

D5.4

E-learning gamified Smart Health app

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SHIFT-HUB: D5.4 E-learning gamified Smart Health app

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Abstract

The Deliverable 5.4 entitled "E-learning gamified Smart Health app", presents the SHIFT-HUB Smart Health app by illustrating the development and implementation of this innovative digital tool designed to foster health awareness and promote the adoption of healthy lifestyles through an engaging gamified experience. The Smart Health app is designed as an interactive platform where users embark on a personalised journey, exploiting game elements to facilitate learning and incentivise behaviour change towards healthier practices.

This deliverable explores the strategic framework in which the app has been created, including the objectives and target users together with the conceptual and methodological development process. Emphasis is placed on the collaborative and synergic process of gathering proposals and feedback, content curation and the development of a rewarding system, to finally introduce the final version of the SHIFT-HUB Smart Health app. The final product is a technologically sophisticated application with a strong focus on user-friendly design and graphics, with the aim of improving user experience and engagement along with knowledge retention.

The e-learning gamified Smart Health app developed within the SHIFT-HUB project seeks to empower people by improving their digital health literacy, promoting proactive and personalised health management while encouraging a patient-centred health ecosystem. Expected outcomes of the app include improved patient adherence to health interventions and a clear shift from reactive to preventive health strategies.

Keywords

Smart Health app; Gamification; Healthcare; Digital; Digital Literacy; Health Literacy; Horizon Europe; Deliverable.





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Abbreviations and Acronyms

Abbreviation, Acronym	Description
D5.4	Deliverable 5.4
GUI	Graphical user interface
IPPO	IPPOCRATE AS SRL
PP	Project partner
T5.6	Task 5.6
UX	User Experience





1. Introduction

1.1 Background and scope of D5.4 e-learning gamified Smart Health app

This deliverable 5.4 "E-learning gamified Smart Health app" is created with the objective of presenting the Smart Health app, the digital tool based on the gamification methodology developed in the context of the Horizon Europe project SHIFT-HUB, as well as its implementation process.

For the purposes of the project's objectives, the Smart Health app is configured as an interactive and innovative environment within which users can navigate a digital platform. Through a customised pathway based on gamification, the user will not only be encouraged to acquire healthy lifestyles but will also be involved in a learning process on issues concerning the prevention and knowledge of chronic diseases.

The gamification methodology, developed within the European project SHIFT-HUB, is an innovative solution that aims to revolutionise the healthcare sector through the integration of digital technologies in order to improve healthcare outcomes and empower people to manage their health.

In response to the growing challenges faced by the European health and care sector (e.g. the increasing burden of chronic diseases, an ageing population, the growing demand for personalised care), SHIFT-HUB project emphasises the potential of digital technologies to transform healthcare delivery.

Deliverable 5.4 takes the form of a technical document in which the concept and methodology behind the gamified application will be outlined. After a description of the goals and objectives of the Smart Health technologies, the core of the document is a description of the app development process, which includes (1) the collection of proposals, drafts and feedback in a collaborative process, (2) the joint elaboration of content, as well as (3) the rewarding system development, central to the gamified aspect of the app. The final version of the app is then described, with a focus on technical presentation and graphic design, crucial aspects for an engaging user experience.

The deliverable concludes with a summary of the results, with reference to the positive influences expected from using the app to improve approaches to health and healthcare.





1.2 Objectives of SHIFT-HUB e-learning gamified Smart Health app

The SHIFT-HUB e-learning gamified Smart Health app is a customised, cutting-edge tool that through the implementation of the gamification methodology, has the following objectives:

- To facilitate the development and promotion of Smart Health technologies and services;
- To enable the transition from reactive to proactive and personalised healthcare, emphasising the maintenance of good health;
- To improve the digital literacy and awareness of patients, citizens and health professionals;
- To promote a patient-centred approach, enabling people to actively participate in their own healthcare.

Several researches have demonstrated the beneficial potential of using gamification methodologies in the healthcare sector. In particular, the role of gamification in increasing patient adherence to prescribed treatments has been demonstrated. Specifically, it was shown how the use of scoring mechanisms, rewards and challenges motivated patients to regularly follow treatments or adopt healthy behaviours.

A study conducted by Zichermann and Cunningham (2011) showed how the use of a gamified blood pressure monitoring app led to a significant improvement in treatment adherence by hypertensive patients.

Another study by Cugelman et al. (2013) highlighted the role of gamification in promoting healthy behaviour. This study shown how the use of interactive games to promote physical activity encouraged users to acquire healthy behaviours, such as regular exercise, leading to a significant increase in users' weekly physical activity.

1.3 Target users

The e-learning gamified Smart Health app developed for SHIFT-HUB is designed for different target users categories which, based on their benefits (preventive, learning, support etc.) can be divided into primary and secondary.

Primary target groups:

1. **Patients**: The games are aimed at people who have been diagnosed with specific diseases and who can benefit from the knowledge provided by the games on topics, especially self-monitoring and self-management strategies. Game elements help motivate patients to adhere to their treatment plans, adopt healthier behaviours and actively engage in their own care.





2. **Citizens**: The e-learning gamified Smart Health app also addresses the general population interested in maintaining good health, learning about preventive actions and adopting healthier behaviour. Games become a valuable resource for people seeking reliable health information, lifestyle advice and interactive tools to improve their general well-being. Through gamification, citizens are encouraged to take proactive steps towards a healthier lifestyle.

Secondary target groups:

- 1. **Healthcare professionals**, such as doctors, nurses and therapists, can use the app as a tool to enrich their approach to patients and to promote adherence to healthy treatments and lifestyles. The e-learning gamified Smart Health app provides an interactive platform that can be used to educate patients in an engaging way, with the aim of improving understanding and management of a disease. In addition, healthcare professionals can benefit from continuous learning through updated and gamified information content that can complement their professional training.
- 2. **Healthcare organisations**, such as hospitals, clinics and care centres, can adopt the app as part of their health education and wellness promotion initiatives. The elearning gamified Smart Health app can serve as a complement to prevention and patient support activities, offering an innovative way to engage patients and improve the effectiveness of healthcare communications. The adoption of gamified learning tools can also help reduce long-term costs for healthcare organisations by improving patient self-management of health conditions.
- 3. Organisations representing patients or specific disease groups can use the elearning gamified Smart Health app to provide educational support to their members, offering an interactive and engaging means to learn and share information. These organisations can customise the gamification experience to address specific issues, promote awareness and support health awareness campaigns. Gamification facilitates member engagement and participation, making learning about health more accessible.





2. Concept and methodology behind the e-learning gamified Smart Health app

SHIFT-HUB e-learning gamified Smart Health app has been thought **to ensure the most tailored and personalised user journey** for the adoption of digitally-enabled prevention and selfmanagement solutions and for the awareness raising about the importance of preventive actions and a healthier lifestyle.

With this aim, the Smart Health app has been designed to have a single digital platform in the form of a classic arcade machine, hosting five different games. The digital platform, serving as a single interface, was developed within a HTML I-FRAME. The five different games, developed mainly with Playcanvas and Articulate Storyline 360, consists of:

- Card Association;
- Drag&Drop;
- Basket collection;
- Quiz;
- Simulation.

Each game has been associated with the most common classes of target pathologies or related topic respectively, chosen by the consortium democratically via a survey at the beginning of the project:

- Disease prevention;
- Chronic diseases;
- Cardiovascular diseases;
- Mental disorders;
- Cancer.

In this chapter, the SHIFT-HUB Smart Health app will be explained further in detail. Specifically, the process of development and the final version of the e-learning user journey will be elucidated carefully, consisting of: i. the coral and synergic work stemming from the continuous and assiduous interaction among IPPOCRATE AS (IPPO) and the consortium; ii. the content collection & award system; iii. the technical presentation and the graphic design of the final product.

2.1 Proposals, draft and feedback: a coral and synergic work

Since the beginning of the gamified Smart Health app development, IPPO team has kept posted the consortium and asked for feedback, comments and suggestions in order to get the most impactful and user-friendly educational journey.

Most of the feedback were asked during **consortium meetings**, while partners were asked for comments via **email** only once the gamified e-learning was almost finalised or considered final. The choice of collecting feedback from the consortium via online meetings for the first months of the Smart Health app development falls under the belief that being already there participating in interactive discussions make project partners







(PPs) **more involved and focused**, willing to engage and to provide **feedback promptly**. However, IPPO shared with the consortium all the materials developed since the beginning in the SHIFT-HUB shared Teams environment, in order to allow free access and potential further comments from PPs.

Since July 2023 and on, IPPO has exchanged ideas and comments with **S2i** – coordinator and WP5 leader – **bilaterally**, in order to understand, and thus set, the most suitable footprint from which the Smart Health app was going to be developed.

During a **consortium meeting** held in December, IPPO presented for the first time to the consortium **the gamified e-learning Smart Health app concept** – having a single environment with access to the five different educational games. By receiving a **coral approval** from the consortium, six different educational games have been diligently presented, and one has been excluded democratically as it resulted less attractive than the other options. In addition, IPPO described the **association made between the educational games and the five different health-related topics** chosen by the consortium at an earlier stage, outside T5.6, and the **consortium approved** sharing positive comments.

IPPO started working on the development of the Smart Health app, and specifically on the five educational games. Systematically, with the purpose of being transparent and collaborative, IPPO has been **showcasing the progress on the Smart Health app development** firstly during the **WP5-related meetings** – where all the PPs involved in WP5 activities participate – and subsequently during the **Executive Committee meetings**, which at least one representative per PP take part to. Of course, **communication with S2i** was kept active, via email and/or videocalls.

Every time IPPO team showcased the technical progress, it asked for **suggestions and comments** from the SHIFT-HUB consortium in order to facilitate a **collaborative atmosphere** and a **smooth exchange of ideas**. Fortunately, thanks to their professionality, PPs have been **very active and involved**, resulting enthusiastic about the potential outcome of the Smart Health app. PP engagement made easier for IPPO the development process, as each comment on how to improve the Smart Health app was an additional input to be noted, thought on and discussed within the consortium and later within IPPO's **technical department** further, by analysing and taking into consideration technical limits, side effects and potential new alternatives.

By collecting comments and suggestions on **technical settings**, **content**, **graphic layouts** and **elements**, it was possible for IPPO to provide the consortium with an almost final prototype of the educational games. IPPO team asked for feedback from the entire consortium via email (1st via email round of feedback), leaving them 8 days to play such elearning games, analyse them and check their functionalities. 5 out 11 (IPPO excluded) PPs shared their feedback with IPPO, by analysing game by game. Collected feedback was noticeably **positive and encouraging**, but also **constructive** as it helped to make IPPO aware of technical aspects that could still be improved. Regarding the lack of comments from the other PPs, IPPO team assumed they all checked the game and had no further suggestions from the ones provided by the others.





IPPO developed a **Word file to report PPs' comments and sum them all up**, with the purpose of keeping track of PPs' effort and depicting a clear overview to be forwarded to IPPO's technical department.

After this 1st via email round of feedback, IPPO implemented the needed and requested changes diligently. Once each improvement has been implemented and tested, IPPO asked for a **2nd via email round of feedback**, by leaving PPs 7 days to play the games and test them. The feedback received was extremely positive and only a few minor bugs were reported.

By using the same template to report and sum the comments up, IPPO gathered the feedback received and forwarded them to its own technical team, who assiduously fixed the reported inconsequential defects and cosmetic glitches.

Eventually, the final version was then ready.

2.2 Content collection & Award system

With the abovementioned established objectives, a relevant process for the development of the SHIFT-HUB Smart Health app is the **knowledge content generation and definition**. The truthfulness and clearness of the included notions are essential for the success of the app; this is a strategic activity as false or ambiguous concepts would inject misconceptions into the general audience and patients' minds with unpredictable consequences. For this reason, this task took longer than expected.

Particularly, IPPO coordinated and carried the out the Task 5.6 diligently – by realising that its technical expertise could not include and cover the knowledge content development. For this reason, IPPO discussed the issue with the consortium and asked for the contribution from all PPs, and created and Excel file to be used internally, where each game had its own Excel sheet where the game logic along with content collection instructions have been clarified.

- 4	A B C	D	E F	G H	1
1	WP5: Stakeholder engagemer managem	t and community ent	Gamified user journey for the	T5.6: adoption of digitally-	enabled Smart Health solutions
	Leader: P1	\$2i			
2	Purpose			Game instructions	
3	As stated in the AS, TS.6 involves creating adoption of digitally-creatied prevention an	a gamified user journey for the I self-management solutions. This	The game will be applied to the theme of <u>DISEASE PREVENTION</u> : 2. <u>Card Game Association</u> this game is based on the association between two Cards; 3. Such and can game set tasks or pictures; 4. Players will have to associate compatible cards with each other; 7. <u>The mean and with the set of the the theory and the proceeded</u>		
4	document is interned to collect content (questions and answers) for inclusio within the serious games.		 In geme ends when each card has been associated with another one Deadline: by 22 December For any suggestion or doubts, don't hesitate to contact Giulia Corso (epo_15@)ogroup.eu and project 	ts@jogroup.eu)	
5			1		
6	Card game Ass	ociation			
7			Content example: E.G.		
8			One card can show battered lungs, the other one a smoking person.		
9					
10 11					
12	Partner Card	1: Type of content	Card 1: Content	Card 2: Type of content	Card 2: Content
13	S2i	Text	When you are sick with an infectious disease, if possible	Text	stay at home and rest, avoiding to sprad germs.
14	S2i	Text	When you are sick, always	Text	cough or sneeze into a tissue or your shirt sleeve-not into your hands.
	4				https://www.nevels.com/de-de/foto/hand-hadezimmer-seife-sauher-394
		Prevention	Thronic Dispasos Cardiovascular Dispasos Montal Disc	rdors Cancor	

Figure 1: Content collection - internal Excel file







After discussing the setback with the consortium, IPPO developed the Excel file with the purpose of making it as clear, comprehensive and intuitive as possible, and presented it to the consortium at the beginning of December. It resulted into a **joint desk research effort** and a final collection of relevant and truthful content which took longer than expected – slowing it down by one month, as due to the lack of related expertise each partner encountered difficulties in combination with their simultaneous vivid engagement in SHIFT-HUB other activities. Always with the purpose of adopting a high-quality content, IPPO asked the consortium to take advantage of its network and involve an expert able and willing to cross-check the content we provided.

SHIFT-HUB PP, COPAC, consisting of a patient organisation, committed in this activity and after screening its list of contacts asked Dr. Daciana Toma, vice president of Romanian Society of Family Physicians, to kindly assess the quality of the content and verify its correctness and accuracy. Dr Daciana Toma kindly accepted, assessed the content and provided comments and corrections when needed.

Another relevant sub-task is related to the **award system**, which has to be integrated to the Smart Health app, as stated in the Grant Agreement:

"A virtuous behaviour will be emulated via gamification and **rewards** for which [...], **partnerships with consumer brands** in the field of nutrition, sports, wellbeing able to offer prizes and discounts will be sought."

Since the start of T5.6, the idea of a rewarding system drew the attention of IPPO, given that some subsequent sub-tasks are worthy of particular interest: from the number of companies to be involved, the approach to adopt with them, to the possible legal aspects and agreements to make. In order to reach a high number of interesting and interested companies, IPPO prepared an Excel file – appropriately described – where PPs could insert multiple information, including the names of identified companies clarifying their field, whether they have been contacted and the feedback received.











The Excel file was presented at the beginning of December; however, this subtask generated a concern and a lively discussion on the possible need for a legal agreement with these consumer brands. This matter was firstly discussed between IPPO and S2i, and later among the entire consortium. It was decided to first contact a list of consumer brands in order to assess their responsiveness and interest. The different discussions and debates postponed and slowed down the process.

This activity was carried out by IPPO, as task leader, which contacted via email more than 50 companies in the field of nutrition, sport and wellbeing from EU countries, with a special focus on Italian companies. Unfortunately, only one company appeared to be willing to explore deeper this opportunity.

Given the difficulties encountered and addressed, together with the tight time at our disposal, IPPO opted –after PPs' approval – to implement a rewarding system that includes suggestions on:

- 1. Relevant health-related **apps** and **solutions**, helping users to adopt a healthier lifestyle;
- 2. **Educational resources** on health-related topics, oriented to the improvement of digital literacy and health literacy.

Of course, the direction taken so far will be further explored and could be re-oriented during the lifespan of SHIFT-HUB.

2.3 Final version: technical presentation and graphics

2.3.1 Technical presentation

SHIFT-HUB Smart Health app – accessible <u>here</u> - presents a **single digital platform**, serving as a navigation interface, into which the **five games** are accessible and playable. The development of the single comprehensive navigation interface posed significant effort, due to the use of diverse technologies for the games development. The most suitable, intuitive and user-friendly solution was the integration of various HTML elements to ensure that both navigation and gameplay could be accessed from a unified channel. Central to this integration was the use of an HTML I-FRAME containing the navigation for all game pages within the app. Additionally, for UX (User Experience) purposes, it was created the "Play Now" page – visible through the classic arcade cabinet screen – in PHP, HTML, and JavaScript, along with a game selection page – accessible by clicking on "play now" button, both embedded within an I-FRAME. Once more for UX purposes, JavaScript functionality was implemented to enable full-screen mode and a return button to the game section. All Smart Health app pages were developed by using PHP, to which graphical elements were integrated by using HTML and CSS.

The navigation within this section involved loading pages dynamically within the same I-FRAME container, offering a seamless UX that simulates continuous gameplay without the traditional full-page reloads associated with the traditional and classic web navigation. This approach ensures a cohesive and immersive environment for users interacting with the games, enhancing the overall usability of the Smart Health app.





Thus, within this single digital platform, the five different games will be accessible and ready to play. Specifically, these games were developed by using two different pieces of software:

- Playcanvas (<u>https://playcanvas.com</u>); and
- Articulate Storyline 360 (https://www.articulate.com/360/storyline/).

Playcanvas is a platform that allows developers to create games, applications and interactive content directly in the web browser, mainly using web technologies such as HTML5, JavaScript and WebGL. It supports high-fidelity 3D graphics and audio integration to enhance the gaming experience. Playcanvas integrates a physics system to simulate realistic interactions between objects in the game via external libraries, in particular it mainly uses Ammo.js, an open-source library that provides a 3D physics simulation. It can be used to simulate rigid body dynamics, e.g. to handle collisions, friction and gravity, and is considered one of the best and most comprehensive libraries available, especially for web use. It allows games to be published directly on the web or distribution platforms such as browsers, mobile devices and social media.



Figure 3: Playcanvas editor

Articulate Storyline 360 is a cloud-based platform that allows developers to create interactive and engaging online courses, simulations, quizzes, and other learning content. These contents can be structured using slides and a layer system, integrating audio and video, and enhancing them by adding captions, characters, pan and zoom effects, and also interactive elements, like buttons, dials, sliders, markers, and hotspots. Animations and interaction can be added using pre-built triggers and personalised JavaScript code.

They can be published in various formats, including SCORM to insert them in a LMS system, and HTML5 to run them through a web browser using a responsive player, in order to be accessible on any device with internet connection.







HIL HOME INSERT SLOES DESIGN TRANSITIONS ANIMATIONS VIEW HELP DESIGN	0
🖾 STORT VEW 🛛 Q1.1 Drag an ×	
Scenes 5	Question - A
Toestin Ruk •	Form View Slide View
	Triggers - 5
	Slide Triggers 2
	 Slide - Q1.1 Drag and Drop
	Execute JavaScript When the timeline starts on this slide
	Set state of carts1 to Normal When the timeline starts on this slide If card1 = value True
	Set state of carta? to Normal When the timeline starts on this slide If card? = value True
	Set state of carta3 to Normal When the timeline starts on this slide If card3 = value flue
	Set state of cartal to Normal When the timeline starts on this slide If cards = value from *
Timeline States Notes New 🖞 * 5	Slide Layers - 🖻
	* 😰 card24 *
criticit main encantrial chain	and card23
contail imagentaic char	terre card22
cata22 isi orizontak char)	card21
contail contail contail	ard23
cata23 ind entertaile chiat.	
● [adu31] [adu	D 🖉 🛈 🗸 Dim 🗘

Figure 4: Articulate Storyline 360 interface

Languages: the ones used for the development of these games are:

HTML5: for the game structure and user interface;

PHP: for the digital platform pages development;

JavaScript: for game logic and interactivity;

WebGL: for 3D rendering within the browser (only for Playcanvas);

CSS: for game styling and presentation.

System requirements: in order to make the SHIFT-HUB Smart Health app and its games as accessible as possible, to play the app is only necessary a stable internet connection and a web browser, modern enough to execute WebGL. For some mobile devices, it is necessary to check that JavaScript execution is enabled.

Security: SHIFT-HUB app and its games have been designed to be played without requiring personal data to the players; this has been decided with the purpose of avoiding the risk of stolen data. When the player completes one of the games, a script redirects the user to a protected page of the website that manages the delivery of awards. The only data collected by the game are related to the number of times the game has been executed in order to generate final statistics. Statistical data are collected in a database protected by password and accessible through a VPN, and reachable only by the system administrators.

Network and storage: all games are hosted into the project web space and accessible to users by clicking the corresponding button on the dedicated section. Every user has a specific game session that uses browser storage space during the level, and clears all data when it finishes.

Integrations: SHIFT-HUB educational journey is integrated with the website through an I-FRAME; the user has the possibility to get the award by clicking the link at the end of the game and will be redirected to a dedicated page. The page checks if it is loaded after the





game has been successfully completed and keeps a list of allocated coupons and related emails, to prevent a user from claiming other awards inappropriately.

Preloading page and general design: The Smart Health app games start with a loading screen that displays the project logo and a bar showing the loading progress. Background is flat and with a dark neutral colour.



Figure 5: Preloading screen

The main screen shows a wood table with some green elements (buttons, labels, etc.) and in some scenes a white area in which the elements are placed. Around the screen, there are some design elements, like a cube or a joypad.



Figure 6: Graphical common elements

Technical specificities of each foreseen game are listed below.

Game 1: Card Association – Disease prevention

Developed with Playcanvas, the aim of this game is to recompose sentences by matching two cards according to the logic of a Memory. The camera shows a wooden table on which the cards are placed and is set in orthogonal projection to render a 2D effect, while a script





allows animations on the cards that rotate when selected. A light system that illuminates the entire environment completes the effect of the scene.



Figure 7: Main screen of Card Association game

At the top of the page, there is a green block that shows the user the score; at the top-right side there is a button "matched cards" that – by clicking – shows the user a layer with the already matched cards.

	A way of living that reduce the risk of	\otimes
What is a healhy life?	getting sick and dying prematurely	
Practicing good dental bygiene, including regular brushing and flossing	is essential for preventing tooth decay and gum disease.	

Figure 8: Layer with matched cards

The user has to click two cards using the mouse, or tapping the screen on a mobile device, and try to match two parts of a sentence; if the cards are correctly matched, they disappear and are visible in the dedicated layer, vice versa cards return covered on the table.

The scoring system and the management of the already uncovered cards made it possible to create a complex project both in terms of graphics and scripting. The scoring system is script-based, and allows the player to receive positive points in case of success, and nothing in case of failure. There is also a randomness system, which allows each time the game is





reopened to have a different set of 20 cards in different positions from the previous one, to increase playability.

At the end of the level, a screen shows the user the total points and a restart button, which allows the user to reload the page and start the game again.



Figure 9: Card association - Final results

Game 2: Drag&Drop – Chronic diseases

Developed with Storyline, this game shows a set of cards that must be divided into two groups according to the correctness of the statements in them. The main screen shows two areas where you can drag and drop the cards, available at the bottom of the screen. A script makes 12 cards appear randomly. Clicking on each card shows a layer with full-screen text (figure 9). Dragging and dropping the cards is done by mouse on laptops and by swiping a finger on mobile devices. At the end of the game, the cards issued in the right section are counted and if the score exceeds the minimum threshold, the final screen is shown.









Figure 10: Main screen of Drag&Drop game



Figure 11: Layer with details of a card in the Drag&Drop game

Game 3: Basket collection - Cardiovascular diseases

Developed with Playcanvas, this game shares many of the features of the first game, in terms of graphics and scene setting. It is based on collisions: a basket in the centre of the scene can be moved by dragging it with the mouse, or by dragging it from the touch on the mobile device screen.











Figure 12: Main screen of the Basket collection game

A series of images descend along the screen and the player has to collect in the basket only those considered "good habits". The images have a script that allows for total randomisation, so the level is always different every time it is played; the whole animation lasts 1 minute, at the end the screen showing the score and the restart button pops up. The basket has an internal collision system, invisible to the user, which allows the cards that enter inside it to be destroyed. When the basket and the picture collide, the system gives positive or negative points depending on the choice made by the user.



Figure 13: Collision between the basket and a picture

Game 4: Quiz Game – Mental disorders

Developed with Storyline, this game is designed as a multiple-choice quiz. Each question has 3 possible answers but only one is correct and gives 10 points, one is partially correct



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and gives 5 points, and one is totally incorrect and gives 0 points, and there is a layer with different colour and feedback messages as shown in Figure 15.

WHAT IS A COMMON FEATURE OF POST- TRAUMATIC STRESS DISORDER (PTSD)?
Fear of social situations
Flashbacks and intrusive memories
Rapid mood swings
CONFIRM

Figure 14: Main screen of the Quiz game



Figure 15: Layer with feedback for each question

A script randomly takes 10 questions from a pool of 18 and displays them in random order, the answers are also shuffled for each question; in this way the game is presented to the user differently each time it is run.









Figure 16: Final screen with feedback for the player who won

The final screen shows the total score and feedback, giving the users the possibility to go to the awarding page if the score reaches the minimum value, otherwise restart the game.

Game 5: Simulation Game - Cancer

Developed with Storyline, this game is designed like an interactive scenario. The first screen maintains the wooden table, and the player can choose the character that wants to play.



Figure 17: First screen of the Simulation Game

A script randomly takes 10 questions and displays them in random order; each question has 2 possible answers that are also presented in random order.

The design of this game is different from the others because it represents the hall of a hospital in which some people arrive and ask some questions to the doctor. Each question





is introduced by a random character and the user has to select one answer, by clicking the related balloon.



Figure 18: Random question in Simulation Game

The correct answer gives the player 5 points, the wrong one removes 5 points to the total. At the end of the game a screen shows the final score and feedback; if the score reaches the minimum value, the player has the possibility to go to the coupon page or exit the game clicking the button, otherwise restart the game.



Figure 19: Layers with feedback to the answers provided









Figure 20: Final screen with feedback for the player who lost

2.3.2 Graphics design

This section of the document provides an overview of the chosen **graphic design** for the developed gamified e-learning Smart Health app.

The overall goal was to create a **visually cohesive and engaging experience** while promoting health awareness. During the development of the gamified Smart Health app and the including five games, two **key aspects of the design** were kept in mind:

- simple and intuitive user experience;
- cartoony and less formal graphics.

The graphic design of the single digital platform, serving as navigation interface, is characterized by a clean and flat aesthetic that resembles an **old game cabinet**. The layout is simple and well-organized, presenting a clear hierarchy of information. The use of game-inspired elements, such as background grids throughout the page, effectively conveys the purpose of the webpage.

To enhance the immersive gaming experience, users play on the screen of the game cabinet. By pressing the "Play now" button, users can choose from a selection of five games available and described throughout the current report. Once a game is selected, it starts playing on the screen after a brief loading period.

Furthermore, the game cabinet screen features two additional buttons. One button allows users to reload the page and choose a new game, while the other button enables them to play the game in full-screen mode, enhancing the overall gaming experience.









In addition, the webpage is designed to be responsive and adapts seamlessly to different devices, including tablets and smartphones. On these devices, it is necessary to switch to landscape mode for optimal viewing.

Essential features of the graphic design are the **colour** and **font** adopted, explained in detail below.

Colour scheme

The colour scheme for the app and its games is **based on the SHIFT-HUB logo** and primarily utilises shades of **green** taken from that. Green is **often associated with health, well-being, and nature**, making it an ideal choice for a theme centred around **smart health technologies and services**. This Colour scheme not only reinforces the core message of the games but also creates a visually harmonious environment.

By using a consistent colour palette across all the games, a sense of **coherence and unity** is achieved. It helps players establish a **visual connection among the different five minigames** and fosters a seamless gaming experience. Moreover, it adds visual interest and assists in conveying important information, such as differentiating between "GOOD" and "BAD" sorting columns in the Drag&Drop Game.

Font selection

The choice of the **Grandstander** font is motivated by the desire to maintain a playful and less formal tone throughout the app. Grandstander has a **friendly and inviting appearance**, which aligns well with the goal of creating an engaging and enjoyable gaming experience. This font adds a touch of whimsy and enhances the overall visual appeal of the games, making them more approachable to players. **Grandstander**, as choice of typography, helps differentiate this section from the rest of the website and creates a more relaxed learning environment through the use of simple games.

Image usage

The use of **flat and/or cartoon-style images** serves multiple purposes in the graphic design of the games. Firstly, these types of images are easily recognisable and relatable to a broader audience, including **players of different ages and backgrounds**. They **simplify complex concepts** and make them more accessible, facilitating understanding and engagement.

Smart Health app games specificities

With the purpose of delving into the details of the Smart Health app, below a specific description of each game foreseen in the e-learning journey can be found.

Card association

In this game, players **match cards based on logical textual relationships** to raise awareness about health topics. The graphics feature a **simple board on a woody background** with cards on top of it and a really **simple graphical user interface (GUI)**, making it easier for a wider audience to understand and engage with the game.

Drag&Drop





Here players are presented with **cards** at the bottom of the screen that contain texts and must place them **in the correct column** labelled "Correct" or "Wrong" based on their content. The use of **colour differentiation** in sorting tables facilitates understanding and adds visual interest. Due to space limitations, it was decided to slightly overlap the cards on each other, which creates a more realistic and familiar scenario. Since this could lead to some difficulty to read texts, it was decided to include the possibility of clicking on each card so as to see it at a larger size.

Basket collection

In this game, players are tasked with **collecting photos of healthy habits** while avoiding unhealthy ones as they fall from the top of the screen. Here too the GUI is very simple with a **wicker basket that players can move** around the screen to collect the falling photos.

Quiz

A very simple but effective educational game in which players test their **knowledge on health-related topics** by answering questions by choosing between **3 possible answers**. The graphics are calibrated to give a flexible and visually captivating layout regardless of the length of the texts both in the answers and in the questions.

Simulation Game

Probably the most complex one, in this game, players **assume the role of a doctor** and **must respond appropriately to patient's plausible questions**. The graphics have been thought to make the prompt detection easy for players when a correct or wrong answer is given. Of course, the visuals assist synergically the use of explanatory feedback icons to further facilitate understanding. The **characters**, whether patients or doctors, **take different poses** based on what they say at that moment. In this way, the simulation is more engaging and understandable.





Deliverable 5.4



3. Conclusion

The 'Smart Health app' developed within the SHIFT-HUB project and the subject of deliverable 5.4, emerges as an innovative, cutting-edge ecosystem aimed at improving health awareness and promoting healthy lifestyles through a gamified experience. This tool is part of a growing need for proactive and personalised health interventions, effectively responding to the challenges posed by chronic diseases, an ageing population and demand for personalised care by aiming to transform the way users interact with health information, promoting active and continuous engagement.

In fact, personalisation of the user experience is at the heart of the Smart Health app: each user is guided through a tailor-made journey that not only meets their specific information needs, but does so in an engaging way, using gamification as the main tool. This approach not only increases user interest and participation, but also stimulates a profound behavioural transformation towards a healthier lifestyle.

Gamification, in this context, proves to be essential, not only making the app more attractive but acting as a strategic lever to stimulate lasting healthy behaviour. Playful elements such as missions, challenges and rewards turn learning into a fun and motivating experience.

From a strictly operational point of view, the design and implementation process of the mini-games required an intensive and multidisciplinary collaboration between the development team and health experts in order to validate the proposed material and refine every aspect of the game system to ensure not only educational compliance, but also an engaging user experience that can translate into a real improvement in lifestyle habits.

Ultimately, the Smart Health app emerges not only as a health education tool, but as a real catalyst for a change in behaviour and approach to personal health. With a focus on personalisation and engagement through gamification, the Smart Health app stands at the forefront of innovation in digital health, promising to positively influence both prevention and management of health conditions, shifting the emphasis from a reactive to a proactive and preventive approach.





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E-learning gamified Smart Health app









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