand and plan out a user's experience from the moment they first open the application to the moment they complete the task they are trying to accomplish.

An example of a simple user journey for a generalized job listing creation application, which is much simpler than our Job Publishing Tool (JP Tool):

the application is an app that allows users to create and describe new job openings in advanced manufacturing, the user journey could begin when the user opens the application, which could lead them to a home page with a list of job openings. From there, the user could select 'Create a Job Listing' which would take them to a form to fill out with the details of the job. After they have successfully filled out the form, they would then be taken to a confirmation page that informs them the job listing has been created. The user journey should also account for different user scenarios, such as if the user would like to edit a job listing,or delete a job listing.

The user journey should also consider any possible user errors that could occur, such as if the user enters incorrect information. These would need to be accounted for in the user journey and a solution provided for them.

LCAMP user journeys are segmented into three main parts:

- **Employers publishing job openings**
- **Educators publishing courses and**
- **Users looking for job openings**

4.1Employers publishing job openings

(job publishing tool (JP Tool))

The JP Tool will enable employers to publish their job openings, to find suitable candidates if they have their CV's in the companies' database and even to propose suitable courses to upgrade the skills to the needed level for the job opening.

4.1.1 Employer types in a job description

I.E.: Employer types in 3D printing and he gets suggestions for all 3D printing related occupations. <-- NEEDED FUNCTIONALITIES: A TEXT SEARCH BOX WITH SUGGESTIONS + DATA: ESCO OCCUPATIONS DB + linked with skills TASK 1: prepare the ESCO occupations Table, link it with ESCO skills Table.

TASK: using Zoho Creator, make a prototype for the job publishing tool (3.1) that enables the user to start typing in an occupation, gets suggestions from the ESCO occupations DB linked with ESCO skills.

Breakdown Tasks:

1. *Create form to input job title*
2. *Link to existing jobs/skills*
3. *Link to CHATGPT*

4.1.2 Job publishing tool suggests an existing job

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Employer then chooses one of the occupations and confirms and this results in a 1 - 2 sentence basic description of the occupation + a list of related skills broken up into two categories: required and additional skills. The employer needs to be able to edit the description text. Also needs to be able to add an additional text box if needed, (add a company logo, etc...),

TASK: Add these f(x): once the user confirms / chooses one of the suggested skills OR clicks on GENERATE JOB button, The JP tool generates a text description of the occupation + generates a list of required skills + list of Additional skills.

4.1.2.1 the employer can edit proposed skills

Employer can move the skills from Required to additional portion of description OR vice-versa OR add new skills (add more details on how this works) OR delete some of the skills from the list.

Each category (Required and Additional) would have their own 'search + suggestion box' <-- NEED: ESCO SKILLS DB

TASK: Add editable f(x) to JP: Employer can edit occupation description. Can add images. Can delete/move skills from either Required or Additional skills. Can search for and add new skills in either part (Required/additional). The search tool also suggests based on typed text and is connected to ESCO skills/competencies.

TASK: write function that allows user to edit the listed skills (skills that were printed out or suggested)

4.1.2.2 Employer adds specific job opening related data

Employer adds:

- description of responsibilities
- job start
- salary / payment information
- Other requirements

4.1.2.3 Option: Employer can share the job description

the job description should also offer the employer the options of sharing on various social media networks...

4.1.2.4 Option: Suggestions of suitable candidates

based on the job published, the employer can see which of their employees might be suitable or NEARLY suitable for the job, or which employees are looking for a change in their professional development. This requires a connection to the CV's database and GAP analysis.

4.1.2.5 Option: LCAMP shows the GAPs

The LCAMP job opening Tool lists the skill gaps with chosen employee and recommends courses the candidate could attend to attain the required skill level

4.1.2.6 Option: LCAMP proposes appropriate courses based on GAP

The LCAMP JOb openings Tool lists the names and links to courses that offer learning outcomes of the missing skills identified by the GAP analysis

4.1.3 Job publishing tool doesn't suggest an existing occupation - the employer needs to add the description in manually

If there is no job description in the existing Jobs Table, the employer will have to manually add the following data into the respective fields:

- Job Title
- Job Description
- Required Skills (will be able to find them using a search box, which includes an autocomplete)
- Optional Skills (Same search box can be used as for Required skills)

Remaining parameters are identical to 4.1.2.2 Job publishing tool onward:

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4.2 Educators / companies publishing courses

(Course publishing Tool (CP Tool))

Educators /companies need a tool to publish courses from scratch or a way to migrate their existing courses into the courses Table. The basis for the Courses Table is the SHACL EU digital credentials file. (mapping its obligatory parameters to the minimum required parameters according to project requirements.

The user is the educator who is uploading the data about their class. They log into the CP Tool using their username and password.

They will be presented with 2 options: either to upload a courses Table according to required structure OR to enter each course manually, which is necessary for new ADMA courses.

4.2.1 Educator/company publishes a course from scratch using CP Tool.

The user needs the simplest way possible of adding a new course, while filling in all the required fields. <-- NEEDED functionalities: We need a form with suggestion search, drop downs and multiple choice selection + text and image editor. DATA: Courses DB, skills DB;

TASK: Finish mapping the SHACL credentials obligatory parameters to the DHBV parameters. Create COURSES FOUNDATION parameters DB.

TASK: upload existing courses DB; use courses and skills DB to create a form for entering new courses. start with a search/suggestion box for the title of the course, connected to the existing courses DB. If the title is an exact match, allow the user the option to load the DESCRIPTION of the course and the skills to pre-load along with other parameters of the course. If the course is an exact match something is wrong. The minimum required difference is the entity offering the course. (two courses can be the same, perhaps cost the same, but the entity or the time when the course is available needs to be different) Use editable text description where appropriate, drop-down menus, checklists, etc. Anything that makes it easy for the user to enter a new course. Unique items (such as title, description, location, should be editable, even if pre-filled based on the same title of the course)

User fills in or chooses the appropriate options in the following data fields:

Organisation - entity that is organizing the course

- Organisation name: text field
- organisation url: text field
- Country: should be a dropdown
- City: narrowed-down dropdown list based on country chosen

Course description Basics

- Course Name: text field describing the name course.
- Subject area: text field connected with ESCO skills OR ESCO occupations (TBD)
- Level of study: Using ISCED, offer dropdown option of all EU levels 1-8

Course description parameters

- Credit Type: ECTS, EHEA, EQF, ECVET
- Number of credits: text field that accepts numbers.
- Duration of course: text field that accepts numbers; Obligatory for user to choose whether the duration pertains to weeks or months.
- Cost of course: currency dropdown.
- cost of course (Amount): text field that accepts numbers.

Learning outcomes

- Learning outcomes: search box with suggestions, connected to ESCO skills Table.
- Additional Skills: search box with suggestions, connected to ESCO skills Table.

- ESCO Occupations (optional)

Additional information

- Link to more information: Text tool for url
- Teaching method: dropdown list of teaching methods: Physical, Online, Hybrid (Physical/Online), etc.
- Learning type: class, course, internship, etc.

Submit button

Saves chosen and entered data into the Courses Table

Reset button

erases all chosen / entered data, no data is saved into the Courses Table

4.2.2 Educator/company uploads their course(s) to their courses Table.

A lot of partners already have DBs/lists of existing courses. We need to enable them to upload their lists at least as xls.

Upon signing into the CP Tool, user can select the option of adding a courses Table by clicking on a 'plus' icon.

Once clicked, user is presented by a new page, describing the parameters and parameter structure required within the .csv or .xls file in order for the file to be successfully uploaded. (For LCAMP CP Tool a successfull upload of the .csv or .xls file means that the Courses Table has been populated by all the courses in the files that the user has uploaded)

User is also presented with an option to download a template of the .xls file, which includes named columns (parameters) which need to be filled by the user.

User is asked to confirm if they want to upload their file and does it comply with required parameter structure before uploading.

If the user clicks 'yes', the option to choose a file or drop a file is presented. User can either click and drop a file into a marked area or they can choose from a browser window where they would like to upload their file from.

TASK: Create option in the first CP Tool window for the user to choose 'Upload list of Courses'. Add a large 'plus sign' icon to make it intuitive.

4.3 Job seekers (students, existing employees, unemployed)

(Job Search tool (JS Tool))

WORK IN PROGRESS!

(this is a very complex tool that will most likely be subject to many changes in the coming months and it is currently not our priority as it needs the skills and courses database and the Course publisher tool to work.)

Job seekers are either employers / companies looking through the existing employees lists, that are looking for a change of position (which means their CV or skillset is in the employers database) OR people who are not yet employed (students, other job seekers).

People who are not yet employed most likely have their CV on some online repository (i.e. LinkedIn) or saved on their computer (i.e. Word file or Europass) or they don't have it yet.

There will be several user journeys for job seekers:

1. already has a Europass CV
2. has a CV within some other SaaS.
3. has no CV.
4. upgrading the existing CV within LCAMP

4.3.1 Job Seeker already has a structured CV

User logs in to JS Tool OR creates user account.

User uploads their CV using a '+' icon. Before confirming upload, user is reminded that CV needs to be structured.

4.3.2 Job seeker has a CV on other SaaS platforms

After creating a user account, the user is presented with an option of uploading OR importing their CV from other platforms

4.3.3 Job seeker has no CV

(Self-assessment builder tool (SA Builder tool))

Upon creating a user account, the user is presented with an option to create a CV from scratch, using the SA Builder tool.

4.3.4 Upgrading existing CV

After a CV is uploaded or created, user has an option to edit details within the CV.

5 COMPONENTS

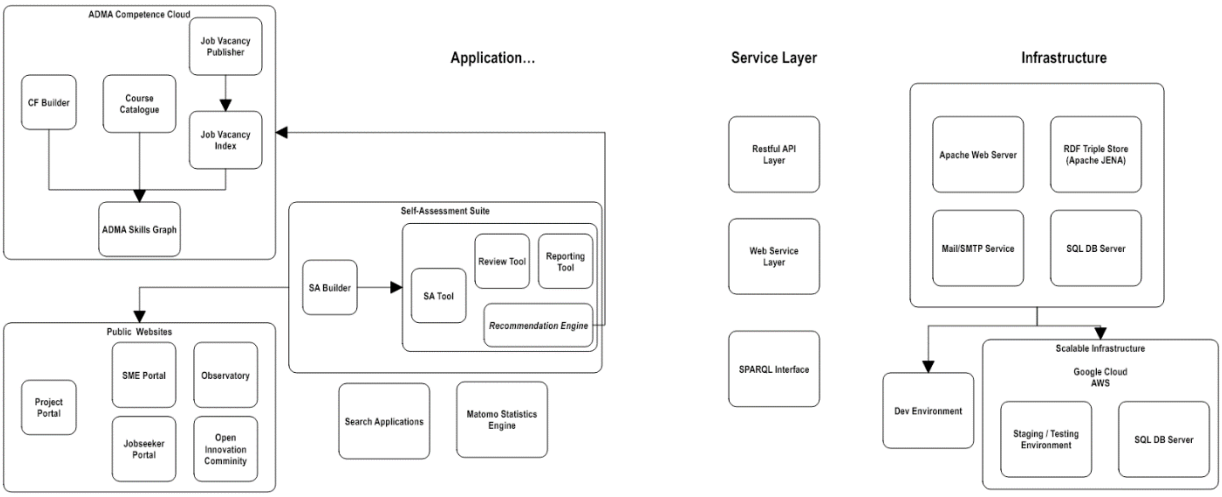

Figure 7 The LCAMP IT architecture high-level view

5.1 The suggested LCAMP infrastructure layer

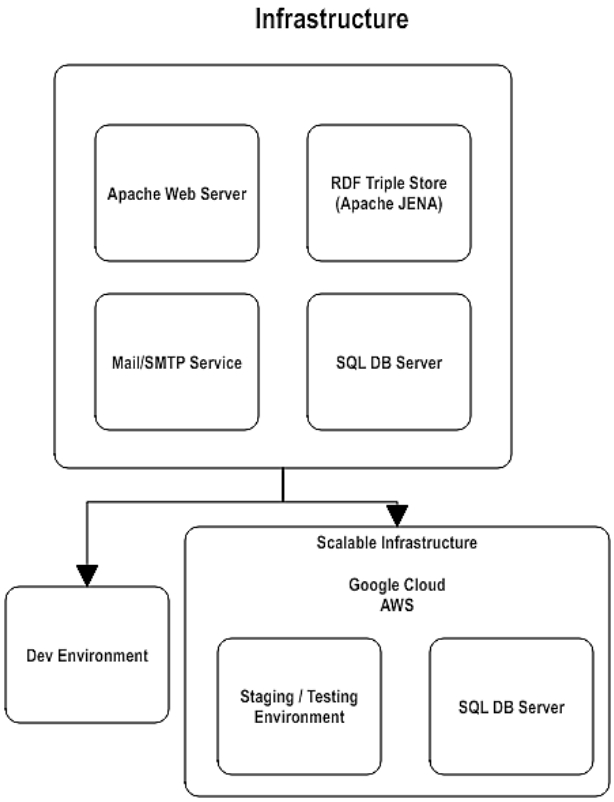

Figure 8 Overview LCAMP infrastructure layer

LCAMP Infrastructure overview Legend:

1. Apache: Apache is a web server that enables web applications to be hosted on the web using a variety of technologies.

2. RDF Triple Store (Apache Jena): Apache Jena is an open source Java based RDF triple store that provides a scalable and reliable platform for storing, manipulating, and querying large amounts of RDF data.

3. Mail/SMTP Service: Mail/SMTP Service is a type of service that provides email hosting and delivery services.

4. SQL DB Server: SQL DB Server is a type of database server that provides a platform for storing, manipulating, and querying structured data.

5. Google Cloud: Google Cloud is a cloud computing platform that provides a range of services for computing, storage, networking, and analytics.

6. AWS: AWS is a cloud computing platform that provides a range of services for computing, storage, networking, and analytics.

5.2 The Application layer

The application layer of a website is the layer of the website that interacts with the user. This layer includes all of the logic, code, and interactions that the user experiences when visiting the website. This layer is responsible for handling user input, processing requests, generating visual elements, and providing an interface for the user to interact with the website. This layer is also responsible for providing a secure connection between the user and the website, as well as providing authentication and authorization services. Additionally, this layer is responsible for handling any errors or exceptions that occur during the user's interaction with the website.

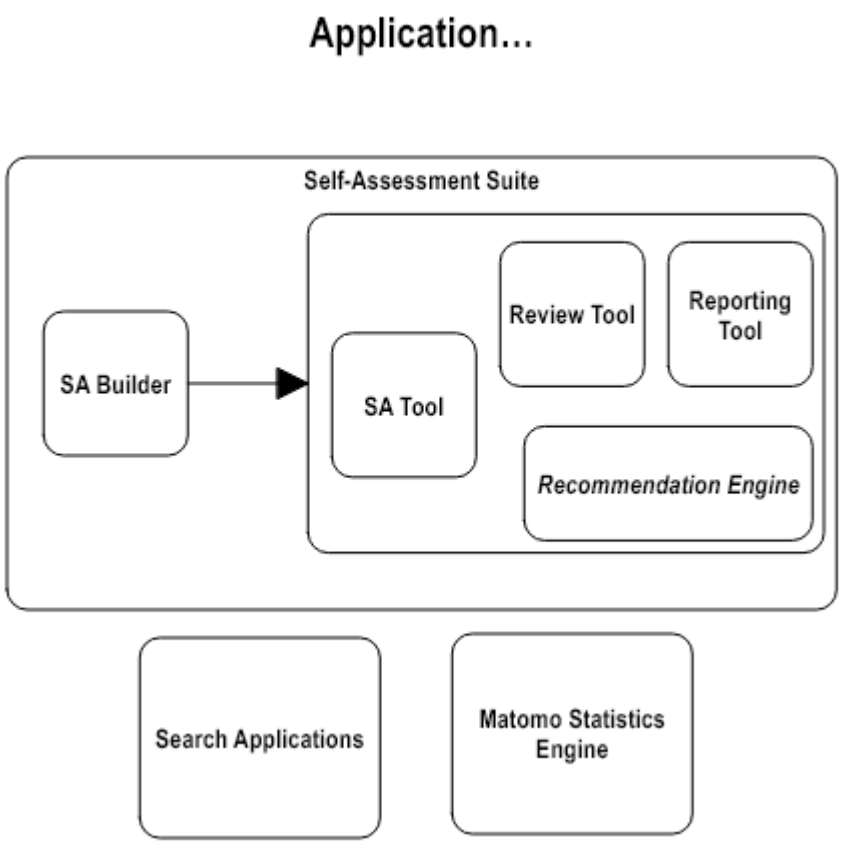

Figure 9 LCAMP Application layer

LCAMP Application layer Legend:

- **SA Builder**: An IT infrastructure layer that is used to build secure architectures, providing a platform to review and optimize security postures.
- **SA Tool:** An IT infrastructure layer used to analyze infrastructure security and identify potential risks, vulnerabilities, and misconfigurations.
- **Review Tool:** An IT infrastructure layer used to review and analyze security configurations and postures, providing a platform for security teams to review and assess risks.
- **Reporting Tool:** An IT infrastructure layer used to generate reports on security postures and identify potential threats.

- **Recommendation Engine:** An IT infrastructure layer used to suggest best practices and recommendations based on security postures.
- **Search Applications:** An IT infrastructure layer used to facilitate searching of data, applications, and other resources.
- **Matomo Statistics Engine**: An IT infrastructure layer used to analyze website and application usage, providing data and insights for optimization and improvement.
- ***Zoho Creator: An IT infrastructure layer used to build custom applications and to integrate data sources and applications.***

For applications which are deployed in the Cloud in Zoho data centres in Amsterdam, we are implementing a low-code solution via Zoho Creator. This is broken into several sub-services. Broadly we have the following set of services: application we use aPaas, integration iPass, database we use dbPaaS, API management we use apimPaaS, Communications we use cPaaS and for functions - fPaaS.

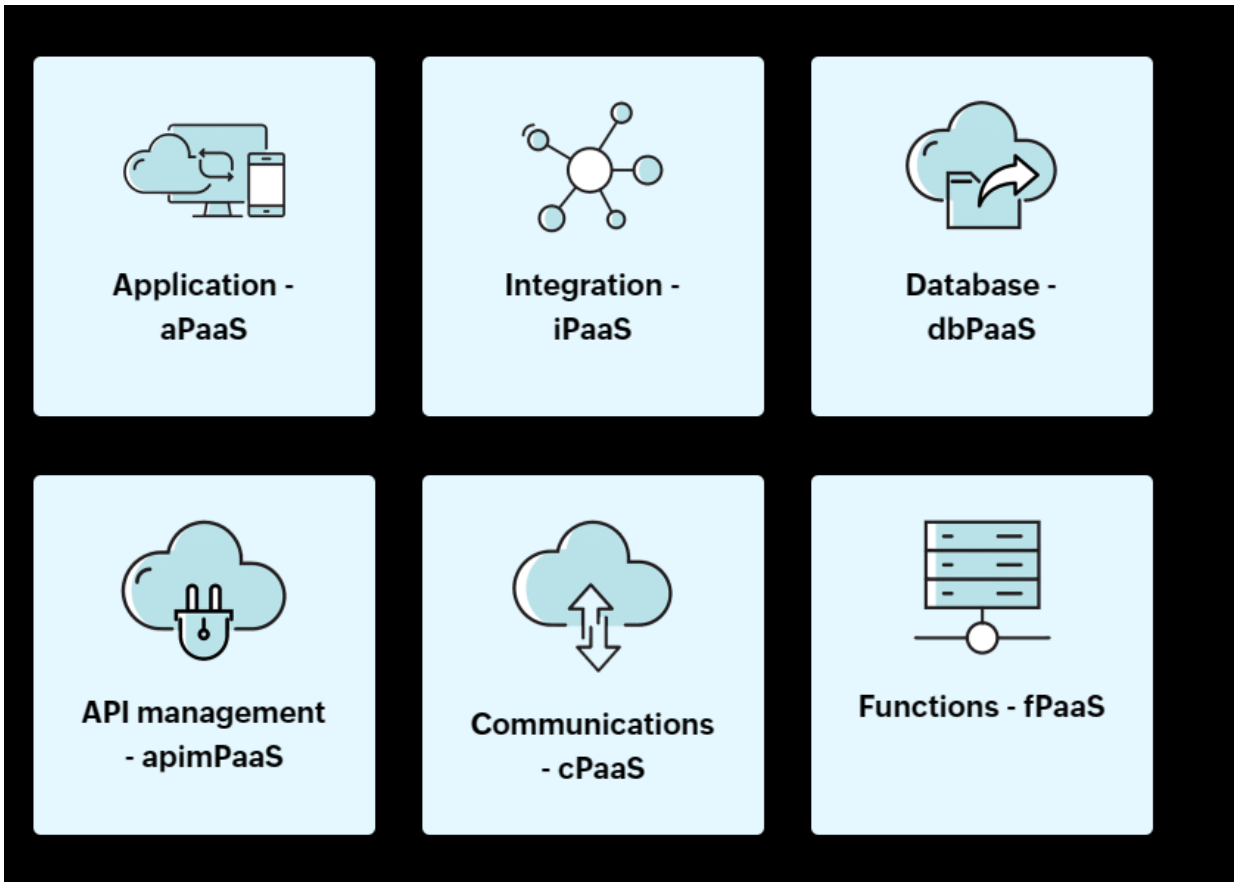

Figure 10 Zoho low-code app creation solution

Zoho creator legend:

- **aPaaS**: Application Platform as a Service is a cloud-based IT infrastructure layer that provides an integrated environment for developing, testing, managing, and deploying applications.
- **iPaaS**: Integration Platform as a Service is a cloud-based IT infrastructure layer that enables the integration of various applications, data sources, and services.

- **dbPaaS**: Database Platform as a Service is a cloud-based IT infrastructure layer that provides a managed database service to set up, operate, and scale databases in the cloud.
- **apimPaaS**: API Management Platform as a Service is a cloud-based IT infrastructure layer that provides a platform for managing and monitoring APIs.
- **cPaaS**: Communication Platform as a Service is a cloud-based IT infrastructure layer that provides an integrated environment for building real-time communication applications.
- **fPaaS**: Function Platform as a Service is a cloud-based IT infrastructure layer that provides a platform for developing and managing serverless functions.

6 REQUIREMENTS

6.1CP Tool Requirements

Courses need to have a common denominator when it comes to learning outcomes and skills data.

This data needs to be in accordance with EC accreditation standards. Due to the large number of countries we have to cover, we have opted to use the ESCO skills Table and a list of Obligatory parameters to describe a course.

Obligatory parameters that describe a course:

Field Names
internal ID no.
Issuer ID
Organization Title
Organization URL
Location of Course physical address
Location of Course (Online/Physical)
Course Name
Learning Achievement Specification Name
Level of Course (Bachelor's, Master's, PhD)
Subject Area
Credits type (ECTS, EQF,...)
Number of Credits
Duration of Course (Weeks/Semester)
Course Description
Prerequisites (If any)
Language of Instruction
Learning Outcomes
Other Skill
Cost of Course (currency) FIXED. CHANGED LATER
Cost of Course (amount) CHANGE TO NUMBERS
More information link (course info where you can apply)
Teaching Methods (Lecture, Blending learning, etc)
Learning method type (course, mentoring, internship)
International Exchange Programmes (If applicable)

Table 1 parameters for Courses

6.2 JS Tool requirements

(JS Tool – Job Search Tool (ref.: 4.3))

We need **4 ways of accessing the job seeker's CV**:

- company's database (if employee is looking for a job opening within the company where they are employed in currently. That means their CV could be in the company's database)
- existing DB online (User has a CV built on an online SaaS platform such as LinkedIn or similar,
- CV upload from computer OR
- User builds their own CV (SA Builder Tool).

We conclude that we will need a 'CV tool' and it would be optimal to have a self-assessment tool that would allow the remaining options for the user:

- uploading an existing CV
- scraping data from other online CV websites
- gathering data from own database (i.e. using their HR database to check for employees with adequate or near-adequate skillsets or looking for a new challenge)
- building CV from scratch or
- editing a CV uploaded through options 2.3.1 - 2.3.3 (4.3.4)

7 USE CASES

Use cases described through technical steps, divided according to Tools (e.g.: Courses tool)

WORK IN PROGRESS! This section will be gradually upgraded as we develop individual tools. The first tool we are working on is the Courses Tool, which allows educators to upload or describe their courses.

7.1 Employers publishing job openings

Technical steps for employers publishing job openings on the LCAMP website using our JP Tool (ref.: 4.1)

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Job publishing Application	*already bundled in software*	
2	User Clicks on Create New Job opening	Create new Table and Form with name "Course"	
3	User Enters Data in Form	Implement the Form to perform as described	task link
4	User edits suggested data		
5	User adds missing data		
6	User clicks Create	The form is saved into the table by the Zoho Creator software.	

Table 2 publishing job openings

7.2 Educators publishing courses

Technical steps for educators publishing their courses on the LCAMP website using the Courses Tool.

There are two ways that the courses will be added to the Courses Table:

- Adding the course manually or
- Adding a list of course(s) by uploading a .csv or .xls according to the instructions

7.2.1 Add courses to database manually

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2	User Clicks on Create New Course	Create new Table and Form with name "Course"	
3	User Enters Data in Form	Implement the Form, using the fields shown in section 5.1 below.	LC1-T17 - Implement Form in Zoho
4	User clicks Save	The form is saved into the table by the Zoho Creator software.	

Table 3 add course manually

7.2.2 Add courses by uploading tables of courses

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2	User Clicks on Create New Course	Create new Table and Form with name "Course"	
3	User chooses option 'Upload data Table'	Add option to upload Table of Courses. Add description and sample of Courses Table	task spec task spec
4	User clicks Save	The form is saved into the table by the Zoho Creator software.	

Table 4 add course from Table

7.3 Job seekers

Users are students OR existing employees OR unemployed, looking for jobs

Technical steps for job seekers finding job openings they are interested in AND getting recommendations for courses, based on the GAP analysis, using the LCAMP website

7.3.1 Job Seeker already has a structured CV

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2			

Table 5 Job Seeker already has a structured CV

7.3.2 Job Seeker has a CV on other SaaS

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2			

Table 6 Job Seeker has a CV on other SaaS

7.3.3 Job seeker has no CV

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2			

Table 7 Job seeker has no CV

7.3.4 Upgrading existing CV

Step	Description	Technical Steps Needed to Implement	Task in Zoho
1	User Logs in to Application	*already bundled in software*	
2			

Table 8 Upgrading existing CV

8 DATA STRUCTURES

List of data structures in connection to all user journeys and tools.

WORK IN PROGRESS!

8.1Courses

Label	Property Name	Expected Value	Cardinality	Component Type	Description
internal ID number		number			
Issuer ID		number			
Organization Title		string/text			
organization URL		string/text			
Location (country)		string/text			
Location (city)		string/text			
Course Name	course:title *or* dc:title	string/text	1..0	Text Box (Single Line)	The title of the course
Learning achievement					

Level of Course					
Subject Area					
Credits Type (ECTS, EQF,...)					
Number of credits					
Duration of course					
Course description					
Prerequisites			0..1		
Language of instruction					
Learning Outcomes					
Other SKill					
Cost of course (currency)					
cost of course (amount)					
more information link					
Learning method type					
International exchange programmes			0..1		
internship Opportunities			0..1		
Career opportunity			0..1		

Table 9 Data structures - Courses

9 REFERENCES

To be added during the course of upgrading the document

10 INDEX OF IMAGES

11 INDEX OF TABLES

Annexes, (if any)

LCAMP

Learner Centric Advanced Manufacturing Platform

Co-funded by
the European Union