Interreg CENTRAL EUROPE

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Health Labs4Value

Slovenia: Technical Solution upscaled thanks to the Pilot experience

1. Executive summary

The report presents an innovative technological solution developed at the Jesenice General Hospital with the support of the Health Labs4Value project. This solution assists patients in recovering more quickly after a hand injury. Its purpose is to empower and support patients following surgery or conservative treatment of the hand, who require further rehabilitation and care within our institution.

In developing the application, we collaborated with CCIS, which primarily supported us in the development of the solution — particularly in IT support — and will ensure that the Living Lab continues to operate within the Slovenian environment.

The results of the solution demonstrate positive effects for patients, their families, as well as healthcare professionals. It is important that the solution benefits patients and increases their satisfaction, while also enhancing the credibility of medical professionals and the broader healthcare system.

Moreover, it is essential that the application can be continuously adapted based on needs and new insights, including those received from our other project partners.

Although the initial development of the application required a significant investment of time and effort, it has been designed in a way that allows for ongoing upgrades. This ensures its sustainability, as we plan to gradually expand its use to cover other illnesses or injuries as well.

2. The technical solution based on the pilot experience

2.1. Brief overview on the background and context of the technical solution

Access to rehabilitation services **after injury** is limited, with patients—especially those requiring physiotherapy—often waiting several weeks for treatment. During this period, they are typically on medical leave and may experience emotional distress, as they are unsure whether the rehabilitation information they find outside the healthcare system is reliable.

The main goal of the pilot project was to **empower patients in their rehabilitation** journey by providing them with access to high-quality, evidence-based information verified by healthcare professionals.

The outcome of the pilot is a **mobile application** that enables patients to gain a clear understanding of their rehabilitation process. It provides videos, visual materials, and structured guidance—such as specific exercises, timelines for medical check-ups, and physiotherapy appointments. These resources help patients feel more confident, informed, and actively engaged in their recovery.

2.2. Detailed description of the technical solution and its uptake

The main goal and purpose of the new technical solution was to **empower patients by providing them with high-quality and continuously accessible information.**

The solution was developed based on patient feedback regarding their needs during the post-treatment or post-discharge period.

Key needs were identified, along with gaps in general information and rehabilitation-related guidance, as well as challenges in accessing appropriate and relevant stakeholders who provide support and advice throughout the rehabilitation process.

Insights into what patients need and expect led us to the decision to develop a digital solution (an application). A service provider was selected based on their capabilities, followed by the design of a prototype, testing, and the collection of feedback, which was subsequently used to improve the application.

The final version of the application is now in use and continuously monitors user feedback. The application will be further updated and adapted as needed, based on this ongoing input.

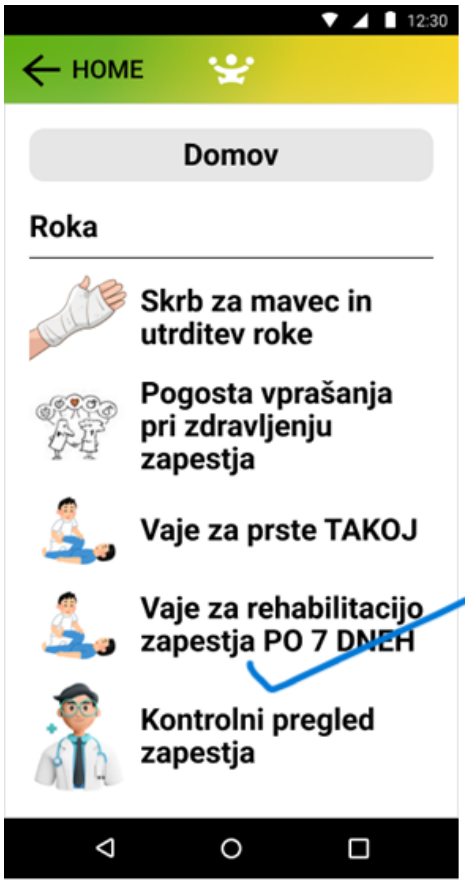
Key stakeholders in the process include hospital staff, members of the Chamber of Commerce, the national health insurance fund, the IT company, patient organization representatives, and most importantly – the patients themselves.
We employed surveys and interviews as our main methodologies for user feedback and development.

The uptake of the solution is evidenced by the number of active users and the volume of feedback received from them. The project and its results are also being promoted through public media.

Members of the General Hospital Jesenice and the Chamber of Commerce and Industry of Slovenia actively participate in all project meetings – both in-person and virtual – where we share best practices and seek support for ongoing development.

One of the main milestones in the process was addressing the concern of whether there was a provider on the market capable and willing to develop the application in accordance with our specific requirements and applicable legislation.

Another key issue was related to funding after the project's completion and the future of the Living Lab — whether it would continue to operate beyond the project's official end. This model is still relatively unfamiliar in our local environment.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The co-creation of the solution also involves the exchange of information and the sharing of best practices and ideas through monthly meetings with project partners, who are likewise developing their own solutions.

The IT developer who co-created the solution with us is involved in several EU-funded projects focused on the implementation of digital solutions in the healthcare sector. These experiences have also contributed significantly to the development of our solution.

Although the technical development was led in Slovenia, the solution was co-developed conceptually through a transnational process: shared Living Lab methodology, joint thematic meetings with partners from Hungary, Germany, Poland and Czechia, and exchange of tools and lessons learned. The co-creation steps and evaluation framework were aligned across countries, allowing future replication.

2.2.1. How the solution was developed, tested and validated in a way that can be transferred to other contexts - Step-by-step validated co-creation methodology

The key outcome of the Slovenian pilot is not only the digital application itself, but the validated and transferable methodology that led to the improvement of the care process. The same development model can be replicated in other hospitals, other clinical pathways, and even other countries — regardless of whether the same IT tool is used.

The co-creation approach followed a structured Living Lab and value-based healthcare (VBHC) model, combining patient involvement, clinical expertise and transnational knowledge exchange.

Step 1 – Identification of the care gap and unmet need

• Long waiting times for physiotherapy and lack of trusted rehabilitation information were identified as a critical care gap.

• Baseline situation: patients leave the hospital without clear, structured, evidence-based guidance; emotional distress and uncertainty are common.

• Sources of validation: staff feedback, patient interviews, informal complaints, PREM data.

Step 2 – Stakeholder mapping and quadruple helix setup

• Stakeholder groups included: patients & caregivers, clinicians, hospital management, IT developers, payer (ZZZS), Chamber of Commerce (MedTech Slovenia), and external project partners.

• Roles and responsibilities were assigned before development started.

• The project ensured early involvement of end-users, not only at the testing stage.

Step 3 – Transnational alignment and knowledge exchange

• Although the technical solution was developed in Slovenia, the methodological development was transnational: project meetings, shared Living Lab templates, peer-reviews, and exchange of lessons learned with partners from Hungary, Germany, Poland and Czechia. The co-creation stages, evaluation indicators, and stakeholder engagement logic were aligned across countries, ensuring transferability and comparability.

Step 4 – Living Lab co-creation cycles

• 3 iterative rounds of development were carried out: needs analysis → prototype → feedback → redesign.

• Methods used: structured interviews, co-design sessions, paper prototypes, usability testing, PREMs/PROMs.

• Patients and clinicians validated every iteration before technical development continued.

Step 5 – Technical development of the tool

• Based on validated functional requirements, an external provider developed the application with full GDPR compliance.

• Technical development was not the starting point, but a consequence of the Living Lab process.

• The solution was designed to remain upgradeable and adaptable.

Step 6 – Pilot testing and real-world validation

• 20 patients, relatives, and clinicians tested the solution in real care pathways.

• Data collected: user activity log, satisfaction survey, QOL indicators, qualitative interviews.

• Improvements were introduced immediately (simplified login, navigation redesign).

Step 7 – Evaluation and care process improvement

• The solution increased patient empowerment, confidence, and clarity about their rehabilitation timeline.

• Although not cost-saving in the short term, indirect benefits were identified: reduced uncertainty, better self-management, lower pressure on staff.

• Staff burden was neutral after the onboarding phase.

Step 8 – Transferability and resource requirements

• Conditions for replication include:

- a defined clinical pathway,
- at least one member of the medical team,
- IT supplier,
- stakeholder engagement mechanism (e.g. Living Lab),
- app/content administrator.

• Average time needed to replicate the process: 6–12 months.

Step 9 – Sustainability and ownership model

• The solution is not owned as a software product, but as a validated methodology that can be applied to other use cases.

• Sustainability is ensured through:

- institutionalised Living Lab at GZS (MedTech Slovenia),

- trained staff and existing content management,

- feedback loops built into the tool,

- integration potential with national e-health infrastructure.

Step 10 – Lessons learned and recommendations for future adopters

• Early patient involvement is non-negotiable.

• The Living Lab model requires dedicated coordination, not only technical resources.

• Tool development should never start before user needs are validated.

• Sustainability must be planned before development — not after launch.

• The same model can support other clinical pathways (orthopaedics, neurology, chronic disease).

2.3. Measurable results

We monitor the effectiveness of the solution through data analysis of app usage and patient surveys, focusing on both the number of users and their satisfaction with the technical solution and its content. We use the principles of QOL (Quality of Life) questionnaires.

Findings show a steady increase in the number of users, with many returning to the app multiple times. Patient satisfaction has improved following recent updates; users report high levels of satisfaction with the app's usability and feel more empowered when dealing with their rehabilitation challenges. Overall, the app has had a positive impact on patients' experience and perception of the rehabilitation process.

The application was tested by 20 patients, their family members, and healthcare professionals. Since the initial deployment, we have upgraded the application to simplify the login process and enhance user-friendliness.

Following the testing phase, we will begin monitoring data on a monthly basis, with the first results expected by the end of August.

Feedback was collected from all 20 users, including both qualitative and quantitative data, which indicate that the application has contributed to improved and faster rehabilitation, as well as more confident and effective exercise performance.

The application incorporates both PREMs and PROMs. During the testing period, these questionnaires were distributed in paper form.

During the initial phase, the application posed an additional workload for staff, as it required multi-level verification and data entry. However, with the decision to open the application for “broader” use, no additional burden was placed on employees.

Importantly, the application does not affect our staff's work, as they follow standardized protocols in line with clinical guidelines. This observation is based solely on conversations with healthcare personnel, as no formal measurements were conducted.

While the app does not currently lead to direct cost savings for the healthcare organization it is perceived as a valuable tool by patients. We also believe there are indirect benefits for other stakeholders, such as patient support groups, who have expressed strong approval and see the app as a complement to their own efforts.

Additionally, we anticipate potential indirect benefits for the health insurance fund, although we have not yet conducted a formal evaluation in this area.

3. Sustainability of the solution

3.1. Sustainability Strategy

We distinguish between two structures when addressing the sustainability of the solution:

General Hospital Jesenice

The hospital will continue using the application, having recognized its benefits for patients. There is clear interest and support from both staff and management. The team also intends to align patient-reported results with clinical outcome measures, which could later serve as a basis for changes in reimbursement models or funding by the payer. Collaboration with patient organizations and the national health insurance fund will be maintained.

The existing agreement with the IT provider allows for further technical upgrades. As long as the app continues to demonstrate success and value, the hospital will cover its technical maintenance costs.

Short-term user feedback has shown high satisfaction and a strong willingness to continue using the app.

The main threat to long-term sustainability is securing stable funding.

Living Lab at the Chamber of Commerce and Industry of Slovenia

The second structural component is the Living Lab, which will remain in use by the Chamber.

Living Lab at the Chamber of Commerce and Industry of Slovenia – MedTech Slovenia.

To ensure the long-term impact and sustainability of the Health Labs4Value initiative in Slovenia, the Living Lab will be institutionalized within the Chamber of Commerce and Industry of Slovenia (GZS), specifically under the MedTech Slovenia Association. As the central representative body for medical technologies and healthcare services in Slovenia, MedTech Slovenia provides a strong professional, organizational, and stakeholder platform for the continued operation of the Living Lab.

The Living Lab will continue to act as a facilitator of collaboration between industry, healthcare providers, patient organizations, academia, and public authorities, with a focus on value-based healthcare innovation, co-creation, and testing of new technologies and services in real-world environments.

Financial and Legal Sustainability

To support the ongoing activities and strategic development of the Living Lab, the following financing and organizational options are being actively explored:

- Public delegation (javno pooblastilo): Formal recognition of the Living Lab as a national or regional innovation support structure for health technologies, which would enable stable public funding and integration into systemic healthcare development efforts.
- Public-private partnership (PPP): Establishment of a long-term collaboration model between GZS and public institutions (e.g., Ministry of Health, ZZZS, research institutions), where joint projects and services would be co-financed and jointly governed.
- Project-based funding: Active involvement in national and EU-funded projects (e.g., Interreg, Horizon Europe, EU4Health) to finance innovation pilots, capacity building, digital health transformation, and promotion of value-based models.

Strategic Role

The Living Lab within GZS / MedTech Slovenia will:

- Serve as a permanent innovation ecosystem node, supporting value-based healthcare transformation.
- Enable ongoing stakeholder engagement, knowledge exchange, and alignment with policy developments.
- Provide a testing and validation infrastructure for new solutions, including digital health tools, patient engagement methods, and outcome-based approaches.
- Act as a national contact and coordination point for international cooperation and project participation.

Conclusion

This institutionalization ensures that the momentum created by the Health Labs4Value project will be maintained and further developed through structured support and integrated collaboration. It positions Slovenia as a committed and capable actor in the advancement of value-based healthcare through innovation, co-creation, and strong public-private alignment.

3.2. Key lessons learned

We learned that a **direct, personal approach** is often necessary when working with patients, as simple questionnaires are limited in capturing the full scope of their experience. Surveys have their value but also clear limitations.

Co-creation of the solution with all stakeholders exceeded our expectations and proved to be a key factor in the success of the project.

We anticipate that the results and approach will be positively received more broadly and may serve as a model for similar initiatives in the future.

4. Upscaling of the Technical Solution

4.1. General goal and strategy for upscaling

The main objective of scaling the solution is to provide access to high-quality rehabilitation support to patients in other regions and healthcare institutions. This would involve adapting the content to meet the specific needs of different patient populations.

The strategy for upscaling is based on a phased expansion through collaboration with additional healthcare providers, continued support from the health insurance fund, and the development of new functionalities within the application to address a wider range of rehabilitation scenarios.

4.2. Concrete goals and measures for upscaling

The solution is designed to be sufficiently flexible for adaptation across various healthcare environments and regions. Based on current outcomes, we have defined the following short-, mid-, and long-term goals and measures:

Short-term goals (0–12 months):

Geographic Upscaling: Expand use of the application within other departments of the General Hospital Jesenice and partner hospitals in the Gorenjska region.

Quantitative Upscaling: Include a broader range of patients with different rehabilitation needs (e.g., orthopedic and neurological cases).

Functional Upscaling: Add new content tailored to specific diagnoses and rehabilitation phases.

Measures: Establish cooperation with partner institutions, conduct onboarding workshops, and adapt content to the needs of specific patient groups.

Mid-term goals (1–2 years):

Institutional Upscaling: Engage additional healthcare providers such as health centres, specialty outpatient clinics, and physiotherapy practices.

Functional Upscaling: Integrate the application with existing digital systems (e.g., national eHealth infrastructure, hospital information systems).

Measures: Prepare content for new institutions, test interoperability, and involve new stakeholders (e.g., private providers) in further development.

Long-term goals (2+ years):

Geographic Upscaling: Implement the application nationwide in collaboration with the national health insurance fund (ZZZS), aiming for official system-level adoption.

Quantitative Upscaling: Make the app accessible to all rehabilitation patients regardless of the institution.

Functional Upscaling: Develop additional modules (e.g., for self-management, communication with care teams, and progress tracking).

Measures: Develop a proposal for systemic financing, evaluate usage and outcomes, and explore international cooperation for scaling to other countries or regions.

Supplement – Evidence for Achieving RCR104 (Uptake and Upscale of the Solution):

To provide evidence for the uptake and upscale (RCR104), we will prepare the following key documents and activities that demonstrate genuine interest and strategic commitment to further development and expansion of the solution:

Upscaling Strategy
This document will include a timeline for expanding the use of the application to other hospitals and regions, including defined phases, goals, responsible stakeholders, and measurable success indicators.

Action Plan
An operational action plan will be prepared for the period 2025–2026, outlining specific steps for expanding functionalities, adapting content to new diagnostic groups, and involving new partners (e.g. health centres, private providers, physiotherapists).

Letters of Commitment
Letters of intent or support will be collected from key stakeholders, such as:

- The Health Insurance Institute of Slovenia (ZZZS), for long-term integration into the reimbursement system,
- Partner healthcare institutions (for inclusion in the next phases of testing and deployment),
- Patient associations and professional societies (to support promotion and user validation),
- Chamber of Commerce and Industry / MedTech Slovenia (for institutional support and Living Lab sustainability).

Evidence of Stakeholder Engagement
Regular meeting minutes from project and stakeholder working groups, showing active involvement in the development, implementation, and upgrade of the solution.

Milestones
Key milestones will be identified, such as:

- Expansion of application use to additional hospital departments,
- Integration with the national eHealth infrastructure,
- Achieved interoperability with at least one hospital information system,
- First inclusion of an additional region in the solution's use.

4.3. Resource Requirements for upscaling

Human Requirements & Partnerships:

To scale the solution effectively, additional human resources will be required both in technical and clinical areas. This includes:

Clinical experts (e.g. physiotherapists, rehabilitation specialists) to co-create and validate new content for different patient groups.

IT specialists for integration, customization, and ongoing technical support.

Project coordinators to manage multi-site implementation.

Upscaling will also require:

Targeted training for healthcare providers to ensure effective onboarding and use of the application.

Knowledge transfer processes between institutions to share best practices.

Continued collaboration with patient organizations, the national health insurance fund (ZZZS), and regional healthcare providers.

Institutional support in the form of formal approvals and strategic alignment with hospital or regional health policies.

Operational Change Requirements:

Scaling the solution to new settings will require:

Standardized onboarding procedures and content adaptation workflows.

Integration of app-based information into existing patient care pathways.

Clear management structures to support cross-institutional implementation.

Cultural and communication alignment to ensure that patients and staff see the tool as a complementary aid, not a replacement.

Technical Requirements:

While the application is designed to be modular and scalable, technical adaptations may include:

Language localization for other regions or countries.

Interoperability with various hospital information systems and national eHealth infrastructure.

Development of new modules or features tailored to different diagnoses or user types (e.g. pediatric, elderly patients).

The solution is cloud-based and built with adaptability in mind, making it technically viable for expansion into different environments.

Financial Requirements:

The upscaling strategy requires a mix of capital investment and operational funding.

Capital costs include content development for new patient groups, technical integration, and initial training efforts.

Recurring costs involve technical maintenance, user support, ongoing content updates, and coordination.

Funding options include hospital budgets, support from ZZZS, innovation grants, or potential private-public partnerships (e.g. through regional development funds or EU-level calls).

Recommendation for Legal Form of the Living Lab at GZS / MedTech Slovenia

Recommendation(s):

The proposed legal and organizational form for the continuation of the Living Lab in Slovenia is its **institutional anchoring within the Chamber of Commerce and Industry of Slovenia (GZS), specifically under the MedTech Slovenia Association**. This structure offers a credible, professionally recognized, and operationally effective base for long-term functioning.

While no formal legal entity creation is required under this setup, the following legal arrangements are recommended to enhance operational autonomy, scalability, and project readiness:

- **Embedded unit within GZS** (with defined mandate, resources, and governance under MedTech Slovenia): This allows for flexible integration within existing legal structures while ensuring clarity of mission and responsibility.
- **Public-private governance model**: A formal advisory or steering committee could be established involving representatives from public institutions, healthcare providers, and industry to ensure balanced decision-making and strategic alignment.
- **Option to establish a dedicated legal entity (e.g., non-profit institute or project company)** if required for specific future funding schemes, international cooperation, or PPP models.

Justification:

- **Contextual relevance**: GZS and MedTech Slovenia already operate under a legal framework that allows for multi-stakeholder collaboration and sectoral coordination, making this setup cost-effective and administratively efficient.
- **Scalability**: The chosen model allows for gradual evolution toward a more autonomous legal entity if needed, depending on strategic direction, funding sources, and volume of activities.
- **Adaptability**: The structure is capable of hosting both publicly funded programs and private innovation initiatives, which is essential for future-proofing the Living Lab's operations.
- **Credibility and access**: As part of a national business and industry institution, the Living Lab benefits from strong positioning, established networks, and easier access to key stakeholders.

5. Conclusions

The technical solution has been successfully implemented within the General Hospital Jesenice, where both patients and clinical staff have demonstrated high levels of acceptance and engagement. Short-term uptake is already evident through increased patient use, positive feedback, and strong institutional support.

In the short term, the focus will be on consolidating use within the hospital and partnering with nearby institutions in the Gorenjska region. Content will be further refined based on user feedback, and training efforts will be expanded to new user groups.

In the mid-term, the strategy includes broader institutional engagement, functional upgrades, and integration with national healthcare IT systems. Partnerships will be strengthened, and evaluation mechanisms introduced to support policy-level decision-making.

In the long term, the goal is national-level adoption with systemic funding and full alignment with public healthcare priorities. The solution has potential for international transfer, especially through collaboration with EU partners and digital health ecosystems.

Outlook and Considerations:

The success of the solution hinges on sustained collaboration between stakeholders, institutional support, and financial viability.

The co-creation model has proven to be a critical success factor and should remain central in future development.

Aligning the app with clinical outcomes and reimbursement mechanisms is essential to ensure long-term impact and sustainability.

Lastly, user-centric design and technical flexibility will continue to guide improvements and scaling across diverse healthcare contexts.