

Human Collaboration Environment in Industry 4.0

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Some questions for you

- How do you encourage developers to take advantage of the platform and create new applications?
- What communication channels do you foresee for enabling an optimal collaboration environment?
- How do you ensure that the collaborative work will follow the agile methodology?

Why: Purpose and motivation

A framework for collaborative practice has the key role for enabling higher levels of productivity in Industry 4.0. The Human Collaboration Environment (HCE) component provides collaboration mechanisms to enhance teamwork by offering user-user, user-developer, and developer-developer interaction through multiple communication channels enabling diverse collaboration ways. The HCE also aims to ease the relationship between human users and manufacturing assets by providing holistic information and usage description in digital format. The collaboration environment may also include external developers and users who can request services and use communications platforms such as audio and video streaming, forums, workshops and solutions to support hackathons.

Human Collaboration Environment Features

Human Collaboration Environment in ZDMP will consist of the following activities:

- **Forums on QA platform.** This is a Question-Answers web module that sustains interaction between users from industry and application developers. Users login in the platform, create discussion threads and expose their requests for new applications. They add images and videos from their industrial processes, and also they upload data files extracted from the manufacturing machines. Developers interested in collaboration find these discussion threads and start interacting with the users, by requesting more details about the new applications to be developed. They all together can start a negotiation process about the functionalities and licenses of the new applications, while also using these discussion threads. All these actions are object of an iterative process. Figure 1 depicts what are the flows for the actions described above.

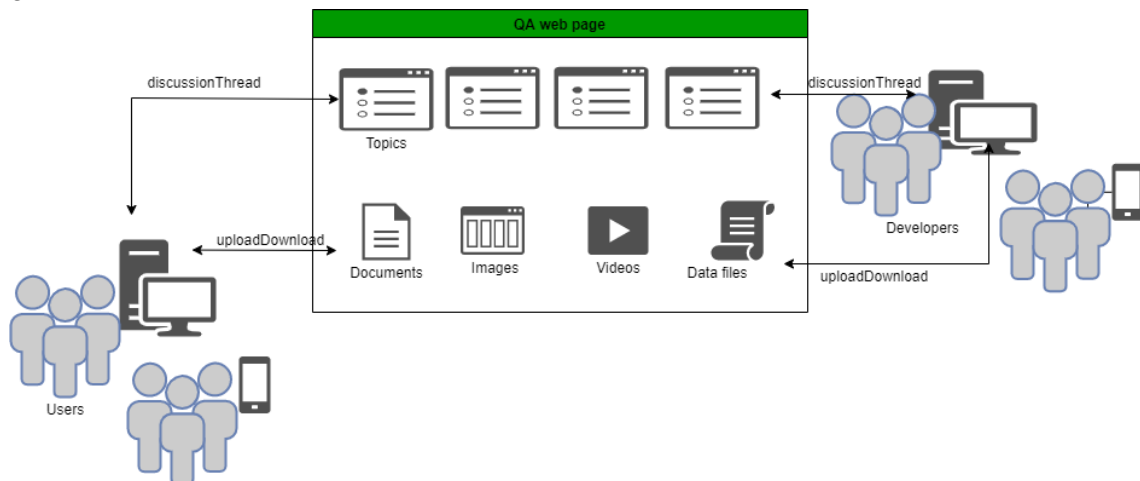


Figure 1. QA web module data flow diagram

- **Code collaboration.** This is a Human Collaboration web module that sustains interaction between developers of different applications that work together in Industry 4.0. New developers start writing their code, login in the platform and upload their code. They can keep multiple versions and branches. They can create tasks and milestones in order to keep all development processes aligned with an agile methodology. Experienced developers can assist them providing code snippets and libraries. All developers can document their application using tools provided by this collaborative platform. More than that, all the developers are allowed to use continuous integration methodology, being able to build scripts for application running and create

pipeline of running tasks in order to build, test, and validate the code changes before merging them into the main branch. Figure 2 depicts what are the business flows for the actions described above.

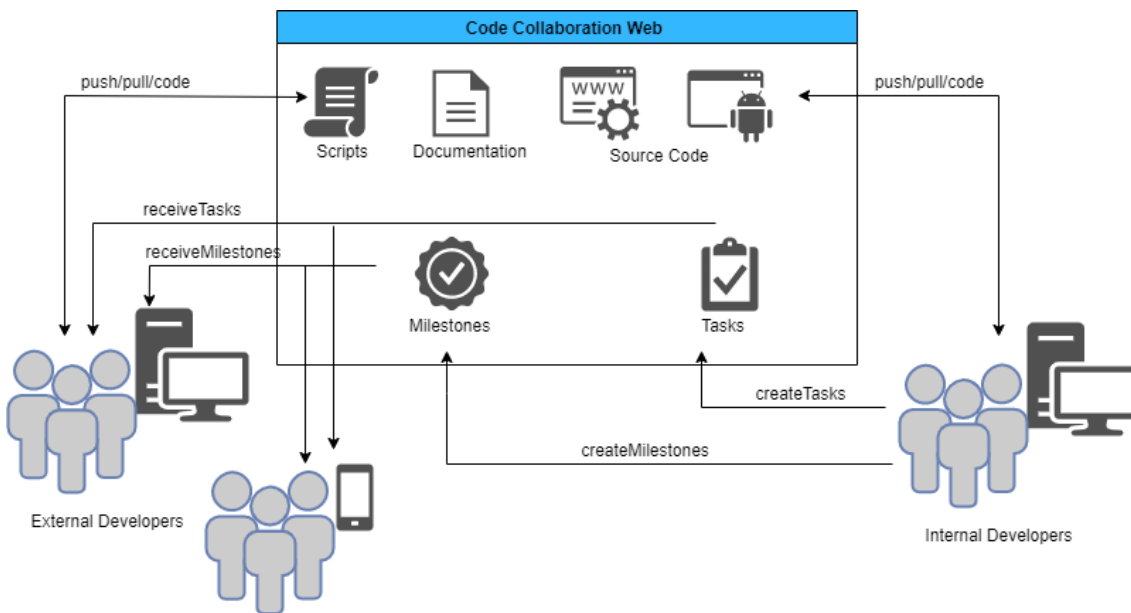


Figure 2. Code Collaboration web module data flow diagram

- Video calls, webinars, hackathons.** This web module is used for online face-to-face interaction between users and application developers from Industry 4.0. If a video call is needed the initiator opens a video streaming and users invited join the call. During the call they can share their screens to show presentations or demos, and they can exchange links or other useful information using a chat window. Figure 3 depicts what are the business flows for the actions described above.

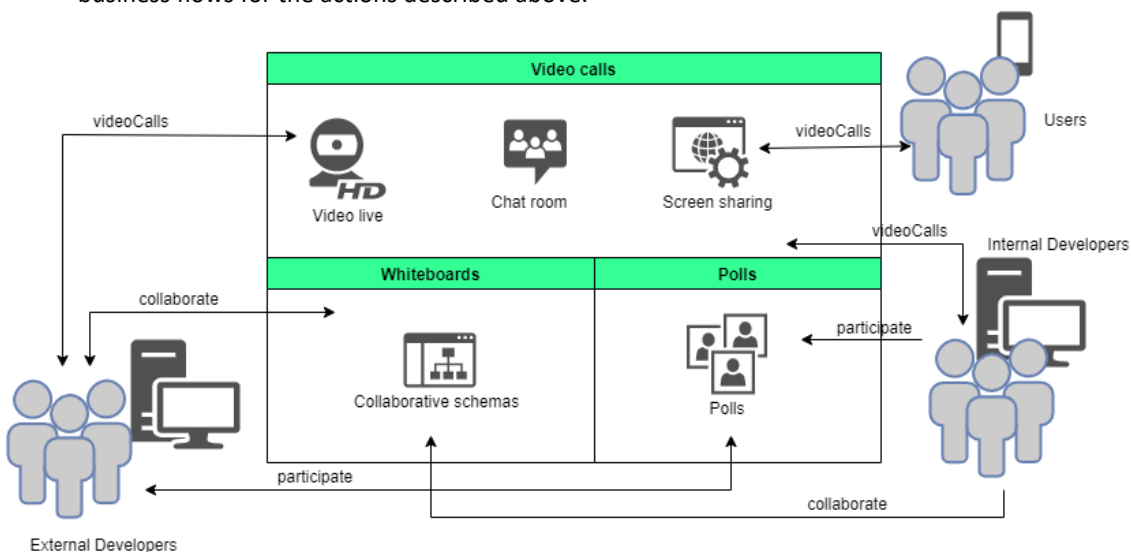


Figure 3. Video calls web module data flow diagram

- Online polls.** Using this web tool users can schedule calls, meetings and to improve the decision-making process. Also, the developers can address the external users or customers by creating complex surveys to measure aspects of collaboration efficiency, such as: customers’ levels of satisfaction, employees’ wellbeing, external developers’ motivation.
- Online whiteboards.** During their video calls, users can express their ideas in a graphical way – using interactive online whiteboards for creating diagrams together for better understanding the business process. These online canvases help them organize brainstorm, do user story maps, agile workflows and more, using templates to provide an easy way to get the team ideating and collaborating.

- **Online retrospectives.** Agile methodology is a key aspect for an iterative approach of the design and development of applications. In this regard, assistance is provided by an efficient retrospective scrum meeting, using an online retrospective web tool. With this application users can analyse their activity for every scrum, finding out strengths and weaknesses of their work and establishing proper action items in order to increase the team functionality and efficiency.
- **Virtual academy.** Using this web module, the application developers upload eLearning materials as presentations, technical documentation, manuals, videos, and useful links. The industry users login in the platform and can view, watch, and download all the eLearning content presented. Figure 4 depicts what are the business flows for the actions described above.

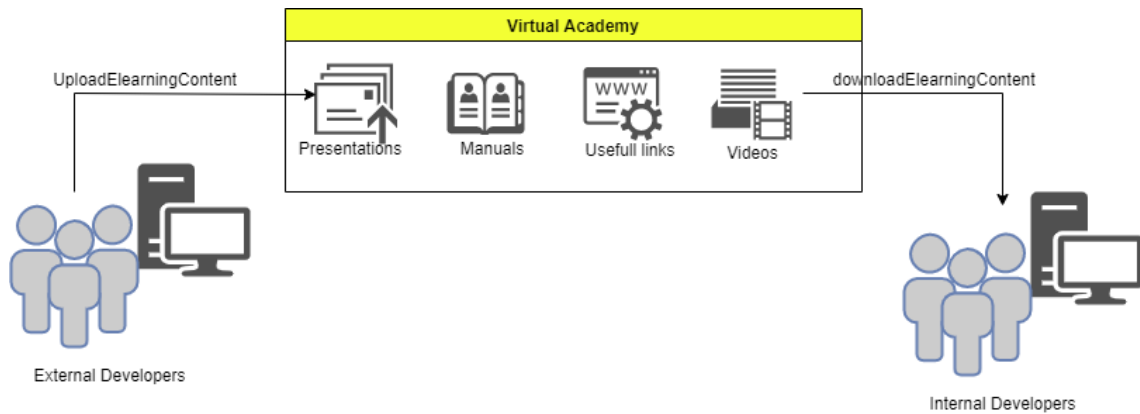


Figure 4. Virtual Academy web module data flow diagram

What will ZDMP achieve

- **Forums on QA platform.** In ZDMP, Scoold was selected as the best platform for the implementation of this human collaboration tool. This is the best approach for sustaining interaction between users from industry and zApps developers and between zApps developers (external developers) and internal developers (of ZDMP components). In figure 5 a questions screen from Scoold is displayed.

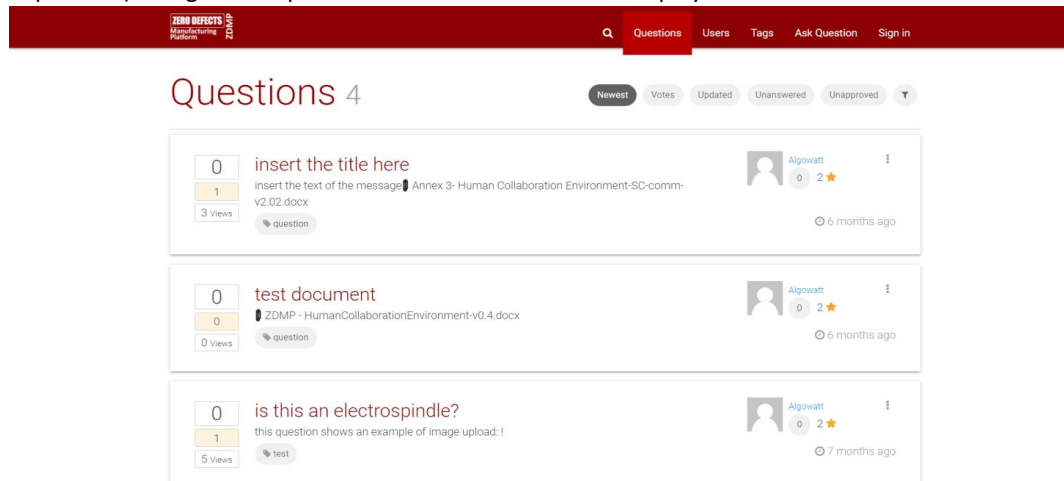


Figure 5. Q&A screen in Scoold

- **Code collaboration.** Vf-OS engagement hub was proposed during the last plenary as a choice for the implementation of a code collaboration tool. Vf-OS engagement hub is based on GitLab with appropriate plugin. On ZDMP platform it will be a separate instance from the GitLab used by ZDMP developers, for safety reasons. In figure 6 a screen from snapshot from GitLab is displayed.

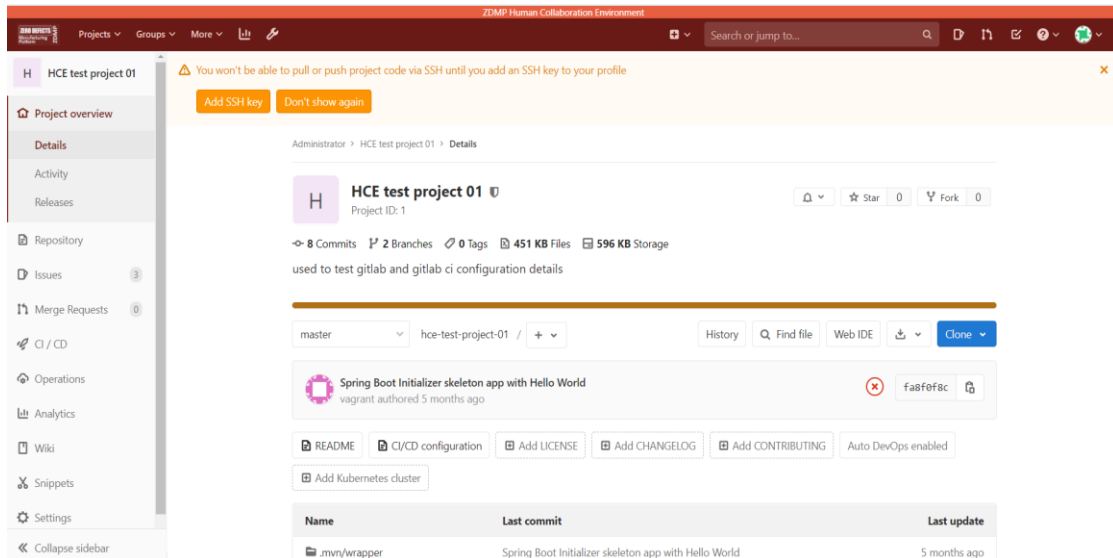


Figure 6. Code Collaboration using GitLab

- Video calls, webinars, hackathons.** This feature is used for online face-to-face interaction between users from industry and zApps developers, while communication between zApps developers (external developers) and internal developers (from ZDMP components) is accomplished by the HCE mobile application. Figure 7 depicts a snapshot from mobile video conference application.

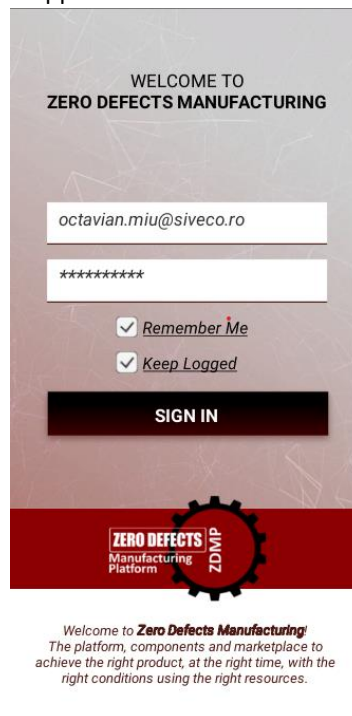


Figure 7. HCE mobile application

- Virtual academy.** Moodle open-source solution was selected to be implemented to upload eLearning materials provided by internal ZDMP components' developers. The external developers login in the platform and can view, watch and download all the eLearning contents presented. In figure 8 a snapshot from Moodle is displayed.

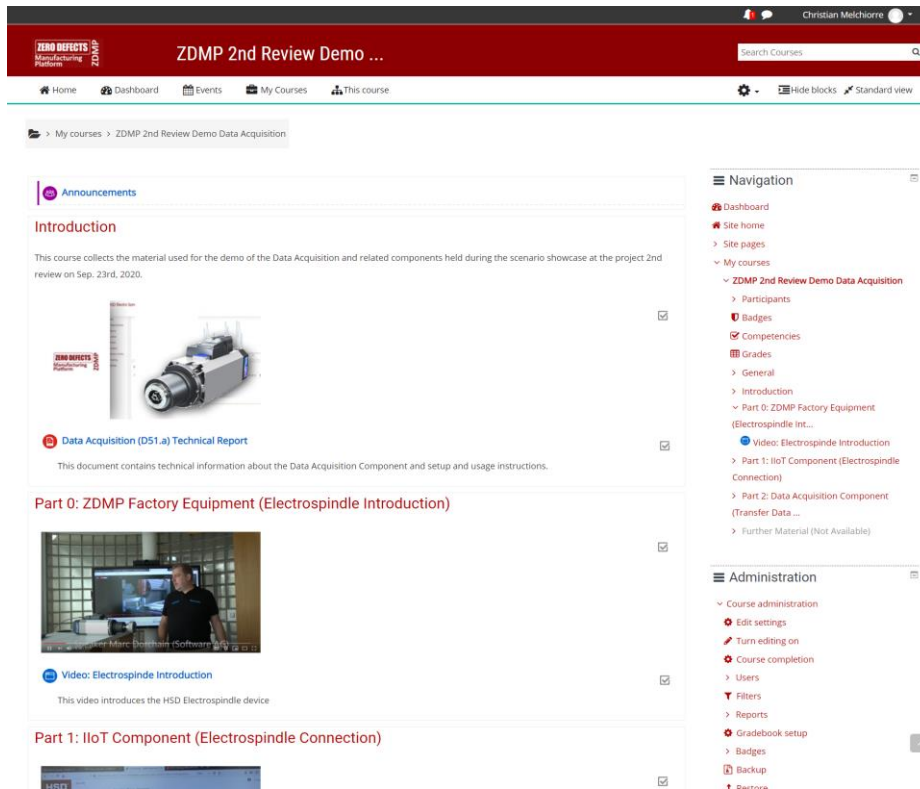


Figure 8. Virtual Academy - Moodle

ZDMP Links

| | |
|------------------------------------|--|
| • Architecture Component(s) | Human Collaboration Environment |
| • Work Package | WP6 – ZDMP Platform Building WP11 – ZDMP Experimentation Facility |
| • Tasks | T6.3 – Human Collaboration Environment T11.4 – Developer Engagement and Interaction |

References/Acknowledgements

None