

Patterns of Organizing Remote Users with Agile Teams

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ABSTRACT

Working with remote users and connecting them with agile teams creates considerable challenges in software development. This requires careful organization due to challenges in building agile teams and motivating remote users for efficient participation in the software development process. Involving remote users in the software development process introduces additional problems, such as issues with time zones, inadequate infrastructure, limited user capacity, unclear documentation, ambiguous business requirements, and language differences. This paper presents five newly discovered patterns: *Establish Channel of Communication*, *Target Users*, *Requirement Visualization*, *Build and Run*, and *Monitoring Activity*. The aim of these patterns is to overcome the challenges between remote user and agile teams in terms of communication, requirement sharing, understanding, user needs, project goal, and mutual acceptance of a software project, and to facilitate effective collaboration during project implementation in a remote working environment. These patterns are derived from practical observations in projects involving remote agile teams and are supported by relevant literature. The application of these patterns aims to enhance project efficiency and collaboration for both remote users and agile teams.

CCS CONCEPTS

• **Software and its engineering** → **Patterns; Agile software development.**

KEYWORDS

organizational patterns, remote software development, users, agile, team, collaboration

ACM Reference Format:

Mohammad Daud Haiderzai and Valentino Vranić. 2023. Patterns of Organizing Remote Users with Agile Teams. In *Proceedings of 30th Conference on Pattern Languages of Programs (PLoP 2023)*. ACM, New York, NY, USA, 8 pages.

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PLoP 2023, October 22–25, 2023, Allerton Park, Monticello, Illinois, USA.

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1 INTRODUCTION

Software companies have several projects in different time zone and locations and they try to build highly motivated and expert agile teams to implement their projects. Software development through agile teams and the involvement of remote users and local users are problematic in terms of requirements collection, the actual flow of the system, and getting comprehensive business requirements. Working as a software developer in an agile team with remote users is a more challenging task and creates complexity between users and developers. Moreover, users play an essential role in the software development process and they are crucial a part of a project for business requirements.

In software companies, managing multiple projects across diverse locations with remote users and remote agile teams are complicating and require professional and skilled agile team members. These teams are crucial for executing projects within budget constraints while meeting stringent timelines. For an agile team, it is essential to understand the project scope and requirements, and to involve the users effectively with the team. Agile teams need to identify users' and developers' problems in the project and provide reliable communication between them.

While working on software projects that were implemented in Afghanistan and Nepal with remote users as members of agile teams, we encountered various problems, such as coordinating remote collaboration between users and developers, locating dedicated expert users, and ensuring efficient communication within the agile team.

Users and agile team are both important to communicate effectively for project implementation and to engage them the initial step is to build a relation between them in a colocated working environment[22]. Achieving user acceptance and product quality depends on effective interaction between users and agile team during requirement definition, remote user testing impacts agile methodologies suggest that both users and agile teams play a important role in effectiveness of system design and usability[18].

Understanding requirements and testing the actual flow of the system is challenging. It's important to engage users with agile teams[16]. Their involvement can deepen the understanding of user experience and help sharing the actual data with the agile team. User experience and involvement can be supportive for agile teams and provides guidelines for incorporating UX into agile development [6]. Effective communication is required in remote work between user and agile team for shared understanding, meeting, feedback and documentation [28].

With respect to collaboration between remote users and agile team members, we found difficulties in information sharing, designing the process flow, and understanding the business needs. In this study, organizational trends that were noticed in interactions between remote users and agile teams throughout project implementation are documented as organizational patterns.

These patterns are aimed at project users in remote work environments and agile team members co-located in different locations. The software company is located in the USA and had clients from different countries, for example, one project was implemented in Afghanistan. The agile team and clients were communicating for the project implementation and faced several challenges due to the remote connection. We put our efforts to minimize these challenges through patterns.

The rest of the paper is structured as follows. Section 2 provides the importance of remote work in software development and Section 3 explains where did the patterns come from. Sections 4–8 present the patterns discovered in this study. Section 9 concludes the paper.

2 THE IMPORTANCE OF REMOTE WORK IN SOFTWARE DEVELOPMENT

For cooperation, requirements gathering, productivity, business ideas, and innovation in software development, a working environment for remote users and agile teams in the future will be essential. The future of remote work on users and agile teams are growing and will be simpler than the current period of software development because of the advancement of technology developments [13].

Possibilities for growing remote work: working environment changes in organizations, companies and looking at the limitations of people's movement have increased the need for remote work and provide effective mean technology utilization. For the viability, sufficient utilization, and advantages of software developers, users, and businesses, experiments were conducted on the workforce for remote agile teams and usage [29]. It has been shown that there is a rise in the use of remote work or hybrid working environment engagement by more companies and individuals across a variety of industries.

Agile team building and remote users' adaptability: The working environment for remote work will enable agile teams to form a larger, more skilled, and more professional team that is not limited by geographical location restrictions. Creating a remote agile team can benefit from a range of perspectives, talents, and experiences since they can collaborate with team members from different locations [31].

Using communication tools: It is necessary to have sufficient tools for remote working environment, collaborative tools to improve remote working environment. Providing opportunities for members in real time collaboration and bridging the gap between remote users and agile teams, these solutions may include virtual whiteboards, instant messaging, project management tools, and video conferencing. This can help you provide the fundamental communication channel between the agile team and stockholders in order to establish remote relationships [7].

Building trust in remote users and agile teams: Building trust between agile teams and remote users needs dedication, a mutual mindset, and a focus on outcomes rather than monitoring activities for all companies, either on a large or small scale [24]. Remote agile teams have a chance to develop a culture of trust, empowering them to take ownership of their work and deliver better result in a remote environment, effectively engaging remote users.

Priority of working in a remote environment: In comparison to onsite working, remote work offers greater freedom for agile teams and employees in general. It may make it easier to manage tasks for personal life. It can also support real work for people in job satisfaction and productivity of remote teams and users. Better context or way of the remote working environment can be developed in the working domain by remote agile teams that acknowledge and promote work balance for stockholders [14].

Remote work challenges and solutions: There are benefits and drawbacks adapting to remote working, as well as some common misconceptions and challenges. In remote work its usually arise that people think of isolation among team members, problems understanding, problems with team members' availability in different location, poor participation to communication, and cohesion within agile teams are a few of these difficulties available to team [11]. With communication techniques, frequent check-ins, online team building layout, and developing a strong team culture that encourages collaboration between agile teams and remote customers, these difficulties can be successfully overcome.

Learning and adaptation: Remote working for both user and agile team will be different and changed in the future developments, it will be focused more on preparing IT workers for remote work settings and including remote users in the working environment. Agile teams and remote users will continue to adapt and learn in the future as technology is promoting and changing the working type. As we know that technology improves and developing, new tools, concept and approaches will emerge in society, it will increasing remote collaboration for teams[11].

Establishing and accelerating the adoption of new tools and technologies is something very important in remote agile work. Remote agile teams must remain flexible for rapid change, adapting to new situations and consider new methods of working remotely. They agile team must also be well prepared and aware of the continuous development of technology and the resulting new problems for the remote working phenomenon.

3 WHERE DID THE PATTERNS COME FROM

This study originates from the experience of the first author with numerous software project implementations and from related challenges found in literature [2, 4, 17, 19, 20, 28]. One particular project involved an agile team based in the USA communicating with users in Afghanistan and Nepal. The remote work between the users and agile team is shown in Figure 1. The agile team and users exchange information relevant for software implementation. They work in an iterative manner to achieve the desired goal of the project.

The remote user and agile team engagement involves a software corporation overseeing projects different location with agile teams tasked with completing project goals. Agile team members and

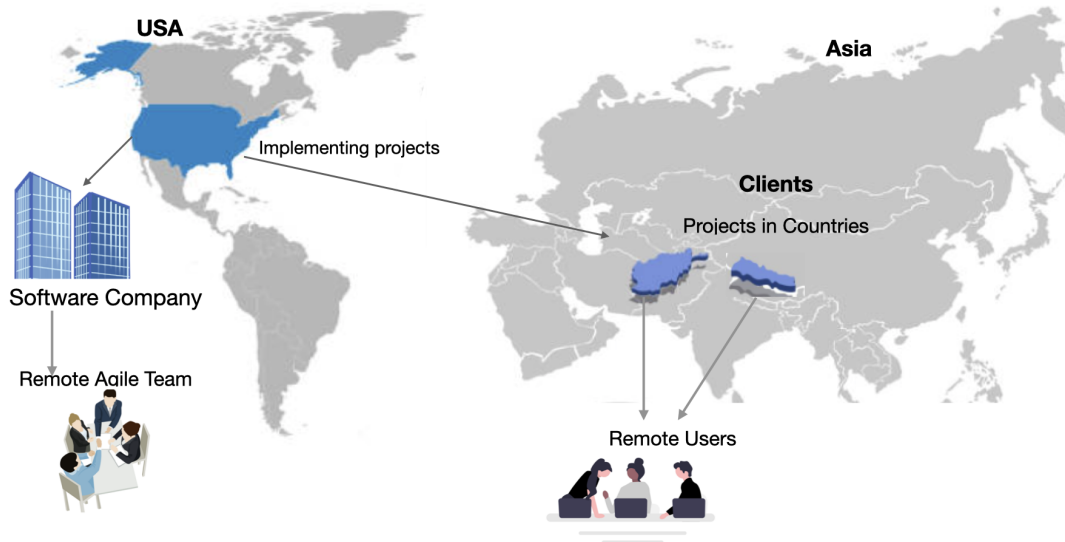


Figure 1: An agile team based in the USA communicating with users in Afghanistan and Nepal.

users frequently collaborate remotely in such situations. Therefore, team members' dedication is required to ensure good communication. This goes beyond common project management challenges [25–27, 34, 35].

The organizational patterns we discovered form a sequence shown in Figure 2. Writing and understanding patterns requires deep thinking about the problems and their solutions, as well as what are the consequences of applying these solutions [33]. For writing the patterns, we used Coplien and Harrison's approach [3, 5, 8], which is based on the Alexandrian form [1].

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The interaction of remote user and agile team demonstrated in Figure 2.

4 ESTABLISH CHANNEL OF COMMUNICATION

... Trust in knowledge sharing becomes essential in user and developer collaborations. Effective communication channels in projects facilitate the smooth interactions of support, build skills, share data, and learning, which is critical for project success.



Connecting user and developer are required to access resources and specifications for effective project collaboration, but without their connection and interaction, accessing sufficient resource and mutual understanding between them become difficult.

Building relationship between remote user and developers, connecting them through proper channel, and accessing remote users' resources and engaging them with developers is an essential task for in software development, but identifying the responsibilities of users-developer and connect them remotely is challenging. Agile teams need to access and understand the user and business requirements compared to local users, but it is difficult to access them and

define a workflow understanding remotely. Remote users and agile teams in organizations want to be connected, but this is not possible due to the time zone and physical distances. The agile team want to connect remote users for regular participation in the project, but identifying committed, and trusted remote users to be involved in the project is not difficult.

Therefore,

Establish a channel of communication between remote users and agile team for effective interactions and communication



Create a virtual communication of technology as a medium of channel between remote users and the agile team to interact, share, and work for the common goal of the project. Use the current platforms of technology to interact with remote users and connect them with agile teams for remote communication through technology to perform services and work effectively on projects. For the purpose of collecting information from users who are not physically present, use communication tools for remote users to effectively communicate and engage them in the development process. To effectively achieve your goal, establish a proper interaction between stockholders.

To encourage user participation with agile team, you can set up activities and stories for stockholders to perform while recording their screens and voice feedback like User Testing, Look back, and stockholder participation in the development process.

You can use tools like Zoom, Microsoft Teams, or Google Meet to have live sessions with participants for moderated remote tests or interviews in remote working environment. Create video conferencing with remote users and agile team using these tools such as Skype, Zoom, or Webex. There are different patterns observed by several other authors to set up coordination and communication remotely first. For example, *Dissolve Geographical Boundaries* can

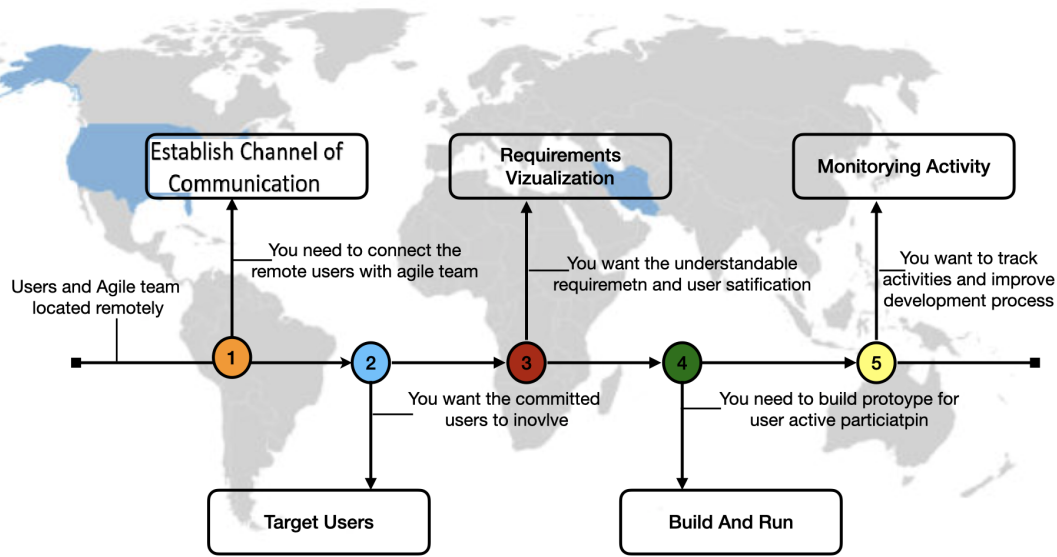


Figure 2: Patterns for remote users and agile teams.

be used to set up the remote connection and identify the responsibilities of team members, while *Communication Broker* can be used to enhance the communication of remote teams, which can be a better way to connect the remote users with agile teams [21, 32].

5 TARGET USERS

...Engaging users with agile team members are important part in project because they often work remotely. In order to facilitate smooth collaboration and satisfy user needs, this gap must be closed. Solutions for building collaboration and communication in dispersed working environments can be found in agile approaches. Predefined tactics, opportunities, participation need are put into practice to maximize remote user participation and achieve project goal.



Different users and developers are located remotely, committed, skilled and expert users are required to be involved in the software development process with the agile team to participate in the project implementation.

Involving users through remote working environments creates missing business requirements and unclear information in the software development process, but knowledgeable remote users are required to avoid misunderstanding between users and developers for resource sharing.

User participation in remote work environments presents complex issues that might lead to incomplete software development projects and unfulfilled business needs, but misunderstandings about resource sharing between users and developers bring limitation and unclear requirements to the project. In remote working environment, stockholders, users and agile teams face the lack of in-person contacts that can obstruct stakeholder communication and clarity while identifying the right stakeholders, but adopting strong approaches targeted in user-developer collaboration for an effective

information sharing in distributed project teams is necessary to achieve these required goal.

Therefore,

Identify motivated and strong committed users, those who understand the workflow and are skilled in information sharing with others comparably.



Agile teams need to take care of all users involved remotely in software development and analyze the remote user's skill, and knowledge. Target those users who understand the business requirements and are willing to work with the team and have motivations toward project implementation. Strongly committed users are required to work with the agile team for the common goal of the project. User involvement is an important part of software development, but it's crucial to engage the domain expert users that can share the business requirements and help with the modification of software artifacts. [9].

6 REQUIREMENTS VISUALIZATION

...Users are available remotely and the agile team is located in a different location, understanding and access to business requirements and user specifications on different sites becomes more challenging.



Access to business requirements and understanding user specifications in a remote working environment is crucial, but without this, the agile team may find it difficult to comprehend the requirements and workflow effectively.

In remote working environment users and agile team are geographically co-located and they depend on communication tools for effective communication and interactions to collect the project requirements, but accessing and collecting the requirements from remote users is not comprehensive and understandable to the agile

team because they are not available face to face. Both users and business requirements are not well understood by the agile team, but designing the actual workflow can not be done without clear and comprehensive requirements.

There is a misunderstanding between remote users and agile teams in information sharing, but if requirements are not clearly understandable and do not meet the customer needs, then the system may not meet their satisfaction and quality can not be measured. Understandable requirements for a projects are important and without knowing the right and actual business requirements, but the agile team can not start the initial phase of software development.

Therefore,

Visualize the business process and user needs, get feedback throughout the process to design the business flow and start the project by sharing a live prototype with remote users.



Visualize the workflow to remote users by collecting the business requirements and getting their feedback for each task improvement. When collecting the project requirements first consider the remote user specifications through the data visualization method.

Requirements visualization for remote users means providing textual requirements with graphical illustrations and also a form of user interface prototyping that is used for gathering customer requirements. It can help the agile team to design the business process and customer background processes. Illustrate the business and user specifications through a graph, data flow diagram, flow chart, business process model, and mind maps. Use tools and provide options for remote users so the user can provide insight, like, dislike, and confirm the process workflow which can help the agile team effectively understand the user requirements.

Visualization is a good way that is used in a variety of software projects to satisfy the customers with the first look at system flow and compare the manual work. The visualization of data needs to support the agile team to get the actual acceptance of remote users during the project.

Requirements visualization plays an important role in remote work environments between users and agile teams in startups and communicating business plans. The goal of your visualization should be to understand the business requirements and user specifications so you can choose the right option for project implementation in remote work.

Users are not experts in how to visualize requirements and share them with the agile team. They are not skilled at sharing requirements. Therefore, users need requirements illustrations in the development process. Lavalley et al. [15] proposed a visualization methodology and presented a case study to support the users through requirements visualization for effective user requirements and data collection.

The requirements visualization is helpful for software development teams in knowledge domain visualizations, which assist users in extracting and interpreting interesting patterns [10]. Kanban and Scrum are often used by agile teams in project implementation.

In software development, engaging users with the agile team and understanding the business requirements can involve requirements visualization, which plays an important role in capturing user requirements easily.

It is well known in academic and professional way that user experience and Lean UX purposefully apply lean principles to both improve user experiences and support product development processes [12].

When developing software, it is crucial for developers to have a thorough understanding of user needs because this supports them in making innovative and user-friendly solutions. Developers need to ensure their software fulfills customer expectations and is well-liked by users by concentrating on what they require. The acceptance of the software by mutually becoming successful and meet their expectations.

7 BUILD AND RUN

... When software development process is simplified and both users and the agile team are located remotely, prototyping helps them to know system's initial phase, effectively communicate and understand the actual workflow.



The agile teams want to satisfy the users, implement the project on budget and deliver it on time, but the project's requirements are complex and undefined, while the users' specifications remain unclear.

Business requirements and user specifications are often complex, unclear, and take much time to understand, but face-to-face communication to get the actual requirements and engage the users with the agile team is challenging due to the remote work.

Agile teams in projects are often face complicated situations to design the system in one phase and rarely involve the users on occasion, but collecting the requirements remotely at once and then developing the software brings several other challenges to the agile team.

Rapid prototype development is preferred by the agile team in contrast to traditional development techniques, but its difficult to frequently prioritize comprehensive planning and precise documentation always.

It is essential to know the stockholders cultural, temporal, and interpersonal circumstances in the remote and virtual working environment, but its challenging to keep the remote users and the agile team to interact in order to promote productive cooperation and ensure project on on the success side.

software development process also include Well defined stages and procedures that may require to receive user and developer positive attitude toward software development, but its challenging to prioritize agile methods, adaptability, and responsiveness to change software requirements all time.

The aims of the project implementation is based on effectively within a certain budget and timetable, but always changes may creates a conflict with project plan and need approval from customer and software company.

Therefore,

Establish an iterative strategy in project implementation, gather requirements continuously at each step, and build a prototype to understand the flow of each phase.



Work in the iterative way of requirements delivery and build the prototype and share with the users, which can increase transparency between the agile team and users. Be well prepared to the requirements delivery at each phase depends on the agile team and user performance and how much time they spent on the initial phase. The duration for each phase from the concept to the final delivery, needs to be defined by the time each step takes. provide opportunities to users and agile team in prototyping, you should observe to engage remote user insights, inputs to the prototype, user suggestions for changing or expanding the prototype. Provide opportunities to users innovations for using the system based on their experience and skills, and consider any revision plans for the prototype that can help in setting priorities in every phase. And run this initial prototype to go in line with users' feedback and suggestions and Repeat the process of collecting and prototyping to effectively implement the project. The *Building Prototypes* pattern [8] can be used to understand the requirements, interactions with users, design benefits, and reduce the extra cost and time.

Providing a prototype is important for both the customer and the agile team to mutually understand the workflow. According to Smith and Johnson [23], the integration of gamification in mobile applications was investigated as a means to effectively enhance user engagement.

8 MONITORING ACTIVITY

... Users and agile team members are collaborating in remote working environments. Your aim is to improve the process, measure quality and give support to users and agile team members.



In remote working environment, collaboration between remote users and agile teams have progressive activities and processes, tracking activities progressively is required to improvement and achieve quality in product development, but with undefined guidelines and no tracking approaches, its will be difficult to control software development process and measure quality.

Agile teams and users have the freedom to communicate for their work procedures and use communication tools when working remotely, freedom can helps creativity and productivity, but its difficult to have standardized and clearly defined approaches without any tracking strategies to monitor the software development process with different agile team members on remote work.

Improve procedures consistently as they adapt to different conditions and projects, but the absence of defined criteria may make it difficult for agile teams to track, evaluate, and improve the software development process.

Agile teams and users that are separated remotely across different time zones and operate remotely, but the geographical distance may make it difficult to communicate and see team members' activities as well. Agile approaches provide a strong emphasis on user and developer interaction and other project team members,

including all stockholders, which can be more challenging in remote environments, but tracking and monitoring project activity progress becomes less apparent, which makes it more difficult to evaluate the quality of software project work and bring potential improvements in the software development life cycle.

Therefore,

Establish a mechanism of monitoring activity in project through which all activities and processes between remote users and agile team members can be tracked progressively for quality results.



Monitor the development process for periodic tracking of all activities between remote users and agile team members for daily, weekly, and satisfactory process improvement of any activity's progress, this can be done to analyze data and information needed in the project implementation. Establish a monitoring team of two or three members to Progressively track the development process and analyze the existing process for quality results.

Monitoring the development process in a progressive manner can support remote users and agile team members to achieve the expected results. It can help to identify the problems and challenges in project implementation and can determine to highlight any unintended effects for both positive and negative impacts on the project goal. A more structured atmosphere can be created for remote work by establishing clear workflows, employing project management software, and promoting overall progress and status updates. This approach to monitoring activities based on a plan will make it simpler to track operations over time and assure continual improvement and quality measurement.

Build a cross functional monitoring team that include designers, developers, and system administrators for data analysis to identify the challenges and problems in the the project implementation.

Supporting the team and providing a long term opportunity to improve the software product It is important to ensure that the software process is operating efficiently and reliably. Therefore, we need monitoring of the software development process at every stage.

Monitoring is helpful in agile teams for prioritizing work and assessing software quality problems over time by identifying problems and providing insight into performance [36]. It helps to identify the challenges, make clear decisions, optimize resource allocation, and finally achieve the project outcome. For effective and better results of project activities, it is important to have a monitoring framework to support the efficient running of project activities on time [30].

9 CONCLUSIONS

Working with remote users and connecting them with agile teams creates considerable challenges in remote software development environment. This requires careful organization due to challenges in building agile teams and motivating remote users for efficient participation in the software development process. Involving remote users in the software development process introduces additional problems, such as issues with time zones, inadequate infrastructure, limited user capacity, unclear documentation, ambiguous business requirements, and language differences.

This paper presents five newly discovered patterns: *Establish Channel of Communication*, *Target Users*, *Requirement Visualization*, *Build and Run*, and *Monitoring Activity*. The aim of these patterns is to overcome the challenges between remote user and agile teams in terms of communication, requirement sharing, understanding, user needs, project goal, and mutual acceptance of a software project, and to facilitate effective collaboration during project implementation in a remote working environment. These patterns are derived from practical observations in projects involving remote agile teams and are supported by relevant literature. The application of these patterns aims to enhance project efficiency and collaboration for both remote users and agile teams.

ACKNOWLEDGMENTS

We would like to thank Alejandra Garrido for being our shepherd and for her constructive remarks. Our sincere thanks also go to Aoi Imai, who moderated the session of our writers' workshop dedicated to our paper, as well as to other workshop participants: Haruto Aoki, Cecilia Fernades, Kiyoka Hayashi, Takako Kanai, Mohammad Yusuf Momand, Rio Nitta, Kaito Shiota, Aleksandra Vranić, and Branislava Vranić.

The work reported here received funding from the Erasmus+ ICM 2022 and 2023 programs under the grant agreements No. 2022-1-SK01-KA171-HED-000077735 and No. 2023-1-SK01-KA171-HED-000148295.

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