

# DIGITAL SOVEREIGNTY OF OLDER CITIZENS FOR A SELF-DETERMINED USE OF PERSONAL HEALTH RECORDS: E-LEARNING DESIGN AND STUDY RESULTS FROM THE EPA-COACH PROJECT.

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# The ePA-Coach Project



News Jetzt teilnehmen! Projektziele Partner Veranstaltungen Öffentlichkeitsarbeit Kontakt



**ePA Coach**  
Digitale Souveränität für Senioren  
mit der elektronischen Patientenakte

<https://epacoach.de>

The ePA-Coach project aims to foster the digital sovereignty of older citizens in the context of EHR/PHR and to deliver an interactive learning application that allows senior learners to acquire digital competencies relevant to digital sovereignty in using PHR.



Federal Ministry  
of Education  
and Research

# ePA: Electronic Health Records

In Germany, health insurance funds are required to provide policy-holders with PHR (in German: **elektronische Patientenakte, ePA**).



**Electronic Health Records (EHR)** and **Personal Health Records (PHR)** aim to enhance digital health services.

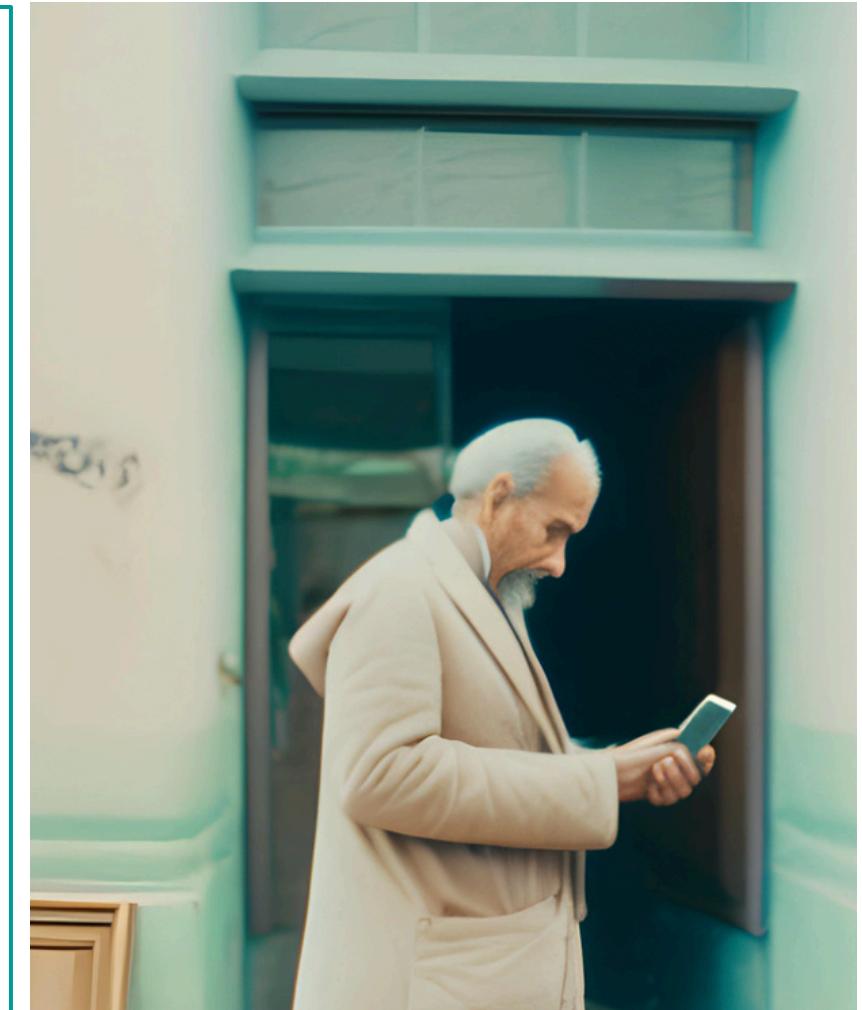
- **EHR** has been used to increase the quality of healthcare and serve as digital repository with patients' information controlled by health organisations (e.g. hospitals, clinics).
- **PHR** has been used to enable citizens to store and manage their own health-related data and serve as health records controlled by the patient (Roehrs, 2017).

# Equal participation in the healthcare system

For older citizens using PHR may be a barrier to equal participation in the healthcare system (Gellner et al. 2021).

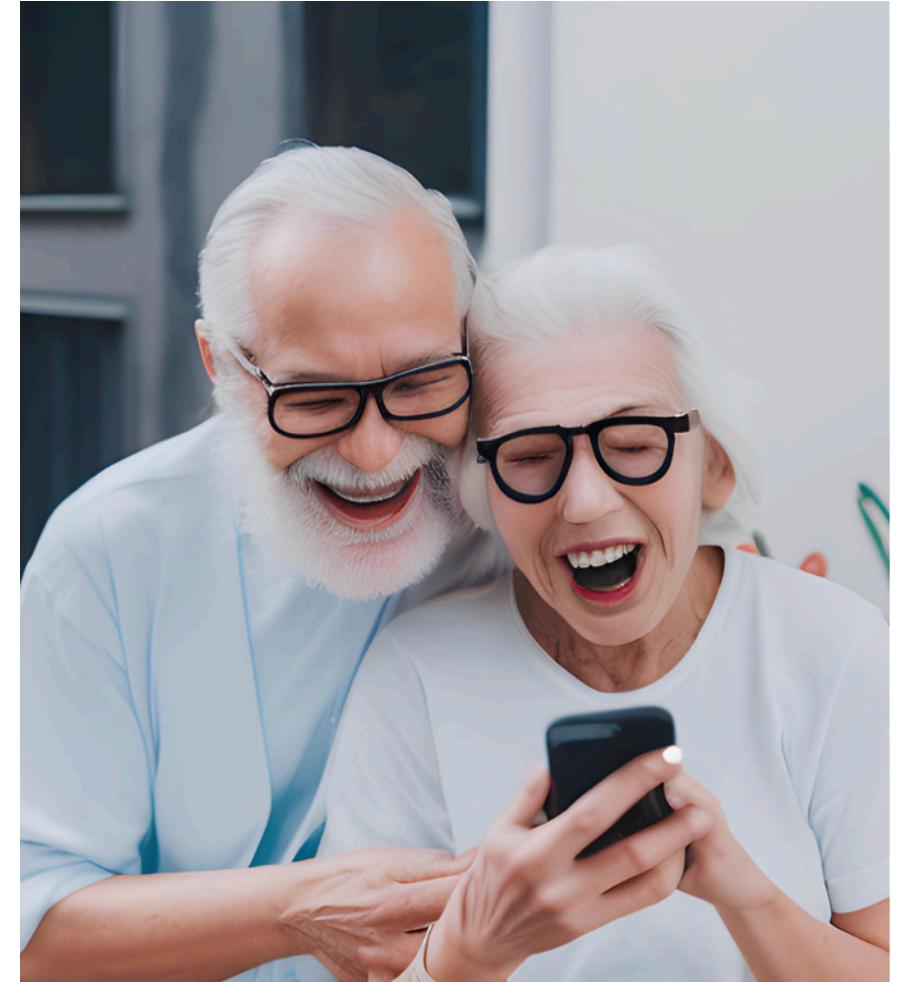
The study by Taha et al. (2013) showed that both middle-aged (40-59 yrs) and older adults (60-85 yrs) **experience difficulties in using PHR**, such as managing common health tasks, reviewing and interpreting lab results.

Studies have shown that the use of the **PHR** requires a **set of competencies** to use PHR (general capability to use digital technologies, and specific skills in the management of digital medical records according to regulations within a given national healthcare system) (Day et al., 2012).



# Digital Literacy of older citizens

Promoting digital literacy and digital sovereignty of older citizens has entered policy-agendas in Europe. In 2022 the Council of Europe published **“The Digital Era? Also my Era!”**, calling for **promoting digital literacy among senior citizens** to ensure their equal access to digital services (Hermans, 2022).



# Empowerment in using technologies

Digital citizenship has emphasised individual choices and rights to participate in society, addressing the question of

*“How the digital facilitates new forms of participation?”*

(Pangrazio & Sefton-Green, 2021, p. 18).

According to the European **“DigComp” framework**  
**“engaging in online citizenship”** means

“to participate in society through online engagement, to seek opportunities for self-development and empowerment in using technologies and digital environments, to be aware of the potential of technologies for citizen participation”

(Ferrari 2013, p. 5)

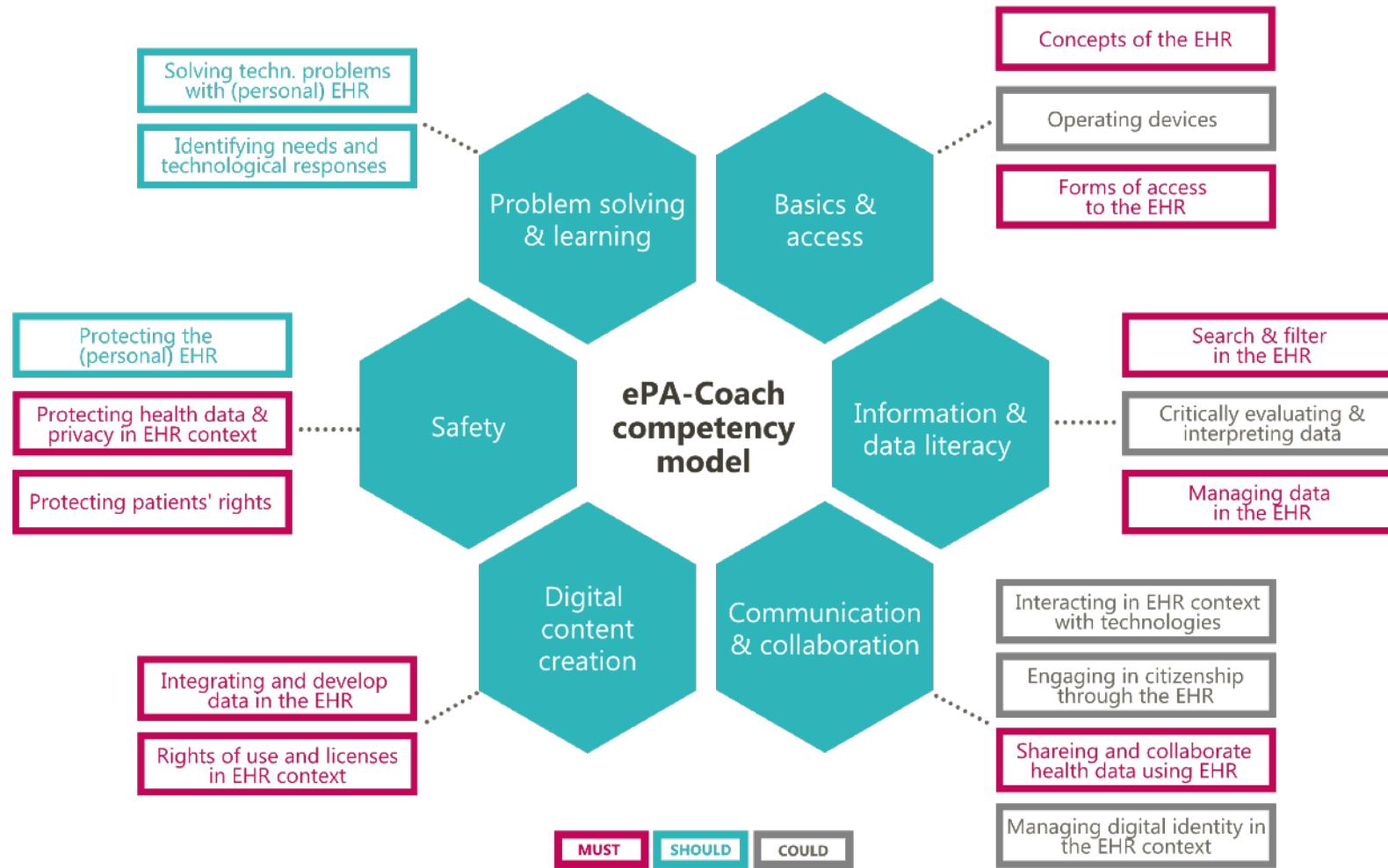


# ePA-Coach: Project aims

The **ePA-Coach project** aims to

- promote *informational autonomy and digital sovereignty of senior citizens*
- develop *a coaching-based e-learning application for older adults* to enhance their *digital literacy* as an enabler for effective use of PHR.
- support older adults in *learning how to operate their own PHR in a self-determined way*
- provide an *engaging learning experience* based on the eight motivational drives specified in the Octalysis gamification/motivational framework.

# ePA-Coach Framework for Digital Sovereignty



The digital competence framework in the ePA-Coach project is based on the European “DigComp” framework (Vuorikari et al, 2022).

The ePA-Coach framework was adapted to the use of PHR by older citizens:

- (1) **Basics & access** (basic knowledge about PHR, registration, authorisation);
- (2) **Handling of information & data** (managing data, searching, filtering, deleting);
- (3) **Communication & collaboration** (exchanging health data, allowing and revoking access, authorising);
- (4) **Digital content creation** (adding data and information to PHR);
- (5) **Safety** (understanding PHR terms of use, declaration of consent, termination, revoking termination)..

# Digital Competencies at 3 Levels

	Level 1 <b>Beginner</b>	Level 2 <b>Advanced</b>	Level 3 <b>Expert</b>
Complexity Level	low, basic and easy tasks	higher, clearly defined tasks	highest, best practices for given tasks
Autonomy Level	independent, with guidance if needed	independent, with minimum guidance	guiding others, adapting to others' needs
Cognitive Level	remembering	understanding	application

Each competence area includes several competencies subdivided into three levels: (1) Beginner; (2) Advanced; (3) Expert differentiated into complexity, autonomy, and cognitive levels (Figure 1). A detailed overview of the ePA-Coach competence framework was described by Gellner, Kaiser & Buchem (2021).

# ePA-Coach E-Learning Application

The screenshot shows the ePA-Coach application interface. At the top, there is a navigation bar with icons for Startseite, Lernen (highlighted), Glossar, FAQ, Schriftgröße, and a user profile for 'M. alias Schröder'. Below the navigation bar, the word 'Lernen' is displayed. On the left, there are two learning units listed: 'Grundlagen der ePA' and 'Sicherheit der Gesundheitsdaten', both marked as 'Noch nicht begonnen' (not started) with a progress bar. To the right of these is a large map-based navigation area. The map features a winding road, buildings, trees, and water. Several white circles with arrows point to different parts of the map, labeled 'Selection of the competence areas'. A yellow box labeled 'Q&A Forum' is positioned above the map. Another yellow box labeled 'Avatar' is located near the top right of the map area. A speech bubble on the map says 'Wie kann ich helfen?'. A circular icon with a person's face is also present. The overall theme of the application is digital health and personal data management.

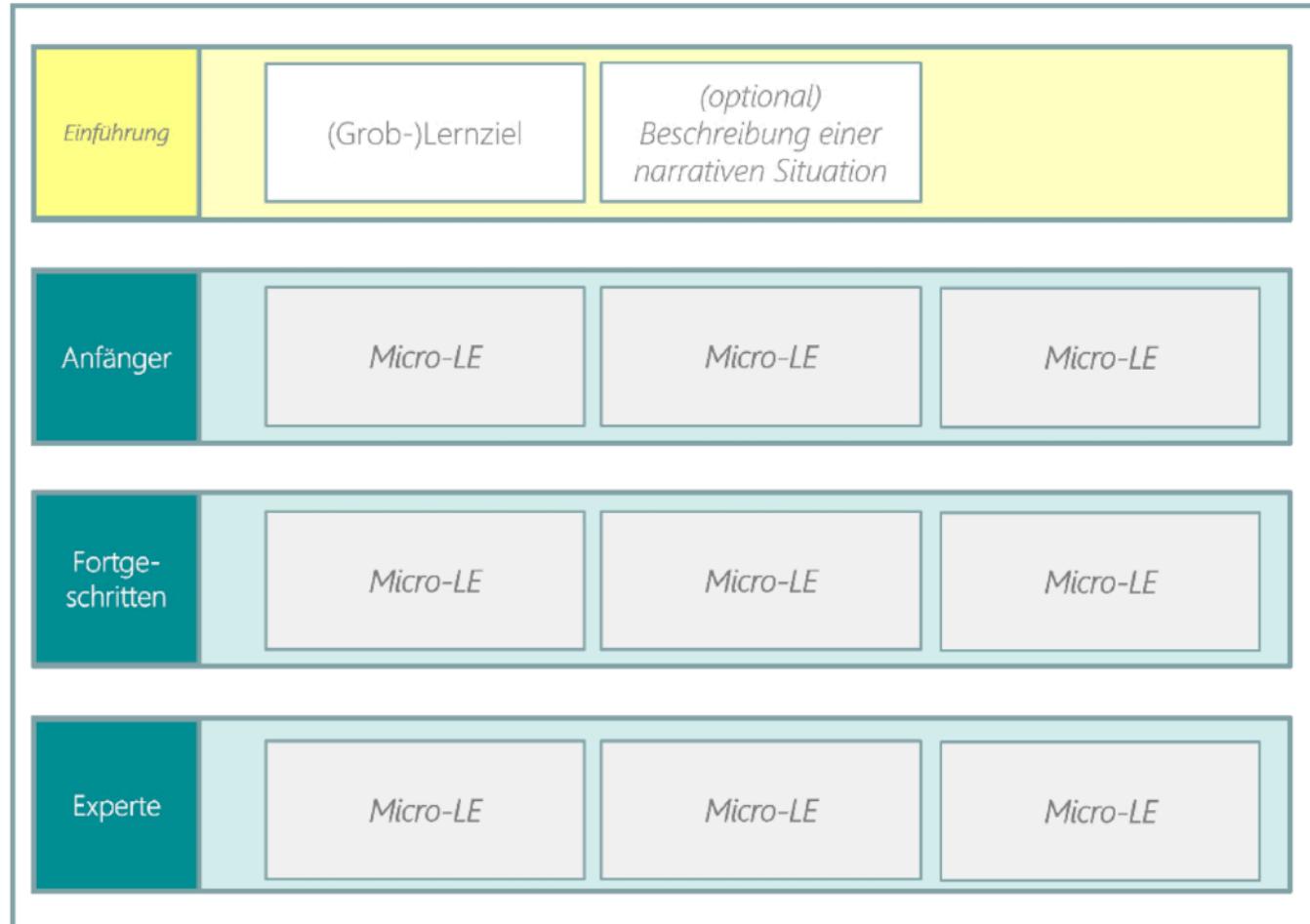
The ePA-Coach application consists of **28 learning units**, i.e. 12 beginner units, 11 advanced units, and 5 expert units.

All units are designed as **micro-learning units** with micro-contents (Buchem & Hamelmann, 2010).

Learners can freely choose what they want to learn next.

The choice is only limited in that, within a competence area, all learning units of a competence level must first be completed in order to unlock the next level.

# Micro-Learning Units at 3 Levels



The units are **scaffolded** as the learner becomes increasingly confident in using PHR:

- **beginner units** offer more theoretical information and tasks in the form of single/multiple choice, true/false, fill the blanks to sort the paragraphs questions,
- **advanced units** offer more complex and application-oriented exercises, for example in the form of embedded click dummies, which are used to practice real-life challenges related to the use of PHR. Similarly.,
- **expert units** offer complex tasks with no help beyond the description of the scenario. Also, it is possible for the learner to take the wrong path.

# ITERATIVE DESIGN WITH STUDIES

Coaching beziehungsorientiert 2D vs. 3D Instruktionen  
Realismus Sprechstil Informationsquelle Animation  
aufgabenorientiert Geschlecht Alter  
hohe Kompetenzen EnALI-Framework

**Literaturrecherche zum Stand der Forschung bei Pädagogischen Agenten**  
Typen, Frameworks, Allg. Effekte und Design-Präferenzen, Präferenzen von Senioren  
Gesamtfazit: Forschungsstand zu Präferenzen und Effekten noch uneindeutig; Lücke bei Senioren

Workshop qualitativ quantitativ  
Fragebogen 8 Senioren Okt. 2020

**Evaluation der Design-Entwürfe**  
Befragung der Zielgruppe zur Nutzung eines Lerncoachs und den Design-Entwürfen

**Ableitung erster Design-Entwürfe**  
Konzeption und Design von vier Lerncoach-Varianten basierend auf den Ergebnissen der Literaturrecherche hinsichtlich der visuellen Erscheinung, Kommunikation und Interaktion sowie Kompetenzen und Rolle

Portrait realistisch  
Mitte 50 seriös attraktiv  
klischeefrei menschenähnlich  
frisch 2D weiblich  
männlich nicht-animiert

**Designentscheidungen**  
Festlegung von Entscheidungen zum Design basierend auf den Evaluationsergebnissen

**Überarbeitung der Design-Entwürfe**  
Design von vier Lerncoach-Optiken basierend auf den Designentscheidungen und Ergebnissen der Evaluation

**ePA-Coach**

## Entwicklungs- prozess

für die digitale Lernbegleitung

Mai 2021 41 Senioren Online-  
Fragebogen  
quantitativ

**Evaluation der überarbeiteten Design-Entwürfe und Finalisierung**  
Favorisierung von zwei Design-Entwürfen im Projektkonsortium;  
Befragung der Zielgruppe zur Wahrnehmung der neuen Design-Entwürfe;  
Evaluation ergab kein Änderungsbedarf

- Iterative design & testing applied to the development of the ePA-Coach e-learning application.
- Findings from two exploratory studies (currently final evaluation taking place).
- The recruitment of participants undertaken by the project partner Charité – Berlin University of Medicine, using an internal subject database, and with the help of stakeholders such as Berlin Senior Citizens' University and LMU Munich.

# TWO EXPLORATORY STUDIES

- The **first** study was conducted in May 2022 with **41** senior citizens, aged 66 to 93 years old (average 76 years).
- The study helped to gain insights into the **assessment of the core drives from the Octalysis framework** by Chou (2019).
- The **second** study was conducted June to October 2022 with **46** senior citizens aged 65 to 88 years (average 73 years).
- This study provided insights into the perception of the **ePA-Coach e-learning design**, which was iterated taking into account results from the first evaluation.

Results from both studies were described in detail by Gellner & Buchem (2022) and Buchem et al. (2023).

# OCTALYSIS FRAMEWORK

The Octalysis Gamification framework supports learning designers in creating engaging experiences by proposing game techniques focusing on the eight motivational core drives.

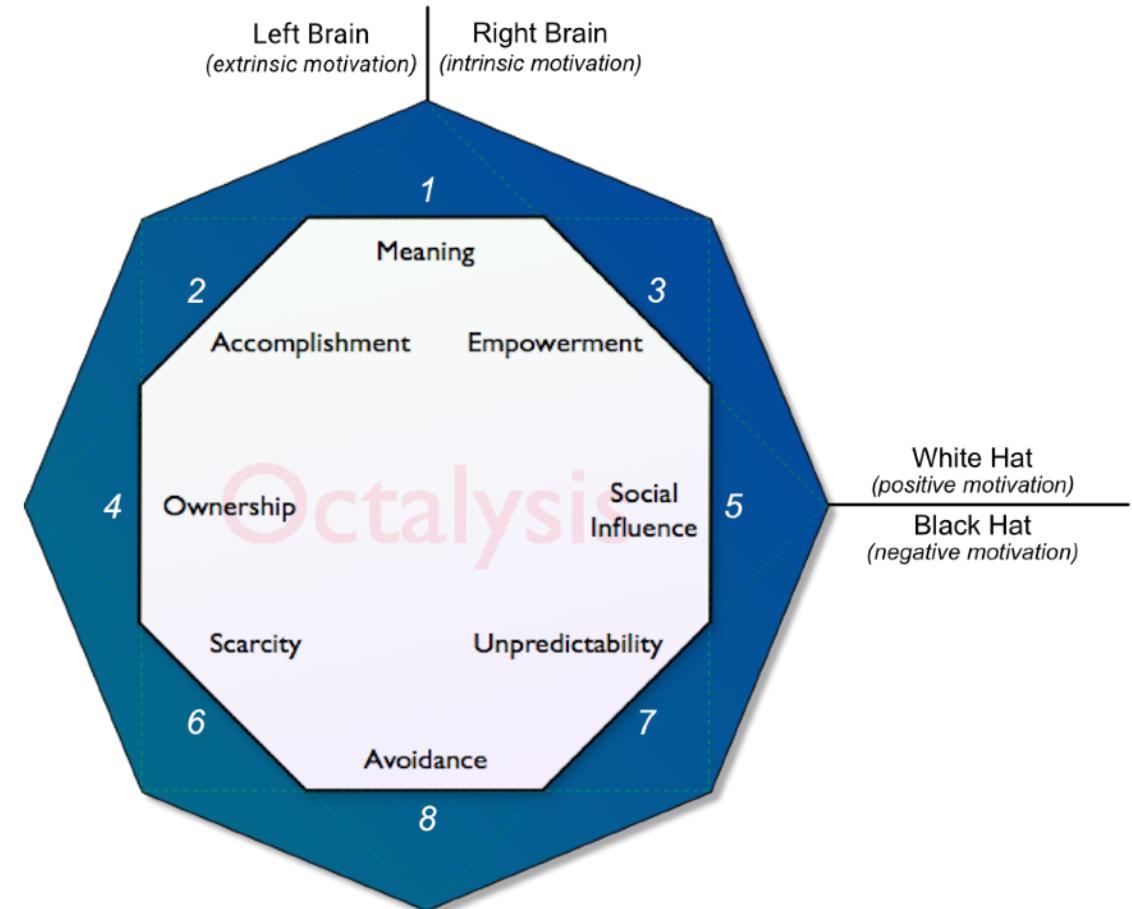
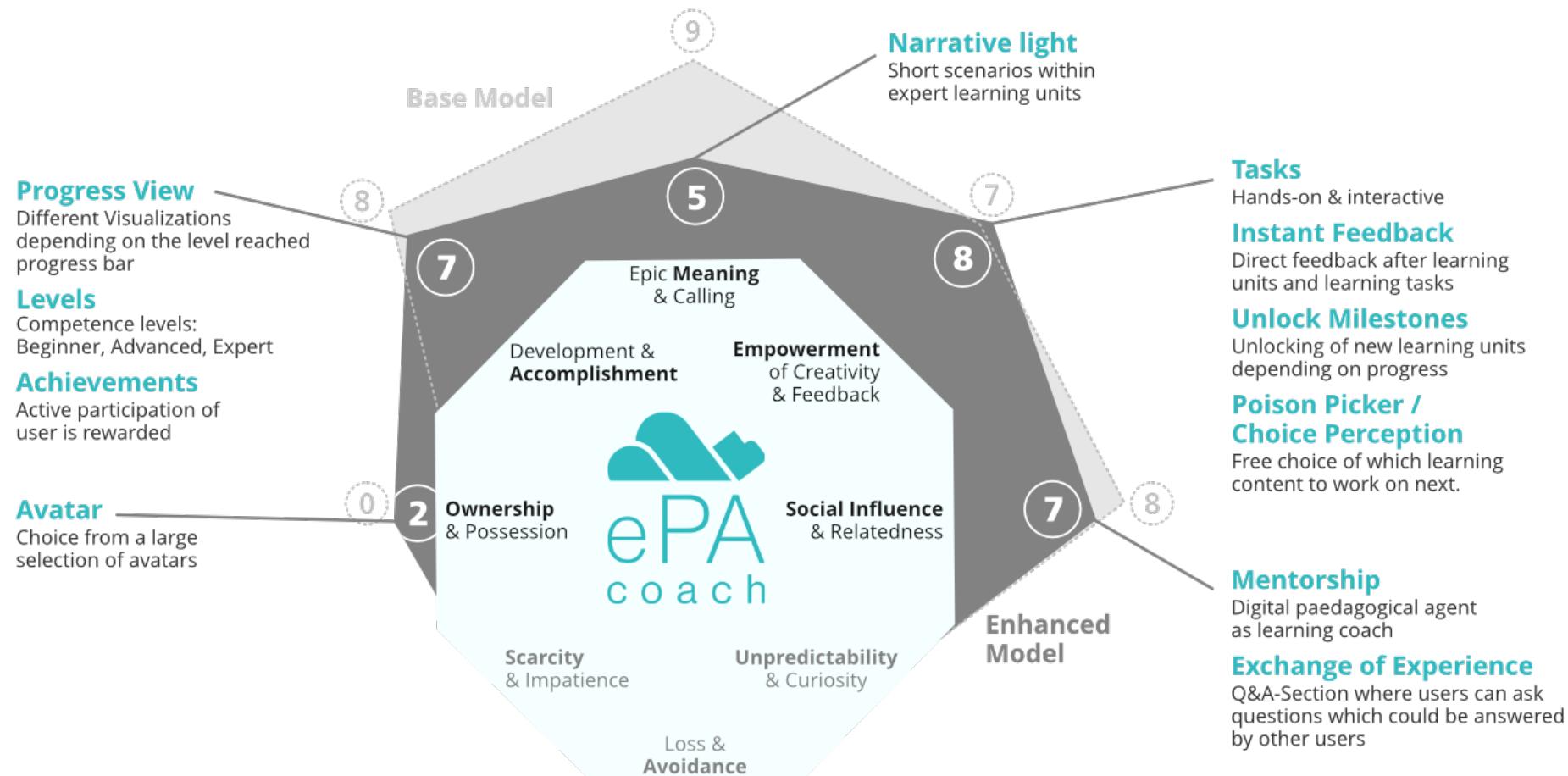


Figure: Octalysis Framework

# Results from the first study

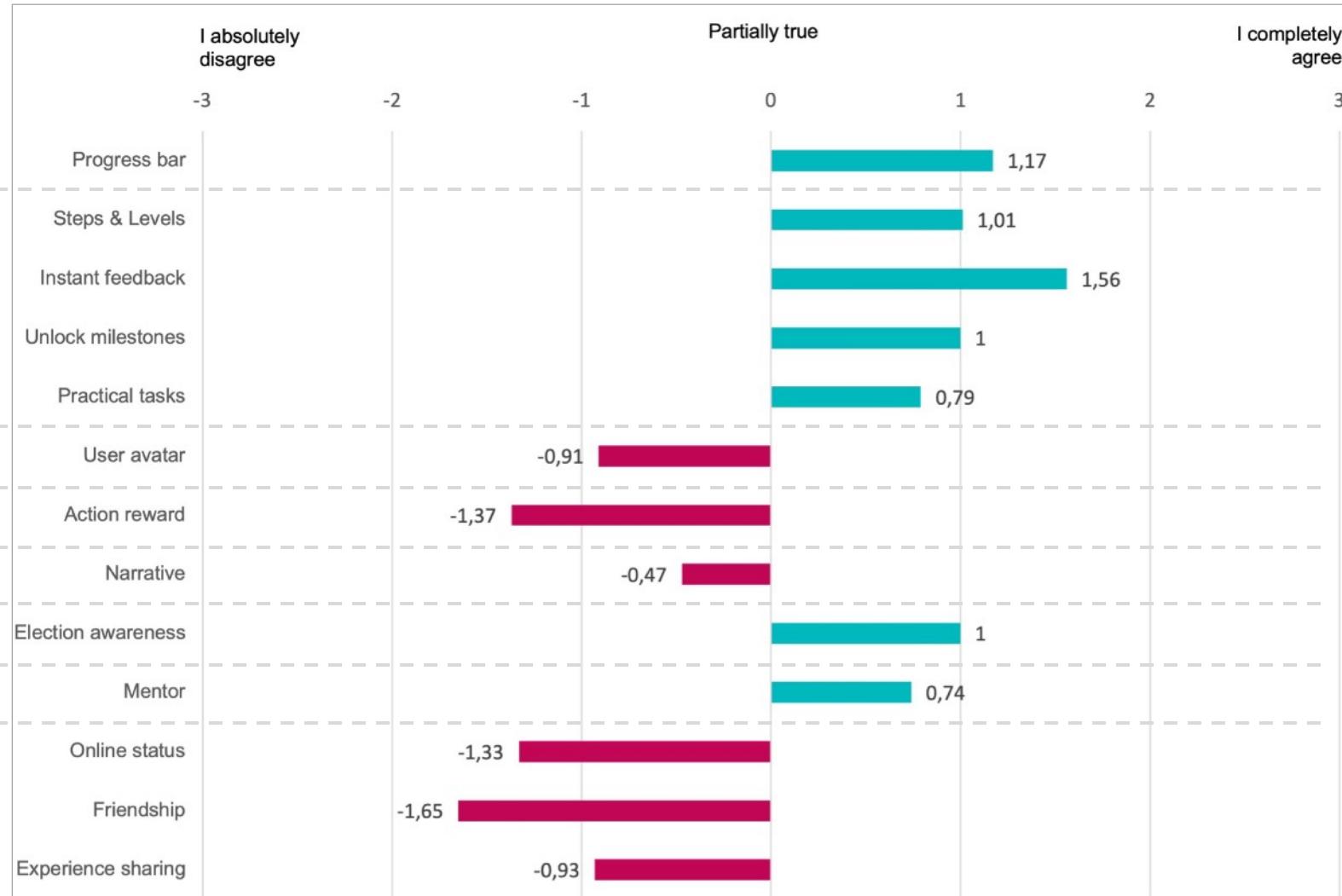
The adapted Octalysis model with the modified core drives and the respective game techniques:



# Results from the second study

## Octalysis Core Drives

Development & Accomplishment



Empowerment

Ownership & Possession

Accomplishment

Epic Meaning & Calling

Unpredictability

Social Influence & Relatedness

Social Influence & Relatedness

# Implementation of gamification elements

The image displays three main screenshots of the ePA coach platform:

- Left Screenshot:** Shows the "Gesundheitsdaten einstellen" (Health Data Settings) section. It includes four cards: "Metadaten für ein Dokument festlegen" (Metadata for a document), "Aus Bildern/Papierdaten Dokumente in der ePA erstellen" (Create documents from images/paper data), "Metadaten für ein Dokument festlegen / eintragen" (Set metadata for a document / enter), and "Dokumente hochladen und Metadaten festlegen" (Upload documents and set metadata). A teal box labeled "poison picker" has a line pointing to the third card. Another teal box labeled "milestones" has a line pointing to the fourth card. A teal box labeled "narrative light" has a line pointing to the second card.
- Middle Screenshot:** Shows the "Dokumente hochladen und Metadaten festlegen" (Upload documents and set metadata) section. It includes a scenario titled "Szenario 'Anamnesegespräch'" (Scenario "Anamnesegespräch") with a detailed description, an "Aufgabe" (Task) section with instructions, and a "hands-on & interactive tasks" section. A teal box labeled "digital agent as learning coach" has a line pointing to a small icon of a digital agent.
- Right Screenshot:** Shows a mobile phone displaying the "Übersicht" (Overview) screen. The screen lists "Dokumente" (Documents) with categories like "Notfall-daten", "Zahnbonus", "Impfpass", and "Medikationsplan"; "Berechtigungen" (Permissions) with items like "Einrichtungen & Praxen", "Mich vertretende Personen", and "Mkk Classic"; and "Aktivitäten" (Activities) with items like "Gelöschte Dokumente", "Neue Dokumente", and "Heruntergeladene Dokumente". A teal box labeled "hands-on & interactive tasks" has a line pointing to the "Aufgabe" section in the middle screenshot.

**Text Labels:**

- Example competence overview
- Example expert learning task

# CONCLUSIONS

The results from two exploratory studies with older citizens revealed strong preferences for **design elements related to digital sovereignty**.

Especially, the results indicate that senior learners tend to value elements that enhance their individual digital sovereignty **related to making choices, controlling and monitoring progress, and receiving instant feedback** as opposed to social aspects related to friends, status, sharing or even mentoring.

# REFERENCES

- Buchem, I. & Hamelmann, H. (2010). Microlearning: a strategy for ongoing professional development. *eLearning Papers*, 21, September 2010 "Innovation in Lifelong Learning", pp. 1-15.
- Buchem, I., Kauth V., Kirschen, M. & Katzer, M. (2023). Designing E-Learning Activities for Senior Learners based on Core Drive Analysis Using Octalysis Gamification Framework: Results from the ePA-Coach Project. Proceedings of the INTED 2023 Conference, Valencia, Spain.
- Chou, Y. (2019). Actionable Gamification: Beyond Points, Badges and Leaderboards. CreateSpace Independent Publishing Platform.
- Cukier, K. & Mayer-Schönberger, V. (2013). The Rise of Big Data. *Foreign Affairs*, 92(3), pp. 28-40.
- Day, K., & Gu, Y. (2012). Influencing Factors for Adopting Personal Health Record (PHR). *Studies in health technology and informatics*, 178, pp. 39-44.
- Ferrari, A. (2013). DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe, Publications Office of the European Union, Luxembourg.
- Gellner, C. & Buchem, I. (2022). Evaluation of a gamification approach for older people in e-learning. Proceedings of the 16th International Technology, Education and Development Conference (INTED), pp. 596-605.
- Gellner, C., Kaiser, S. & Buchem, I. (2021). Entwicklung eines E-Learning-Konzepts zur digitalen Souveränität von Senioren im Kontext der elektronischen Patientenakte. In H.-W. Wollersheim, M. Karapanos, N. Pengel (Eds.). Bildung in der digitalen Transformation. Medien in der Wissenschaft, 78, pp. 161-167.
- Gellner, C., Perotti, L., Koppenburger, A., Buchem, I., Dietrich, M. & Heimann-Steinert, A. (2021). Digital Literacy of Seniors in the Context of the Electronic Health Record, Proceedings of the ICERI2021 Conference, pp. 1297-1306, doi: 10.21125/iceri.2021.0374.
- Hermans, A. (2022). Digital Era? Also My Era! Council of Europe, Information Society Department DGI (03). <https://rm.coe.int/digital-literacy-for-seniors-print/1680a6ce9e>
- Marczewski, A. (2015). User Types HEXAD. In D. Diver (Eds.). Even Ninja Monkeys Like to Play: Gamification, game thinking and motivational design (pp. 65-80). Gamified UK.
- Millard A, Baldassar, L. & Wilding, R. (2018). The significance of digital citizenship in the well-being of older migrants, *Public Health*, 158, pp. 144-148. The Royal Society for Public Health. Elsevier. doi: 10.1016/j.puhe.2018.03.005
- Mossberger, K., Tolbert, C. J. & McNeal, R. S. (2007). Digital Citizenship: The Internet, Society, and Participation. Cambridge, MA: MIT Press. <https://doi.org/10.7551/mitpress/7428.001.0001>.
- Örtegren, A. (2022). Digital Citizenship and Professional Digital Competence — Swedish Subject Teacher Education in a Postdigital Era. *Postdigit Sci Educ* 4, pp. 467-493, <https://doi.org/10.1007/s42438-022-00291-7>
- Pangrazio, L. & Sefton-Green, J. (2021). Digital Rights, Digital Citizenship and Digital Literacy: What's the Difference?. *Journal of New Approaches in Educational Research*, 10(1), pp. 15-27.
- Pohle, J. (2020). Digital sovereignty. A new key concept of digital policy in Germany and Europe. Konrad-Adenauer-Stiftung e.V., Berlin.
- Poss-Doering, R., Kunz, A., Pohlmann, S., Hofmann, H., Kiel, M., Winkler, E.C., Ose, D. & Szecsenyi, J. (2018). Utilizing a Prototype Patient-Controlled Electronic Health Record in Germany: Qualitative Analysis of User-Reported Perceptions and Perspectives. *JMIR Formative Research*, 2(2):e10411.
- Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu. Luxembourg: Publications Office of the European Union. doi: 10.2760/159770
- Roehrs A., da Costa C.A., Righi R.D. & de Oliveira K. S. (2017). Personal Health Records: A Systematic Literature Review. *Journal of Medical Internet Research*, 19(1):e13, doi: 10.2196/jmir.5876.
- Segall, N., Saville, J., L'Engle, P., Carlson, B., Wright, M.C., Schulman, K.A. & Tcheng, J.E. (2011). Usability evaluation of a personal health record, Proceedings of the Annual Symposium AMIA 2011, pp. 1233-42.
- Stubbe, J., Schaat, S. & Ehrenberg-Silley, S. (2019). Digital souverän?: Kompetenzen für ein selbstbestimmtes Leben im Alter. Bertelsmann Stiftung, doi: 10.11586/2019035
- Tondello, G. F., Wehbe, R.R., Diamond, L., Busch, M., Marczewski, A. & Nacke, L. E., (2016). The Gamification User Types Hexad Scale, Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play, pp. 229-243, New York, NY, USA, doi: 10.1145/2967934.2968082.
- Taha, J., Czaja, S.J., Sharit, J. & Morrow, D.G. (2013). Factors affecting usage of a personal health record (PHR) to manage health. *Psychology and aging*, 28(4), pp. 1124-39.
- Vuorikari, R., Kluzer, S. & Punie, Y. (2022). DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes, EUR 31006 EN, Publications Office of the European Union, Luxembourg, doi:10.2760/115376.

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