
*Pathways and Supporting Apps*

*2019/08/31*

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# Abstract

This deliverable supports the activities related to the Task 5.6 and describes the practical implementation of the pathways of well-being and of the interfaces that supports the different pathways. In particular, the NESTORE Coach app is presented as demonstrator of T5.6 and of the NESTORE Coaching system.

In this task, wellbeing pathways are designed to guide the user towards the personal goals, as defined in Task 5.1. This task also implements the NESTORE app that will support the coach intervention in the selected pathway. In particular, the Coach App provides a detailed visualization of the user progress in the different dimensions to empower the user through self-monitoring as well as a system for self-reporting information that cannot be automatically measured through the wearable and environmental sensors or through the analysis of the interaction with the coach.

In the first part, we describe:

- which design strategy we have chosen to follow for this project;
- the identification of the users of NESTORE with their characteristics;
- the NESTORE Identity definition and design, which we adapted to future users to be recognizable and valuable. We defined colours, fonts and tone of voice in order to succeed in NESTORE goals.

After this analysis, strong motivations led us to design clear, dynamic and intuitive User Experience to entertain. We explain our choices in the second section.

The third part describes the Wellbeing Pathways that were thought to be the main focus of users' activity.
Pathways are divided into four categories: physical domain, nutritive domain, cognitive domain and social domain.
Every domain has different goals to reach and a lot of activities, exercises or games that the user can make to improve his life habits.

# Key Words

Pathways; Identity; UX; Design; Health; User-centric; Physical domain; Nutritive domain; Cognitive domain; Social domain

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# 1 Introduction

In this document, we summarise the results of outputs from Task 5.6 within Work Package 5, whose main objective is "to design the interaction with and to develop the interface for a personalised coach and the ecosystem of NESTORE resources".

The ambitious goal of the project is to exploit the potential of technologies to support, assist, and guide the community of older adults to engage in virtuous and healthy behaviours. Following a methodological approach based on co-design, we developed the pathways of wellbeing to meet the user's preferences, and we designed the user experience to be suited to the community's characteristics.

## 1.1 Interlinks with other Work Packages

Deliverable 5.6 has its focus on the design of the Pathways of Wellbeing, the User Experience and the app ecosystem, to guide the user towards his personal goals, as defined in Task 5.1. The design of the pathways is based on behavioural change techniques individuated in Task 5.1. The original design of the pathways has been refined in this task and a various number of coaching activities have been defined in a co-design process that involved users (T7.1, T7.2 and T7.3) and domains experts. Such activities involve also other elements of the NESTORE ecosystem, including sensors (WP3), tangible coach (T5.3), the serious game (T5.5) and the social platform (T5.4). All the coaching activities proposed in the NESTORE Coach are orchestrated by the Decision Support System (T4.4).

In the Physical domain, the app allows to communicate with the wearable device (Task 3.1), through the WoT agent, which keeps track of everyday activities.

In the Nutritional domain, the food recognition system is integrated with the app to collect data about the nutritional habits of the user (Task 3.3). A smart weight scale is used to track the user’s body weight (Task 3.2).

Among the Cognitive domain, serious games are provided for continuous engagement and cognitive, physical and social well-being (Task 5.5).

In the Social domain, beacon sensors are used to track family and friends visits and the user’s home (Task 3.2). The social platform is dedicated to the offering of various activities and events that might improve or expand the user’s social life (task 5.4).

# 2 NESTORE User Experience

## 2.1 NESTORE Identity

We created a coherent identity for NESTORE, based on users' necessities. The logo is inspired by the mythological figure of NESTORE, known as the wisest greek king during the Trojan War.

We used yellow and orange as primary colours, positives, easy to read and to distinguish. The same motivations guided the choice of the font and the design of the menu. We made clear and intuitive features to provide an effective UX, appropriate to the community of elderly people.

## 2.2 UX approach

We used the same approach to design the different areas - Experience, Connection, Engagement, Moments, Emotions and Behaviours - that we can synthesise in nine points:

- Users come first: the user must be satisfied, physically and emotionally, by NESTORE. The NESTORE Coach App is designed to be user-friendly, easy-to-use and pleasing to the eye. For these reasons each visual element has been designed taking into account the user.
- Ask, don't tell: the system is always ready to listen to users' requests.
- Help, don't impose: NESTORE exists to help, not to sell or impose something to the users. The purpose of the system is to help users to synchronise their personal goals with wellbeing and healthy ageing goals and help them to visualize the needed steps to improve or maintain their lifestyles (healthy habits).
- Map the journey: to help we have to understand. We map the user journey to analyse the touchpoints between

the system and users to engage them better.
- Be authentic: consistency is the key to engage people. NESTORE system is based on convincing storytelling that respects the project goals.
- Stay memorable: the only way to be memorable is to be present in every moment of users' life. For this reason, we have created omnichannel information systems. The NESTORE App System is designed to be present in each moment of the user;
- Put human touch: an experience can't be only digital. We didn't forget to put a human touch into the relationship with real people.
- Act before react: the best way to shape a memorable UX is to adopt a proactive approach (eliminating problems before they have a chance to appear )
- Don't treat all as one: one-to-one communication and tailored experience are the keys to user retention.

Our UX designers had to face some common challenges in the healthcare systems, which are:

- Keep simple Wearables interaction and Data Visualization: make data understandable, prefer insights to simple numbers and avoid complex interactions;
- Engage and entertain users to give them a feeling of safety by balancing the interaction effects between digitised content, information coming from the environment, and the feeling of the users themselves;
- Make efficient and satisfactory interaction with Artificial Intelligence components that have a high potential in healthcare but also represent a significant challenge.
- Face the new features offered by the Voice User Interfaces that can improve the user experience in terms of engagement and practicality, and help users with physical issues.
- Support the need for personalisation with the correct selection of information to give: the system performs better if providing an understandable language along with little personalised tips that make the whole experience quite humane.
- Use the correct communication tone because users of healthcare related systems need to become more aware of their overall wellbeing and of what lifestyles are beneficial to improve their healthy ageing and wellbeing, understanding the risks and adapting messages to their health literacy level.

The NESTORE User Experience is based on the five major principles of interaction design, defined by the Encyclopedia of Human-Computer Interaction. In short:

- Design involves changing situations by shaping and deploying artefacts;
- Design is about exploring possible futures: analytical and critical studies focus on that which exists, whereas design concerns itself with that which could be;
- Design entails framing the "problem" in parallel with creating possible "solutions";
- Design involves thinking through sketching and other tangible representations;
- The design addresses instrumental, technical, aesthetical and ethical aspects throughout.

## 2.3 User Journey

The User Journey is divided into two different phases.
The first one, the Assessment phase (two weeks), is focused on analysing user's habits and abilities, in order to offer a personalised multi-domain pathway to wellbeing. At the end of this phase, the user chooses her pathway based on NESTORE recommendations given by the DSS and commits to the goals to be reached in each domain.
In the second one, the Coaching Phase, the user follows the coaching plan that NESTORE proposes to the user, through a series of coaching events.
In the end, the subject can repeat the program or choose another pathway.

Assessment Phase (Motivational) (2 weeks)

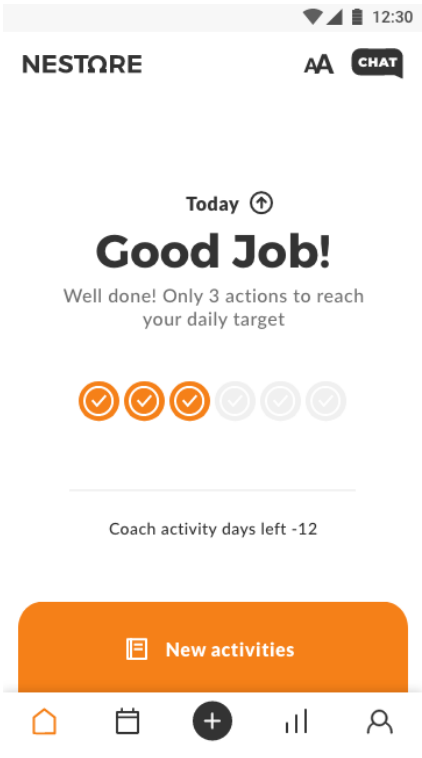
- The system analyses user's physical, mental, emotional and nutritional habits and abilities through tests and activity tracking, to design the ideal offering, in terms of activities and suggestions.
- NESTORE helps the user to learn about the system through tutorials and guides.
- The system finally offers various pathways for each domain, highlighting the option that best fits the user's physical and cognitive condition, although the subject can choose freely.

Coaching Phase (Volitional) (12 weeks)

- The Virtual Coach suggests the best strategy (maintain or improve) to join the Pathway of Wellbeing , considering the results of the assessment phase.
- The Virtual Coach introduces the program (user status and goals) and gives to the user the basic suggestions and information needed to achieve the pathway goals (i.e., walk, cycle, run, eat well, etc.);
- All the information is always available in the NESTORE Coach app;
- Day by day suggestions are provided to support the user through his/her pathway to wellbeing; structured activities can be added to the calendar;
- The Virtual Coach suggests which activities to complete and tracks user's signs of progress through automatic monitoring or manually reported activities;
- The user collects points every time he/she completes an activity; the adherence rate measures the coherence with the pathway;
- The Coach gives suggestions about events useful to reach the user's goal, providing links to the Social Platform website;
- The Coach gives feedback to the user to fine-tune his/her journey;
- At the end of the Coaching Phase, the coaching system gives the final feedback;
- This Coaching Phase can be repeated at any time.

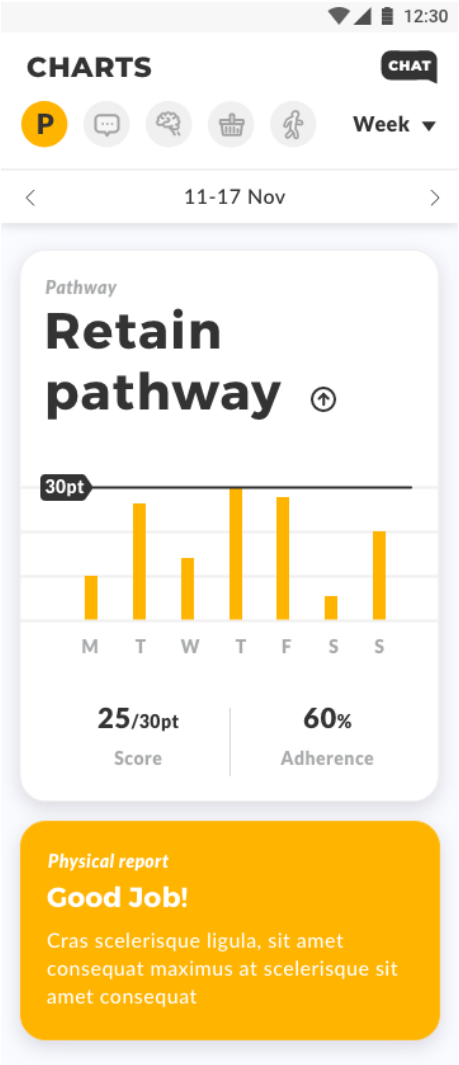
## *2.4* Application design

The first time the user opens the NESTORE App, the system displays the onboarding process: the user is required to log in or register to the system. Once users have registered, they land on the Homepage where contextual tips help users understand the system.




The Homepage is structured as a summary of the user's status: if they are attending the Assessment Phase, the system displays new activities to complete. If they are attending the Coaching Phase, they see a general chart about their daily achievements; they can also swipe up to access suggested new activities.
In the top right corner, there are two buttons: one leads to the Chat, where they can interact with the chatbot answering surveys about activities and general wellbeing, playing one of the serious games (Task 5.5), and receiving reminders about the nutritional and cognitive domains. The other button allows the user to modify the font size, according to their needs.
At the bottom of the page, the user can access the Menu and go from one section to one other at any time.
The Menu comprises five buttons: the Homepage, the Calendar, the Plus, the Chart, and the Profile button.
Calendar Section: the calendar section of the App allows the user to visualize their scheduled activities and delete or reschedule them.
Plus button: once the user taps the Plus button, they see four icons that lead to different actions. They can take a picture of their meal, using the food recognition system (Task 3.3), report water assumption, visualize and play cognitive games (Task 5.5), and see the available events nearby.
Charts section: on the top of the section, five buttons lead to different areas of the Chart section.
The Pathway area displays the adherence score to the selected Pathway, with details about each domain. Data is available on daily/weekly/monthly visualization, together with a weekly report about the user's progress and insights on their improvement through the month.
The Social area displays two types of information: the first one is about self-reported data, regarding the number and type of social interaction and the feeling of loneliness. The second one concerns data collected from other devices: the environmental sensors collect information about the social interaction with relatives and friends; the tangible device collects data about general feelings and emotions. In this section, users can access only weekly or monthly visualizations.

The Cognitive section displays two types of information: self-report data, collected from surveys and questions via the Chat, and insights from the serious games (Task 5.5). In this section, users can access only weekly or monthly visualizations.




The Nutritional section organizes the information according to the selected Pathway. General and personalized data about the nutritional program are available at any time. Data is available on daily/weekly/monthly visualization, together with the comprehensive report displayed in the pathway section.
The Physical section displays various information regarding the user's physical status. The "my fitness score" concerns the general wellbeing and comprises structured and unstructured activities, which data can be visualized in the following cards. Also, the user can access information about their sedentariness and sleep quality. Data is available on daily/weekly/monthly visualization.
The user can choose to visualize the charts of each day, week, or month.

- Day:a graph includes the score, composed of the points collected from all the suggested activities, with an adherence rate (physical and cognitive domain) that shows the user how close they are behaving relating to the selected pathway. With a simple tap, the user can see in details the points collected among each domain;
- Week: a chart shows the progress throughout the week, in terms of score and adherence rate, together with a text card that encourages the user to keep going with the current program;
- Month: in the monthly visualization, the chart shows the general trend of the program. Also, there is a summary of the badges earned during the month and the progress across each domain.

In order to facilitate older people reading and understanding the charts, it has been chosen a palette of contrasting colours, coherent with the NESTORE identity. Also, the use of green, yellow, and red facilitates the understanding of the meaning of data.

Profile section: the user can visualize or update their personal data, change language settings, access to the App notification system and get into the notification page about the Social Platform ( Task 5.4).

# 3 The Pathways of Wellbeing

The design of the Pathways of Wellbeing [1] aims to allow older people developing healthy behaviours ageing with the help of the NESTORE Virtual Coach.

According to the definition provided in D5.1, "a pathway is a process of pursuing a high-level goal to which the user will commit at the end of the motivational phase".
Each pathway comprises various activities that span across the four domains: physical, nutritional, cognitive, and social. The user chooses her/his own pathway at the end of the 2 weeks daily assessment. For each domain, NESTORE Coach proposes 2 to 4 possible (sub-)pathways among which she/he has to choose one, based on her/his preferences about the coaching activities that are proposed for each pathway. The pathway is also adapted and ranked according to the user score calculated in the first two weeks (D.4.4). The first options are those were the user should train more in order to achieve the recommended level).
We designed the pathways system to guide and support the user towards her/his personal goals; the pathway is designed regarding the needs of the user and declined in two different strategies to improve or maintain the user's psychophysical status. The pathway system is defined by the specification of:

- Group of activities associated with the pathway and belonging to one of the four dimensions
- Conversational interaction: user can interact with NESTORE App Coach through the chat section.
- Push notifications: users today have a hard time remembering what they are supposed to do into a project they

joined. Notifications help to deliver timely and relevant information to users and enhance their user experience.
- Active interaction: the NESTORE App Coach make the interactions easy. Shortcut to the main actions are in highlight positions, and the user experience flow has been created to be a continuous stream of relevant information.
- Monitoring mode: automatic and by user input, depending on the touchpoint used to track the activities (wearable device, sensors, tangible device, smartphone, tablet)
- Storytelling, gamification and/or social approaches: social platform (D5.4), serious games (D5.5).

## 3.1 Domains and Coaching Activities

In NESTORE, 4 domains are considered as part of the coaching intervention: Physical, Nutritional, Cognitive and Social. The Emotional domain is monitored, with charts in the app and feedback in the tangible coach to support self-reflection, but no coaching is provided in this domain.
In NESTORE, Coaching Activities can be structured (i.e., they are part of a specific training program proposed by the domain experts, adapted to the user by the DSS and scheduled in the user calendar) or Unstructured. unstructured coaching activities are also proposed by the DSS as suggestions for the user. Finally, the NESTORE system keeps track of the user free-living activities and consider them in order to reduce and adapt the amount of structured activities proposed. This is done in particular in the Physical domain, where the activities tracked by the bracelet are used to reduce the structured activities proposed by the coach.
All coaching activities are reviewed at the end of the day through the chatbot. This allows to have a follow-up with the users, in order to check whether the activity was done or not (in particular, for those activities that cannot be tracked by the monitoring system), whether they enjoyed it or not. The chatbot also asks the reason for not doing or not having enjoyed the activities providing suggestions and motivational messages, based on different Behaviour Change Techniques (BCTs).

## 3.2 Physical domain

In the Physical domain, two pathways can be chosen: Aerobic Fitness and Strength, focusing in the respective sub-domains. Both pathways also include exercises for the Flexibility and Balance sub-domains. Aerobic fitness structured activities require the user to walk/run at a specific intensity, which is related to the user heart rate. The wristband helps the user to perform the activity at the right intensity, measuring the user's heart rate during the activity. Coaching activities for Strength, Flexibility, and Balance consists of several different exercises that are illustrated in the Pocket Odyssey serious game with animations of the NESTORE character. Different training programs are suggested to the user according to user pertinence into the Retain or Improve intervention group, based on the assessment done during the first two weeks.

## 3.3 Nutritional domain

Regarding the Nutritional domain, there are four possible pathways: Body Weight Management (Increasing or Decreasing), Body Composition Management (Muscle Mass), and Achieve Healthy Diet. Coaching activities in this domain consists, for example, in adding or limiting specific food to the user diet or in taking care of the energy intake/expenditure balance. All of the CEs are provided by experts and suggested to aim a balanced diet (D4.3). Energy expenditure is calculated via the wristband, while the energy intake is measured through the food recognition system and requires the user to keep track of all her meals at least 3 days per week, taking photos of all the dishes and sending them to the coach. The NESTORE Coach also provides a tool for easily keeping track of water consumption, recommending the user to drink at least 1600ml of water per day.

## 3.4 Cognitive domain

The Cognitive domain is focused on improving three main sub-domains Executive Functioning (Broader Thinking Skills pathway), Working Memory, and General Cognitive Functioning (Everyday Mental Skills pathway). In the first pathway (Broader Thinking Skills), the user can train using the NESTORE submarine mini-game included in the Pocket Odyssey serious game. For the Memory pathway, the user can train using the Math game (Numerical updating task) included in the NESTORE Coach app. Finally, for the everyday mental skills the user should perform new activities in everyday life, such as learning a new language or playing an instrument. Such activities may also be available through the social platform.

### 3.5 Social domain

Finally, in the social domain two different pathways are possible: Social Integration and Social Abilities. The first pathway focuses on social activities where the user can meet and exchange with other people. A collection of Coaching Events is provided and recommended depending on the pathway selected (D4.3). The Social Abilities pathway focuses instead on social skills that the user should learn through dedicated courses.

# 4 NESTORE Coach App implementation

Three mobile apps have been developed as part of the NESTORE App Ecosystem: the NESTORE Coach app, described in this deliverable, the serious game Pocket Odissey (described in D5.5) and the NESTORE Connect app (previously named WoT agent, D6.3, D6.6), which handles the communication with the NESTORE wristband and allows the set-up of the Tangible Coach. The NESTORE Coach app has been implemented using the Ionic Cross-platform framework, based on the Angular web technology. This framework has been chosen at the beginning of the project in order to ensure compatibility with different mobile Operating Systems (both Android and iOS). During the project, the consortium agreed to focus only on the Android platform, because the development of the NESTORE Connect app for two different platforms was not compatible with the available development effort and time. Nevertheless, the deployment of the NESTORE Coach app for the iOS platform should require minimal adaptation.
The NESTORE Coach app communicates with a NODE.js server that acts as a backend, handling the communication with the DSS, the NESTORE APIs and the NESTORE conversational agent. Indeed, the NESTORE Coach App integrates the interface of the chatbot. The NESTORE Coach app communicates also with the NESTORE Connect app through local broadcast messages. These messages are used to set-up the wristband before structured coaching activities and assessments, as well as to retrieve data once the activity is finished.

# 5 Links

The NESTORE Coach app is available for Android on the Google Play Store through a closed beta program. In order to test the app, it is necessary to join the beta program at this link:

https://play.google.com/store/apps/details?id=institute.humantech.

# References

1. *Angelini, L., del Bas, J. M., Subias, P., Orte, S., Andreoni, G., Mugellini, E., ... & Mastropietro, A. (2019). The NESTORE e-coach: accompanying older adults through a personalized pathway to well-being.*