![beaconing logo](BREAKING EDUCATIONAL BARRIERS WITH CONTEXTUALISED PERVASIVE AND GAMEFUL LEARNING)

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

As an innovation action project, Beaconing will provide components for pervasive teaching with a technology readiness level between 7-9 (see DoA). Therefore, most of the development will be based upon existing technologies and components that will be adopted and extended during the course of the project. Therefore, the objective of this deliverable is to provide an overview of existing hardware, software, learning inventory and expertise within the consortium that may serve as a foundation. The information was collected by using an online questionnaire completed by each partner. Even though it was clear from the beginning that the Beaconing consortium comprises of all the necessary expertise for providing the promised solution, we have added a list of the internal experience in this deliverable. The intention behind this is that this will help new employees involved in Beaconing during the project life time to get an overview of the competences of each partner.

The overall Beaconing inventory shows that we can build upon a server infrastructure, two LMS, an authoring tool and engines for different game genres. In addition, for the pedagogical development we can build upon existing lesson plans, an assessment item bank and learning materials for various topics. In some cases, these lesson plans are designed for a different target group, but parts of them will be adapted and re-used in a new way. Furthermore, we can re-use components developed in previous and parallel running projects like Leas Toolbox and Rage. This includes a learning analytics infrastructure which reports on users' progress and accessible game technologies can be recycled to the project's needs. Assistive tools make Beaconing accessible for users with diverse impairments (e.g. Dyslexia, visual impairments and dexterity issues).

In addition, to know what we can build upon for extension and further development within the consortium, it is required to take into account hardware and software available at the pilot side. This information was collected in parallel to the requirement and was presented in D3.1. That deliverable shows that most schools use an LMS system, and that there is a large variation in hardware and usage of personal devices. Consequently, a main focus on our development will be in the integration and interconnection of the different component in order to provide a Beaconing ecosystem that is interoperable and adaptable to the different user needs.

As expected, the analysis shows that we already have a good basis for the Beaconing project. Development will, however, be needed to extend the authoring and editing tools and to define standards for their integration with the used LMS. The available technologies need to be assembled to a context aware system. Furthermore, the individual learning experience and the teachers and parents' possibility to follow the learning progress of each individual student is a key for the Beaconing project, improved learning analytics will be integrated in some of the games. The games as well as all other learning components will be connected to the learning analytics infrastructure. The analysis of existing components also showed that the consortium will need to develop an interface and feedback system, as well as a PBL and game system to form the Beaconing ecosystem

1   INTRODUCTION

This document provides a repository of existing technologies, pedagogical components and expertise within the consortium. It forms the foundation for the development of the Beaconing ecosystem. The following sub-chapters of the introduction describe the role of this article within the project, the approach of it, as well as its structure.

1.1   ROLE OF THIS DELIVERABLE IN THE PROJECT

This deliverable displays a repository of existing technologies, learning environments, content, infrastructure and their currently used technologies to give a better insight of the project's starting point. It presents the basis for further development. It lists all components we can re-use as asset, product or service, saves time and resources to reach our goals as fast and easily as possible. The document is complimentary to the outcome of the end users' requirements (D3.1) and the lessons plans (D3.3), as they together provide an overview of what we can re-use, adapt and what we have to build or extend. Therefore, these three deliverables are the basis for the further development in task 3.4 and 3.5 as well as in WP 4.

1.2   APPROACH

In order to prepare an inventory of existing technologies, content, pedagogical components and expertise it is necessary to collect the relevant information for systematisation. A questionnaire comprising of questions of each type of component (see DoA) was developed in a co-creative process among the WP 3 partners. Each partner completed this questionnaire online. We gathered information about available learning material, software and hardware (including their technical details and requirements), which can be re-used. Another set of questions focuses on the pedagogical expertise of the partners and another one on relevant technologies used in the institutions. Also pilot partners answered similar questions (they will implement and test our solution), these results are shown in D3.1.

With this information collected we created an overview about resources we can start with. Those establish a starting point from which the Beaconing project can be built up on.

1.3   STRUCTURE OF THE DOCUMENT

The deliverable is structured as follows:

Chapter 1 (this chapter) provides an introduction to the deliverable

Chapter 2 shows the results of the questionnaires all partners of the Beaconing project were asked to fill out. It is divided in two parts. The first one describes the software, hardware and learning inventory. A table gives a well-structured overview about the contribution of each institution. The second part focuses on the expertise and technologies of the Beaconing partners.

Chapter 3 discusses opportunities and limitations about the available input. A closer look is taken on regional, national and international differences in the pilots and what this means for our project.

2   INVENTORY

The main objective of the inventory is to ensure that all partners know what is already available, in order to ensure the highest possible re-use. This will decrease development time and improve the quality of each component. Since we aim at delivering components in TRL 7-9, it is important to re-use as much as possible. Due to differences in the technical infrastructure of the pilots, it is important that the re-used components are interoperable and can be integrated into the Beaconing ecosystem. Thus, in some cases components available within the consortium could not be adapted to the existing end-users' requirements. These components are therefore not listed. This chapter lists existing software, hardware and pedagogical expertise which can be provided to establish a basis from which Beaconing can grow.

2.1   SOFTWARE & LEARNING INVENTORY

This section gives an overview of what each partner can provide. Chapter 3 Discussion explains in more detail how these components can be re-used.

Table 1 provides an overview of existing software, hardware and learning components. These shows that COVUNI contributes to the Beaconing project with their knowledge about **lesson plans** (see deliverable D3.3, for more detail on their expertise as well as for concrete plans). In addition to their experience in the learning design that is used in the specifications of the Beaconing platform, they will also "provide various gamified learning scenarios with missions and quests based on STEM subjects [which are] closely related to the individual needs of each pilot." (Beaconing, 2016).

SEBIT provides **lesson plans** for the K12 curriculum. Furthermore, they offer digital **learning materials** and **domain maps** for the K12 curriculum, as well as **Assessment Item Banks** which include over 200.000 multiple choice questions for the grades 5 to 12 in all topics except for

Figure 1: Interactive comic strip (Succubus, 2015)

math & science in English language. An important limitation is that the re-use of these materials is subject to terms and conditions set by SEBIT. **Lesson plans** for HE and VET on STEM subjects can be provided by BIBA, but will need some adaption to the target group 16-18, as well as for students with learning disabilities. They may also provide **learning materials**, especially for ICT, technology and logistic topics, as well as for management methods. **Game content** exists for many of the topics mentioned above.

SUCCUBUS created an **interactive comic strip** (see Figure 1) for an ecology lesson. It is in French and users take decisions which have either good or bad consequences. Players can also change their mind during game play to understand consequences, influenced by their choices.

"Social Mpower" is a game COVUNI contributes to the project. A screenshot can be seen in Figure 2. Learners experience the effects their use of electricity has within a community.

HFC shares their **Freeware Library for Assistive Software** which assists with Dyslexia, visual impairment, dexterity issues and physical disabilities. They also provide **tutorials, handouts and guides** for their accessibility tools which they are going to integrate into the Beaconing project.

Game assets can be provided by COVUNI regarding the topic of energy management. ATS also supports the project with **"SGREF"**, their collection of references and assets pertaining to serious games.

BIBA developed 2 different Supply Chain Management games, named **"Seconds"** and **"SUMAGA Island"**, which can be adapted to the project's needs. **"Intellica"** is a simulation game about IoT in logistics and is part of a blended learning concept, which can also be adapted for various topics.

IMA offers the mini-game collection **"Doremi Cognitive Games"** as assets for the Beaconing project to establish a basis. It includes four cognitive training games for senior users. One game shows a challenge (e.g. touch every green notepad and red boat) on screen which closes after a few seconds. Instead, a matrix of objects is displayed and the user has to touch / click the correct ones. The second game is a "pairs" like game and the third one shows arithmetic calculations. The user has to choose the right out of four possible answers. The last game is a

Figure 2: Social Mpower (Bourazeri)

"Jigsaw" like game. All levels adjust automatically to the user's abilities.

COVUNI developed a pervasive smartphone game for language learning, called **"Imparapp"**. Players have to solve tasks while exploring the city centre of Coventry. The locations the users visit are used as part of the descriptions in the narratives of the game.

GEOMOTION developed a game called **"City Nostra"** which is a location-based strategy game for smartphones. It is a Mafia themed game where the player has to conquer digital areas in a real city. GEOMOTION provides the technology behind the game, which is both adaptable and scalable.

UCM created a **serious game** for Down's syndrome youngsters. It helps them to improve their independent life by learning how to move in the Madrid metro network. This game replaces the one to one training with a mentor, which would be very expensive. This product is adaptable for the Beaconing project. A learning analytics system will be integrated.

As a partner of the RAGE project responsible for learning analytics, they will ensure the re-use of components developed by RAGE. Beaconing will re-use parts of the **"RAGE learning analytics infrastructure"** and **"RAGE game learning analytics tracker"**. Both are adaptable and scalable and the infrastructure must be extended, e.g. for geopositioning information. They will be adapted or further developed for our needs.

SEBIT provides **"VCloud"**, a cloud-based social LMS, device management, class management and content suit. This service is adaptable as well as scalable and can be used on a PC or mobile device. Its infrastructure is displayed in Figure 3.

BIBA also has an LMS, **"DoceboLMS"**, which can be adapted and provided as a service or an asset. SIVECO developed an authoring tool, named **"Wand"**, teachers can use to create lesson plans and materials and gamify their lessons. The tool is easy to use and content is generated very quickly. "Wand" give authors the opportunity to engage their students with interactive learning activities either to project those on a white board in class, or for assigning them as homework.

ATS contributes a **virtual server infrastructure** for prototyping, automated build and testing. In addition, SUCCUBUS provide their **MMO server**, which supports real time synchronous
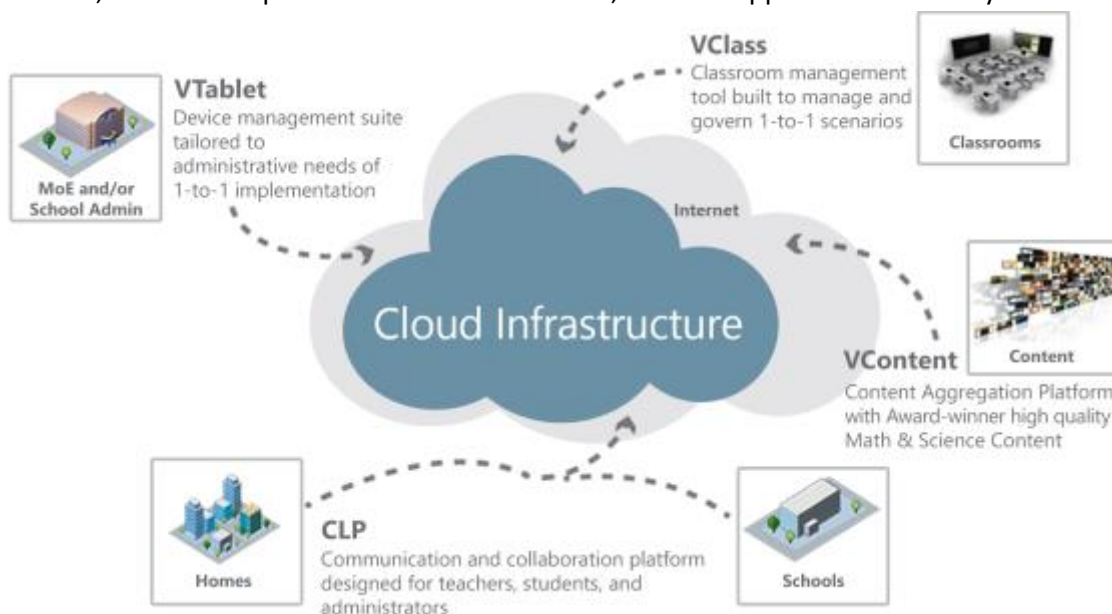
multiplayer gaming. It also features virtual world customization.

Figure 3: VCloud infrastructure (Sebit, 2014)

Furthermore, SUCCUBUS contributes the **"HappyTech Engine"** (see Figure 4). Game developers or also teachers could use it to create Point & Click like adventures for their students. The engine will be delivered as closed source, and will not be modifiable from the outside. Nonetheless, a scenario editor, called **"SEISM"**, will let authors create their own scenario for other people. Also, a web-view will be developed to let people add more content to it.

BIBA's **"be.Mog"** engine lets developers create simulation-based games very quickly. The engine can be used for games that integrate real-time sensor data.

"Serious Talk", created by SUCCUBUS, lets authors create interactive dialogs. This tool allows anyone to conceive non-linear conversations that reflect professional real life situations and challenges. Using this software, users can learn a language, experiencing customer relations or even train management techniques.

A **collection of avatar pieces** will be provided by Playsoft. Those can be used to create a 2D avatar with various options. A user interface for avatar creation is not integrated yet. The avatar parts act as assets, which can be used in an editor.

HFC integrate **"Accessabar"**, an assistive toolbar, into the Beaconing platform. This product is adaptable and scalable and allows the user to access the accessibility functions of the operating system, such as narrator, voice recognition, on screen keyboard, high contrast, etc.

Another product of HFC is called **"MapMyProcess"** which will also be integrated into the Beaconing platform. This software is a helpful tool for e.g. users with Dyslexia as it breaks down tasks and processes into simple steps.

"MindGenie MindMapper" (provided by HFC) helps students with planning how to complete the curriculum based tasks. The Mind Mapping facility lets its users create mind maps to help them plan activities and tasks, add notes, rearrange options and convert them to lists and document formats.

Figure 4: Happytech Engine (Succubus, 2016)

HFC also offers a **"Speech Manager"**. This product is a voice recognition tool which allows the user to dictate and have the words appear on screen. The user will also be able to navigate the Beaconing portal with voice commands and create custom commands to perform hands free functions relevant to the individual user.

Their approach is to develop a complete solution of accessibility in one software toolbar, called **"AccessKit"**. This could run alongside or replace the use of BrowseAloud and inbuilt accessibility tools. This service should be integrated into the Beaconing platform and is adaptable as well as scalable.

Software & Learning Inventory:

No.	Short Name	Learning Inventory	Hardware & Software	
1	COVUNI	**Lesson Plan** Support the learning design and specification of the Beaconing platform Provides various gamified learning scenarios with missions and quests based on STEM subjects and close related to the individual needs of each pilot ➔ Deliverable 3.3 (Beaconing, 2016)	**Social Mpower** Unity game for energy management. http://www.social-mpower.eu/	□ PC (Windows / iOS) □ Adaptable □ Asset
		Game Assets Topic: Energy	**Imparapp** Pervasive smartphone game for language learning. Learning Italian by exploring the city centre of Coventry.	□ Mobile (Android / iOS) □ Adaptable □ Asset
2	HWU	**Framework** Mapping conventional VET/Craft skills lesson plans and activities to digital-analog and gamified blended lesson plans.		
3	BIBA	**Lessons plans** for HE and VET	**DoceboLMS** LMS to upload materials, organising classes, progress tracking of users, etc.	□ Adaptable □ Service / Asset

3	BIBA	**Learning material**	**be.MOG**	□ PC (PHP-based)
		for ICT & technology topics & logistic topics	Game engine. Developers can create new scenarios in a short amount of time.	□ Adaptable
		IoT logistics		□ Asset
		Decision making	Simulation-based games, which trigger events (i.e. sensors)	
		Methodology for risk-management, product management and reengineering	Includes already some scenarios (games)	
		Management methods	No authoring tool	
		Game content	**Seconds**	□ Web-based
		To many topics of the provided learning material	Supply Chain Management game	□ Adaptable
			Players buy, produce and sell products.	□ Asset
			Contains an authoring tool	
			Intellica	□ Multitouch / analogue
			Game about IoT in logistics	□ Adaptable
			Blended learning concept	□ Asset
			SUMAGA Island	□ Web-based
			Supply Chain Management game	□ Adaptable
			Trains systematic thinking	□ Asset
			IoT infrastructure	

5	UCM		**Serious game for Down's syndrome youngster** Improves their independent life Training on how to use the Madrid Metro network on their own.	□ Mobile □ Adaptable □ Product
			RAGE learning analytics infrastructure A base to create learning analytics for Beaconing Needs to be extended	□ Adaptable / Scalable □ Product
			RAGE game learning analytics tracker A tracker to be called for sending in learning analytics data from serious game to the RAGE learning analytics infrastructure.	□ Not yet mobile □ Adaptable / Scalable □ Asset
7	SUCCUBUS	**Interactive comic strip** Ecology lesson, made as an interactive comic strip for tablets or computers (in French). http://www.succubus.fr/en/realisation/build-and-maintain/	**Happytech engine** Engine to create Point & Click Adventures http://www.succubus.fr/en/realisation/game-engine-adventure-point-click/	□ PC /Mobile (Android / iOS) □ Adaptable / Scalable □ Asset
			MMO Server Support for realtime synchronous multiplayer. Features virtual world customization.	□ PC □ Adaptable / Scalable □ Asset

| 7 | SUCCUBUS | | **SEISM**

Scenario editing tool via highly innovative visual scripting for game designers

http://www.succubus.fr/en/realisation/production-tools/ | □ Web-based

□ Adaptable / Scalable

□ Asset |
| | | | **Serious Talk**

Interactive dialog editor.

Innovative complement to traditional learning methods.

This solution allows anyone to conceive non-linear interactive conversations that reflect real life professional situations and challenges.

Intuitive editor creates scenarios in which players become an actor in their own learning process.

Learning a language, experiencing customer relations, management techniques, train to diagnose patients.

Adaptable to all your needs when it comes to human behavior.

http://www.succubus.fr/en/realisation/production-tools-dialog-editor/ | □ Web-based

□ Adaptable / Scalable

□ Asset |

8	ATS		**SGREF** Collection of references & assets pertaining to serious games	□ Via Beaconing platform □ Scalable □ Service
			Virtual Server Infrastructure For prototyping, automated build and testing	
9	IMA		**Doremi Cognitive Games** Set of mini-games for cognitive training of senior users: Find it: Find the correct images in a matrix of objects. Match it: A "pairs" like game. Solve it: Calculation solving game Complete it: Jigsaw like game. Automatic level adjustment to the user's ability.	□ Tablet (Android) □ PC (Windows) □ Adaptable & Scalable □ Asset
10	GEOMOTION		**City Nostra** Location-based strategy game for smartphones.	□ Smartphone (Android/iOS) □ Adaptable & Scalable □ Technology usable

12	Playsoft			**2D Avatars** The head and body of the avatar can be configured with many options.	☐ Mobile & web-based ☐ Adaptable & Scalable ☐ Asset
				Mobile devices ~ 500 devices (Android / iOS)	
13	SEBIT	**Lesson Plans** K12 curriculum		**VCloud** Social LMS, Device Management, Class Management and Content Suit Cloud-based	☐ Mobile (Android / Windows) / PC (Windows) ☐ Adaptable & Scalable ☐ Service
		Digital Learning Materials K12 curriculum			
		Domain Maps K12 curriculum			
		Assessment Item Banks 200k multiple choice questions Grades 5-12, all topics but math & science for English language			

14	HFC	**Freeware Library for Assistive Software** Assists with Dyslexia, visual impairment, dexterity issues and physical disabilities.	**Accessabar** Assistive toolbar directly within the Beaconing platform which allows the user to access the accessibility functions of the operating system.	□ PC □ Integrated into Beaconing platform □ Adaptable & Scalable □ Product
		Tutorials, Handouts & Guides for the Accessibility Tools for the Beaconing platform.	**MapMyProcess** Assistive software tool which allows users to break down tasks and processes into simple steps.	□ Web-based □ Integrated into Beaconing platform □ Adaptable & Scalable □ Product
			MindGenie MindMapper The user will be able to create mind maps to help them plan activities and tasks, add notes, re arrange options and convert to list and document format.	□ Web-based □ Integrated into Beaconing platform □ Adaptable & Scalable □ Product

14	HFC		**Speech Manager** Voice recognition tool, which allows the user to dictate and have the words appear on screen. The user will also be able to navigate the Beaconing Portal with voice commands and create custom commands to perform hands free functions relevant to the individual user.	□ PC □ Adaptable & Scalable □ Product
			AccessKit Complete solution of accessibility in one software toolbar to run alongside or replace the use of BrowseAloud and inbuilt accessibility tools.	□ Web-based □ Integrated into Beaconing platform □ Adaptable & Scalable □ Service
15	SIVECO		**Wand** Authoring tool for teachers to create learning materials designed according to students' needs. Teachers can easily create a variety of simple games. Interface and functionality is intuitive. http://wand.education/index.html	□ Web-based □ Scalable □ Product

Table 1. Software, Hardware and Learning Inventory

2.2 EXPERTISE

Table 2 displays the pedagogical expertise of all partners in the Beaconing project, as well as their used technologies.

CONVUI has a wide expertise in game based learning. They have, among others, expertise in mobile, seamless and informal learning, gamification and education psychology. Game based learning is also the main expertise GEOMOTION brings into the consortium. They also have experience in developing e-learning content and serious games for vocational training and in corporate learning. ORT's teaching expertise in math, IT and economy, as well as their knowledge about e-learning, e-health and law enforcement is a good contribution to the Beaconing project.

SIVECO has vast pedagogical expertise as they work on a lot of educational projects in diverse areas (schools, universities, hospitals, banks, etc.) and collaborate with many teachers. SEBIT employed nearly 100 pedagogical experts and collaborates with about 100 academics from Educational Sciences in Turkey and the USA as well as with the Ministry of Education. Information concerning serious game development for STEM and cultural areas can be given by UCM. They are also experts in e-learning standards and learning analytics.

Through the collaboration with universities, INESC has good pedagogical expertise. Furthermore, INESC has a lot of experience in scenario production for teachers in France, Greece and Israel, whereas BIBA has good knowledge in lesson plans and learning material development, especially in HE and VET in engineering subjects.

Neurodevelopmental disorders and psychometric testing is part of HWU's knowledge. Those tests include, for example, IQ testing and tests of executive function. Their expertise also involves research methods as well as statistical analysis.

HFC contributes many years of experience in training assistive software solutions to individuals one to one and in groups. They taught people in small and large companies, in educational establishments, in higher education and in home visits.

There are several partners with expertise in sensor technologies: GEOMOTION shares their sound knowledge in location-based systems using GPS and Beacons. Ifinity will contribute with their expertise in Bluetooth low energy (BLE) Beacons gained in earlier projects, and INESC has extensive experience in developing location-based games. INESC's experience also contains procedural content generation, natural user interaction and assistive technologies. IMA contributes their knowledge about motion tracking systems. For example, they are using the Kinect. Also SEBIT's experience with cloud-based systems is a big advantage for the Beaconing project.

SUCCUBUS, as well as Playsoft are experts in game development. SUCCUBUS supports Beaconing with their game engine and editors and has expertise in interactive gaming and rendering on various platforms, whereas Playsoft has great knowledge about mobile and web-based games (especially 2D) and also about graphic and game design.

Table of Expertise and Technologies:

No.	Short Name	Pedagogical Expertise	Technologies
1	COVUNI	Learning Communities Education Psychology Mobile Learning Seamless Learning Informal Learning Inclusion Critical Pedagogy Game Based Learning Game Literacy Gamification	VR Games Pervasive games
2	HWU	Neurodevelopmental disorders Psychometric testing (IQ, tests of executive function) Research methods Statistical analysis PBL Experimental learning	Embedded intelligence VR-AR systems and applications Low-power wearables EEG technology Sonification
3	BIBA	Lesson plan development for different engineering topics Learning material development Main focus on HE, VET of Managers & employees in logistics	VR AR Tablets Diverse sensors IoT infrastructure

4	INESC	Scenario Production for teachers in France / Greece / Israel Access to pedagogical expertise through third party universities.	VR AR Unity Location-based games Procedural content generation Natural User Interaction Assistive Technologies PHP Wordpress
5	UCM	Serious game development for STEM and culture	Serious games Learning analytics E-Learning standards
6	ORT	Teaching expertise in math, IT & economy (Secondary school – graduate adults)	E-Learning Serious games E-Health Law Enforcement
7	SUCCUBUS		Serious games Interactive gaming Rendering on all modern platforms
8	ATS	Teaching expertise in IT & foreign languages	VR prototype app
9	IMA	New media psychology	VR Motion tracking systems (Kinect, etc.) Unity3D AWS WebGL
10	GEOMOTION	Advising corporations on training Corporate Learning Developing E-Learning content	VR Beacons GPS

		Game Based Learning Serious Games for vocational training	
11	Ifinity		BLE
12	Playsoft		VR 2D game development Mobile & web-based games Unity (C#) Web
13	SEBIT	Nearly 100 pedagogical experts employed Collaboration with nearly 100 academics from Educational Sciences in Turkey and USA Collaboration with Ministry of Education	VR / AR MR Mobile Cloud Social AI BI
14	HFC	Many years of experience in training assistive software solutions to individuals (one to one & group), in large and small companies, educational establishments, higher education and home visits.	
15	SIVECO	Vast pedagogical expertise. Collaborate with many teachers. E-Learning	J2EE Spring Framework, Hibernate JMS EJB, server de aplicatie JBOSS QuarzScheduler ExtJS Drupal

Table 2. Pedagogical Expertise and Technologies

3   DISCUSSION

Chapter 2 shows that we already have quite many parts that can be re-used, adapted and further developed. This chapter clusters the available means and discusses their opportunities and limitations within the components of the Beaconing eco-system as described in DoA.

Content

The existing lesson plans (see Chapter 2 and D3.3 Beaconing, 2016), learning materials and domain maps build a good foundation for Beaconing. These can be modularised to give teachers the opportunity to assemble their own lesson plan, or they can be used as they are. D3.1 requirements showed that both is of interest for the participating pilot teachers. Furthermore, D3.1 also showed that teachers are willing to share their content with others. A modularisation will also improve the possibility to adapt different elements in the lesson plan to different curricula, as they vary between the countries, states, regions and school forms. The national, regional and school form dependent curricula are known for the teachers, but necessary for the re-use of existing content and components, a taxonomy describing these in a systematic way will need to be applied. This is currently under development in D3.3. Beaconing will provide access to modules and existing material. How the access will be organised will be described in T3.5 and developed in WP 4. Additionally, an adding function will be integrated, so that teachers can add important topics missing in the template. These can also be shared with others. In time, the repository of materials and lessons plans will grow and provide insight in how different components may be used in different context. A possible way to realising this is to use "VCloud" (SEBIT) or a similar system could be used, since it is a cloud-based social LMS for device management and class management. This service can be reached from a PC or mobile device and be used, for instance, to organise and provide learning materials.

A challenge is the large variation in national and school related curricula. HWU's framework for mapping conventional VET/Craft skills lesson plans and activities to digital-analog and gamified blended lesson plans will support teachers and other lessons plans designers to overcome this challenge.

Authoring & Editing systems

The assets SUCCUBUS provides can be used as base for the whole game bundle of Beaconing. The "Happytech engine" lets its users create Point & Click adventures. In combination with "SEISM", a scenario editing tool, teachers can easily build a game on their own, which perfectly fits into their lesson plan.

Another engine, "be.MOG", is provided by BIBA, although the engine does not have an authoring tool included. Nevertheless, when the users got to know the functionality, it is easy for them to create new scenarios.

"Serious Talk" is another tool for creating scenarios for learners. It is an interactive dialog editor, where users learn the correct behaviour in diverse non-linear conversations. This could be used, among others, to learn a language or management techniques, as well as experiencing customer relations.

Playsoft supports Beaconing with a set of avatar pieces from which a 2D avatar, including head and body, can be created. There is no user interface created yet. Beaconing can reuse this as asset, and needs to develop an editor, so that users can create their avatars on their own.

"Wand" is a tool for teachers to create lesson plans and interactive material to engage their students either during class or used as homework. Its intuitive interface enables authors to create gamified content, such as crosswords, Jigsaws, hotspots, trivia and image matching very quickly. "Wand" also reports on the students' progress. It will be a good starting point for the Beaconing authoring tool. More templates will be created to give authors the opportunity to use 3D and information about geolocation in the creational process. Also, the standards have to get defined how this authoring tool shall be connected to Beaconing's LMS. The connection needs then to be integrated.

These assets and services establish a good foundation for Beaconing's authoring and editing systems. Task 3.5 and WP 4 will develop the concrete plans for their integration into the Beaconing learning environment and ecosystem. We also have access to the technology behind location-based games, as well as to cognitive games, but at the moment there is no tool for authors to adapt those to their needs.

Context-aware systems

The technology laying the foundation for GEOMOTION's location-based game can be reused to develop a curriculum related game, in which the player needs to be in specific places or has to find the shortest way. It would also be possible to use the system to ensure that a user, for example, only gets her reward when answering questions about the town hall when also being there. Also COVUNI's game "Imparapp" already uses location-based date as input to their game.

These technologies can be used as a starting point. We would then need to add a system which tracks the time and maybe the pace of the player. Like this the system knows if the player is in school, at home or on a mission and can unlock, for instance, time related quests. The pace of the user might be interesting for quests related to physics or path-finding tasks.

Communication systems

GEOMOTION and Ifinity work with BLE / Beacons, which can be used for indoor context-awareness, as well as indoor navigation, which would be helpful for visually impaired users. Beacons can also be put onto objects, which could play an important role within a game.

A global system which uses the Beacons for the Beaconing context is not set up, yet. Also missing is a system for the communication between mobile devices to the Beaconing platform.

Servers

Servers can be provided by SUCCUBUS for massively multiplayer online games, which also support virtual world customization, as well as from ATS, who contribute a virtual server infrastructure for prototyping, automated build and testing. The overall architecture will be described in more detail in D3.5, under the lead of ATS.

PBL & gaming systems

For both topics we do not have any tools we can recycle in some way. Since there is neither a platform which aims at building engagement and passion on a daily basis, nor an events platform which coordinates activities and rewards of the players, those need to be developed from scratch. Even though, there are games available for reuse and repurposing that are based

on PBL, these games are currently not embedded in a lesson plan that foresees daily engagement, they rather are stand-alone applications. Therefore, efforts are required for embedding and re-purposing these games so that they become a part of the Beaconing learning environment.

Adaptability of Beaconing components

The products and services HFC provides is a big advantage for the Beaconing project. These tools make our platform accessible for users with Dyslexia, visual impairment, dexterity issues and also physical disabilities. Their products help to adapt the PC towards the individual needs of each user and their tools also aid by breaking down tasks into simple steps and by creating mind maps, which help to plan activities. Their Speech Manager will be used to both dictate and navigate through the Beaconing portal. It is even possible to create customized commands. Their work is vital to make our product accessible for a broad range of users. Although the products are adaptable and scalable towards the project's needs, most of them are only- developed for the use on a PC. Some tools are available from a mobile device via a browser, but if the Beaconing project includes tasks, which should be executed via smartphones or tablets, it is a debatable point how users with dexterity issues, or physical disabilities are able to handle these. The tools need to be extended for mobile use or the functionality of Beaconing needs to take this issue into account.

"Doremi Cognitive Games" present a basis of mini-games for the Beaconing platform. Yet, it is a collection of games for senior users to train their cognitive abilities, which would also be applicable for learners with cognitive impairments, to train their overall cognitive abilities. The Jigsaw like game played on a tablet, could also be a training game for people with dexterity issues. Nevertheless, the functionality of the games can be used and adapted to create more appropriate tasks for learners with the target age. Especially the technology, which adjusts the difficulty of the levels towards the player's abilities, is an important element we can reuse and extend for diverse games.

UCM's game for Down's syndrome youngsters which improves their independent life can be a good example of accessibility for cognitive impaired users, as it mediates information for exactly this target group. The game will be adapted and extended to provide learning analytics.

Procedural content generation

A system which generates content statically during game play is missing yet. Depending on which kind of games we want to integrate into the Beaconing platform, this is a system we would maybe need to develop.

Analytics system

UCM offers the "RAGE learning analytics infrastructure" and "RAGE game learning analytics tracker" where geo-information data will be integrated. These tools are helpful for the Beaconing platform to provide a good feedback system for teachers and parents. Existing games, as well as the games which will be authored by teachers, would need to integrate specific learning analytics in order to connect their information to RAGE.

Interfaces and feedback

We have hardly any existing system for interfaces and feedback yet. We could extract some information and assets from existing games and systems we have access to, but a global system needs to be created. The RAGE learning analytics infrastructure will be used to provide input data, which can then be displayed as feedback to the users.

The inventory and the list of expertise show that we have a good basis for fast developing of a prototype of the Beaconing ecosystem. We expect to have the first mock-ups by month 18. This will allow us to have an extensive testing and feedback period with the small scale pilots. The results of these will be fed back to WP 3 and 4 which will adjust the components before Beaconing is rolled out for large scale testing.

4 CONCLUSION

The main goal of this document was to provide an inventory of existing resources that the Beaconing consortium can re-use, adjust and extend as well as to identify gaps between what we have and what we need.

All partners have contributed to this inventory of existing software, hardware, expertise, and learning components, which can then be allocated to the according partners.

We already have a lot of resources available, which serve as basis for Beaconing. Lesson plans and diverse learning materials, including gaming content and an interactive comic strip, can be provided, as well as a pool of games using different technology which can be recycled, adapted and extended towards our needs. Existing LMS help teachers by organising their material, devices and classes. An available authoring tool allows creating lesson plans, gamified learning materials very quickly and it reports on the students' progress. Provided engines can also be used to develop games according to the lesson plans. Included authoring tools give teachers the possibility to adapt those games towards their specific needs. A set of various avatar pieces opens up the opportunity to create a 2D avatar. The RAGE learning analytics infrastructure is useful to keep track of the progress and performance of the learners. These needs to be integrated into games Beaconing uses and also into those games which can be authored by the teachers. HFC supports Beaconing with many assistive tools to make our product accessible to a broad range of users. An available server infrastructure will be used for prototyping, automated builds and testing, as well as for massively multiplayer online games if needed.

However, even though we have an excellent starting point, there are some elements that require more work than other- therefore, the provided games need to be adjusted to the appropriate content and functionality. The context-aware system also needs some development, as well as the PBL and gaming system.

This deliverable is used as input for task 3.4 and 3.5.

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APPENDIX:

Table of Abbreviations

ATS	Advanced Technology Systems SRL
BIBA	Bremer Institut für Produktion und Logistik GmbH
BLE	Bluetooth Low Energy
COVUNI	Coventry University
GEOMOTION	Geomotion Games SL
GPS	Global Positioning System
HE	Higher education
HFC	Hands Free Computing Limited
HWU	Heriot-Watt University
ICT	Information and communications technology
Ifinity	Ifinity Spolka z Organiczona Odpowiedzialnoscia
IoT	Internet of things
IMA	Imaginary SRL
INESC	Inesc Tec – Instituto de Engenharia de Sistemas e Computadores Technologia e Ciencia
LMS	Learning Management System
MMO	Massively Multiplayer Online
ORT	ORT France
Playsoft	Playsoft
SEBIT	Sebit Egitim ve Bilgi Teknolojileri Anonim Sirketi
SIVECO	Siveco Romania SA
SUCCUBUS	Succubus Interactive
UCM	Universidad Complutense de Madrid
VET	Vocational education and training