



Project Acronym: **BIMERR**  
 Project Full Title: **BIM-based holistic tools for Energy-driven Renovation of existing Residences**  
 Grant Agreement: **820621**  
 Project Duration: **45 months**

**DELIVERABLE D9.2**  
**Report and associated material on BIMERR stakeholder engagement & training activities**

Deliverable Status: **First version**  
 File Name: **BIMERR\_D9.2-v1.0.docx**  
 Due Date: **30/11/2021 (M35)**  
 Submission Date: **07/12/2021 (M36)**  
 Task Leader: **Budimex (T9.2)**

| Dissemination level  |   |
|--|---|
| Public   | X |
| Confidential, only for members of the Consortium (including the Commission Services) |   |



This project has received funding from the European Union's Horizon 2020 Research and innovation programme under Grant Agreement n°820621

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## REVISION CONTROL

| Version | Author            | Date       | Status  |
|---------|-------------------|------------|---|
| 0.1     | Budimex, Ferrovia | 01/09/2021 | Draft (structure)   |
| 0.2     | Budimex, Ferrovia | 15/11/2021 | First draft (missing 1.5.3, 1.5.4)                                |
| 0.3     | Budimex, Ferrovia | 23/11/2021 | Missing chapters 1.5.3 and 1.5.4 added. Rephrased chapters.       |
| 0.4     | Budimex, Ferrovia | 02/12/2021 | Updated schedules, added acronyms section, final error correction |
| 1.0     | Budimex, Ferrovia | 03/12/2021 | Submission to the EC  |

# TABLE OF CONTENTS

*List of Tables*..... 8

**EXECUTIVE SUMMARY** ..... 10

**1. Introduction**..... 11

**2. Training and Engagement Strategy** ..... 13

**2.1 Training methods and objectives**..... 13

**2.2 Target audience groups and stakeholders**..... 13

**2.3 Stakeholders engagement strategy** ..... 13

        2.3.1 Recognized Stakeholders – Spanish pilot site ..... 15

        2.3.2 Recognized Stakeholders – Polish pilot site ..... 16

**2.4 Partners involvement** ..... 17

**2.5 BIMERR tools list and involvement**..... 17

        2.5.1 BICA – training material ..... 18

        2.5.2 PWMA for residents - training material ..... 18

        2.5.3 PWMA for workers - training material ..... 18

        2.5.4 PWMA for manager - training material ..... 19

        2.5.5 ARIBFA - training material ..... 19

        2.5.6 RenoDSS - training material ..... 19

**2.6 Feedback/General overview** ..... 19

**3. Demonstration Activities**..... 21

**3.1 Resident Workshops**..... 21

|            |  |           |
|------------|--|-----------|
| 3.1.1      | Purpose .....  | 21        |
| 3.1.2      | Proposed content .....   | 21        |
| 3.1.3      | Expected feedback .....  | 22        |
| 3.1.4      | Timeline.....  | 25        |
| <b>3.2</b> | <b>AEC Professionals – Workers, trainings on site.....</b>       | <b>25</b> |
| 3.2.1      | Purpose .....  | 25        |
| 3.2.2      | Proposed Content .....   | 26        |
| 3.2.3      | Expected feedback .....  | 26        |
| 3.2.4      | Timeline.....  | 27        |
| <b>3.3</b> | <b>AEC Professionals – managers and designers trainings.....</b> | <b>28</b> |
| 3.3.1      | Purpose .....  | 28        |
| 3.3.2      | Proposed Content .....   | 28        |
| 3.3.3      | Expected feedback .....  | 29        |
| 3.3.4      | Timeline.....  | 29        |
| <b>4.</b>  | <b>Conclusions.....</b>  | <b>30</b> |
|            | <b>BIBLIOGRAPHY.....</b>   | <b>31</b> |
|            | <b>Appendix 1 – Official letter (translated).....</b>            | <b>32</b> |
|            | <b>Appendix 2 – User guide for PWMA.....</b>                     | <b>35</b> |
|            | <b>PWMA for Managers .....</b>                                   | <b>36</b> |
|            | <b>Workflow Management.....</b>                                  | <b>36</b> |
|            | Manual workflow import .....                                     | 36        |

|                                     |           |
|-------------------------------------|-----------|
| Automatic workflow upload.....      | 37        |
| <b>Workorder Management .....</b>   | <b>38</b> |
| <b><i>PWMA for Workers</i>.....</b> | <b>41</b> |
| <b>Choosing a workorder.....</b>    | <b>41</b> |
| <b>Completing actions .....</b>     | <b>41</b> |
| <b>Gateways .....</b>               | <b>42</b> |
| <b>Execution menu.....</b>          | <b>43</b> |

## **LIST OF TABLES**

|  |    |
|--|----|
| Table 1 List of stakeholders recognized in Spanish pilot site..... | 15 |
| Table 2 List of recognized stakeholders in Polish pilot site.....  | 16 |
| Table 3 BICA User's feedback questionnaire .....                   | 23 |



## ACRONYMS

| Acronym | Meaning   |
|---------|---|
| AEC     | Architecture, engineering & construction                                  |
| ARIBFA  | Augmented Reality enabled In-situ Building Feature Annotation application |
| BICA    | Building Information Collection Application                               |
| DS      | Demo Scenario   |
| LL      | Living Lab workshops  |
| PWMA    | Process & Workflow Modelling and Automation toolkit                       |
| RenoDSS | BIMERR Renovation Decision Support System                                 |
| WSN     | Wireless sensor network   |
| Q&A     | Questions and answers   |

## **EXECUTIVE SUMMARY**

This deliverable reports, describes, and sums up actions taken to prepare training sessions about the BIMERR Tools used before and during the renovation phase. The aim for mentioned training sessions is to engage and provide a proper training for relevant stakeholders like building residents, AEC professionals, and on-site workers. Deliverable D9.2 introduces and defines all stakeholders who will participate in the demonstration phase as well as explains the engagement strategy which will be implemented during training sessions to personalize and maximize effectiveness of workshops. Each activity has a defined target group, own unique way of presentation and proposed schedule.

## 1. INTRODUCTION

The purpose of task T9.2 *Renovation Stakeholders Engagement & BIMERR Tool Training Seminars* is to make sure that all stakeholders such as main contractor, building administrator, subcontractors, residents, pilot partners, and technical partners involved in the BIMERR tool demonstrations at the actual renovation sites are engaged, committed, informed and able to use the tools to their full potential. The main challenge is to encourage them to use the BIMERR tools during their daily activities despite being under the pressure of delivering the real renovation process. Given the BIMERR tool novelty, targeted activities will be planned to engage and train them on tool usage based on the experience gained in T8.4. Their benefits will be clearly communicated in terms of project performance improvement, enabling faster decision making and on-the-fly change management for improved reporting along the stakeholder chain, ease of use, etc. Stakeholders will be asked to apply their own experiences from renovation projects during the hands-on training to make the learning more effective and to provide further feedback to the tool developers on use cases. The training activities will take place at the renovation sites to address the most critical stakeholder group, the tool end users that are mostly architecture, engineering and construction (AEC) professionals, e.g. renovation designers, planners, project managers, contractors, workers. A distinct user group comprises the building residents. They should also be engaged in the process and use the BICA application to demonstrate its benefits. They will participate in training activities as they are an inseparable part of the tool user group. Training will be delivered through physical seminars (one in each pilot validation site in the respective language) and follow-up activities via electronic means will be foreseen for further Q&A or for live discussion with the tool developers.

Due to the delay of renovation process on Polish pilot renovation site (Appendix 1) and due to pandemics in Poland [1], it was not possible to organize training session for various reasons:

- The list of stakeholders to engage and to be trained is not completely known (see Table 2):

According to the information stated in official letter from city officials (Appendix 1) the public tender should be finished by the end of Q4 2021. It means that currently

the main contractor and designer are not known yet. We cannot complete the list of AEC professionals, that will take part in renovation process, so it was not possible to perform training sessions for them. Budimex is in direct contact with the building owner and is working on these issues.

- Hands-on training during physical seminars could not yet be performed:  
We had to take for consideration that the Polish pilot site is a social building occupied mostly by elderly citizens. Due to the Covid situation in Poland, it is currently unwelcome to carry out hands-on training sessions. We must act socially responsibly, to avoid damage of reputation both for BX and the BIMERR project.
- Training timing should be adapted for higher effectiveness:  
Due to the delay on the renovation works at the Polish pilot site, the gap between dates coupled to the submission of D9.2 and dates of the actual renovation, is too big and would make the training not effective. The hands-on training should be performed as close to the actual use of tools as possible.

Taking into consideration all reasons explained above, D9.2 is being submitted in an early version that is focusing on training material and engagement strategy. The document will be reopened and submitted in its final version as soon as the public tender for the renovation project in Poland is over and the main contractor and actual stakeholders are known. This course of action was agreed with the PO Jonas Hedberg in a meeting on November 4<sup>th</sup>, 2021.

## **2. TRAINING AND ENGAGEMENT STRATEGY**

### **2.1 TRAINING METHODS AND OBJECTIVES**

After the successful outcome of the Living Lab (LL) workshops organized both in Spain and Poland, we adapted the methodology used during the workshops. The need of adapting the content and the form is due to the language barrier (even if we already faced similar issues during the LL workshops) and the participant's profile. Both AEC subcontractors and residents are very unlikely to understand English, especially orally for a 1- or 2-hours training. For this reason, we:

- will conduct the training session in local language (Spanish and Polish)
- asked the technical partners and tools owners to develop clearer and easier presentations and videos, so that the complex content can be taught in the best way possible very simple messages and concepts can be shared with the training participants

### **2.2 TARGET AUDIENCE GROUPS AND STAKEHOLDERS**

The training sessions are mainly focused on two target groups:

- Residents (and building administrators/housing committees)
- AEC professionals that are directly involved in the renovation process of the pilot buildings. The main objectives of the training sessions are:
  - show to the AEC professionals that are directly involved in the construction site and in the day-to-day renovation works what the selected BIMERR tools are, what they target at, which challenges can be overcome through their use;
  - train them on how to use the tools;
  - seek their feedback about the tools.

### **2.3 STAKEHOLDERS ENGAGEMENT STRATEGY**

The stakeholder's engagement is a complex task, as it involves an important part of diplomacy, managing to gain results, but avoiding bothering the relevant stakeholders at

the same time. This has been true since the beginning of the project (mainly with the building administrator and the residents) and will hold as well with the main contractor and subcontractors in the upcoming months. Each pilot partner might use a slightly different strategy, but we agree on the following key aspects:

- Regarding the residents: A trustful relationship has been built along the months. Nevertheless, we still must pay attention not to bother them. We cannot and will not engage them if it involves intrusion or obligation. Our strategy here is to maintain a trustful collaboration, without asking too much from them. During the maintenance (battery charging, fixes) of sensors performed by BX employees, all residents were directly informed about the status of the project and it was explained to them what the next steps would be. In case of the Polish pilot site, to ensure good relations with residents, BX is planning to prepare gift boxes and letters with thanks and appreciation for occupants that agreed to install sensors in their apartments. The gift boxes will be delivered prior to Christmas. In case of Spain, in the last 12 months, frequent exchanges with the residents took place in order to maintain the engagement or to request specific information required for the technical works (for instance questionnaires in task T5.4). In the last months, due to some technical issues with the WSN monitoring, the contact was almost on a weekly basis, but through cordial exchange and collaboration. For that reason, the engagement of the residents from the five monitored flats is still fully ensured. In the case of one flat, there was a change of resident, but FER made sure to ensure the continuity. Recent discussions with the building administrator let to explore the possibility to enlarge the scope: the building administrator believes in the added value of the residents' apps, hence will try to invite private owners of flats to join the validation activities.
- Regarding AEC professionals involved in the validation activities, the strategy is to leverage the good collaboration we managed to build since the beginning of the project with the building administrator in both countries. They are the ones able to insist and convince the main contractor to collaborate with the BIMERR project. In case of Spain, the involvement of the main contractor is already ensured, which will facilitate the involvement of the subcontractors as well, since they must report to the main contractor. In the case of the Spanish pilot, bilateral meetings between the technical partners CERTH and NT as well as the main contractor took place

already in November 2021. The activities within demo scenarios DS3 and DS4 (included in D9.1) were in focus.

### 2.3.1 Recognized Stakeholders – Spanish pilot site

In case of Spain many meetings with the main contractors and the building administrator have been organized, and information about the AEC professionals involved in the renovation project has been gathered. Below, the main stakeholders (both residents and AEC professionals) involved in the project are listed. When this report is being written, the strategy of the demonstration scenarios is still under development, hence the exact list of people who are going to validate each tool has still to be defined. Nevertheless, the chart below gives a good overview of the persons that could take part in the training sessions.

**Table 1 List of stakeholders recognized in Spanish pilot site**

| Category          | Company                   | Job function                       | Comment            |
|-------------------|---------------------------|------------------------------------|--------------------|
| AEC professionals | HORLASA (main contractor) | Upper Management                   | Main contractor    |
| AEC professionals | HORLASA (main contractor) | H&S coordinator                    | Main contractor    |
| AEC professionals | HORLASA (main contractor) | Construction Manager/PM            | Main contractor    |
| AEC professionals | HORLASA (main contractor) | Assistant PM                       | Main contractor    |
| AEC professionals | HORLASA (main contractor) | Foreman                            | Main contractor    |
| AEC professionals | HORLASA (main contractor) | worker                             | Main contractor    |
| AEC professionals | HORLASA (main contractor) | worker                             | Main contractor    |
| AEC professionals | HORLASA (main contractor) | worker                             | Main contractor    |
| AEC professionals | HORLASA (main contractor) | worker                             | Main contractor    |
| AEC professionals | ALCRESA                   | mast climbing platforms            | support facilities |
| AEC professionals | ANDAMIOS INOX             | tubular scaffolding                | support facilities |
| AEC professionals | CERRAMIENTOS ARTU         | joineries/carpentry                | Subcontractor      |
| AEC professionals | FAVENORTE                 | Ventilated façade                  | Subcontractor      |
| AEC professionals | SANEAMIENTOS ARRANDI      | Plumbing/Gas                       | Subcontractor      |
| AEC professionals | BIZELEC                   | Electricity and telecommunications | Subcontractor      |

|               |  |  |
|---------------|--|--|
| Resident 6C   |  |  |
| Resident 8D   |  |  |
| Resident 11B  |  |  |
| Resident 12D  |  |  |
| Resident 13 A |  |  |

### 2.3.2 Recognized Stakeholders – Polish pilot site

For this pilot site, the main contractor for the renovation will be chosen through a public tender. Since the public tender process has not yet started, the list of stakeholders cannot be completed. All information will be filled in as soon as the main contractor is chosen. Nevertheless, the chart below gives an overview of the stakeholders who should take part in the training sessions.

**Table 2 List of recognized stakeholders in Polish pilot site**

| Category          | Company                   | Job Function            | Comment         |
|-------------------|---------------------------|-------------------------|-----------------|
| AEC Professionals | (Pending)                 | Construction Manager/PM | (Pending)       |
| AEC Professionals | (Pending)                 | H&S coordinator         | (Pending)       |
| AEC Professionals | (Pending)                 | Upper Management        | (Pending)       |
| AEC Professionals | (Pending)                 | Assistant PM            | (Pending)       |
| AEC Professionals | (Pending)                 | Foreman                 | (Pending)       |
| AEC Professionals | (Pending)                 | Worker                  | (Pending)       |
| AEC Professionals | (Pending)                 | Worker                  | (Pending)       |
| AEC Professionals | (Pending)                 | Worker                  | (Pending)       |
| AEC Professionals | (Pending)                 | Worker                  | (Pending)       |
| AEC Professionals | (Pending)                 | Worker                  | (Pending)       |
| AEC Professionals | DEDECO                    | Designers               | Subcontractor – |
|                   | Residents Apartment nr.7  |                         |                 |
|                   | Residents Apartment nr.15 |                         |                 |
|                   | Residents Apartment nr.24 |                         |                 |



|                           |  |  |
|---------------------------|--|--|
| Residents Apartment nr.32 |  |  |
| Residents Apartment nr.58 |  |  |
| Residents Apartment nr.63 |  |  |
| Residents Apartment nr.64 |  |  |

## 2.4 PARTNERS INVOLVEMENT

As explained in Section 1.1, the involvement and support of all technical partners, and especially the relevant tool owners will be highly required. BX and FER will make sure that the training takes place and will collaborate in providing the translation of the training material written by the BIMERR technical partners. This input, already provided in the framework of the LL activities, shall be updated and reviewed, as the main objective is not the same: here we aim at guiding the users, so that the tools can be used and evaluated on site. The support of the dissemination and exploitation manager Meritch will be essential as coordinator of the material preparation needed for the trainings.

The following methodology has been chosen:

1. Each tool developer review and update the material provided for the Living Lab.
2. BX and FER adapt the material in cooperation with Meritch.
3. FER and BX translate the material and organize the training sessions. Technical partners will participate in the sessions according to the needs and arrangements stated in demo scenarios included in D9.1.

Because training of most tools will be held in Spanish and Polish respectively, an important part of the preparation to sessions will be direct training of using tools provided by technical partners for BX and FER representatives in first place. Full understanding of all tools' features directed to residents and workers, is necessary to coordinate training sessions.

## 2.5 BIMERR TOOLS LIST AND INVOLVEMENT

The BIMERR tools for which a training is needed are the following:

- BICA
- PWMA for residents
- PWMA for workers
- PWMA for manager
- ARIBFA
- RenoDSS

The first two tools are targeted to residents while the rest is targeted to AEC professionals. Training materials prepared for each tool are described in sections 2.5.1 to 2.5.6.

### ***2.5.1 BICA - training material***

Training material for the BICA application is based on the the end-to-end usage walkthrough provided in section 3 of deliverable D5.6 *Building Information Collection Application for building residents 2*. It presents registration and authorization, describes the main menu and features of the application.

### ***2.5.2 PWMA for residents - training material***

CERTH provided the user manual for the application [3]. This document leads through the installing phase, registration, account creation and use of the application. It contains screenshots with clear instructions for residents. To ensure everything will be understood by occupants, BX and FER translated the material into Polish and Spanish respectively.

### ***2.5.3 PWMA for workers - training material***

NOVITECH provided the user guide for the PWMA for workers application in Appendix 2. This document describes the process of choosing a work order and it describes the “execution menu” with all its features. It contains screenshots with clear instructions for workers. To ensure everything will be understood by occupants, BX and FER translated the material into Polish and Spanish.

#### **2.5.4 PWMA for manager - training material**

NOVITECH provided the user guide for the PWMA for manager application in Appendix 2. This document describes the main features of PWMA for managers such as workflow and work order management and the way of creating and assigning them to workers. To ensure everything will be understood by occupants, BX and FER translated the material into Polish and Spanish.

#### **2.5.5 ARIBFA - training material**

CERTH provided the user manual for the application [4]. This document describes two main subjects:

- First, the technical aspects of using Microsoft HoloLens as a tool used by ARIBFA. It describes the initial setup and safety consideration during use.
- Second, the user manual of the ARIBFA application itself. It contains screenshots with clear instructions for workers. To ensure everything will be understood by occupants, BX and FER translated the material into Polish and Spanish respectively.

In addition to the delivered text manual, it is planned to use video material prepared for the living labs during training session.

#### **2.5.6 RenoDSS - training material**

In the case of RenoDSS, the tool owner XYLEM provided useful video material [2]. More detailed information can be found in deliverables D7.9 and D7.10. In addition to these elements, and as performed earlier in the project (for instance during the Living Lab activities), XYLEM offers once again the possibility to do live training sessions. In some cases, where English language will not be a problem, direct live training session will be carried out. In other cases, BX and FER personal would support as translators.

### **2.6 FEEDBACK/GENERAL OVERVIEW**

A more detailed description of the expected feedback for each tool is shown in section 3.1.3.

As explained earlier, the main objective is to train future users to use the tools, but another goal of these sessions is to gather further feedback that can help the tools' developers to enhance their tools.

In order to gather feedback, the plan is to follow the methodology used in the framework of the Living Lab activities, meaning that the feedback shall be based on:

- Q&A session during the sessions
- discussions during the sessions
- online questionnaires

### **3. DEMONSTRATION ACTIVITIES**

#### **3.1 RESIDENT WORKSHOPS**

##### **3.1.1 Purpose**

Within the BIMERR toolkit, there are two tools that mainly focus on the residents:

- PWMA for Residents: an application for the building residents that inform and alert them about aspects of the renovation they must be aware of (e.g., scheduling appointments with contractors, works progress, hazards in the building, etc.).
- BICA: a user-friendly mobile App to effectively collect additional building and occupancy information from the residents of a renovation site. Three main functionalities can be highlighted:
  - ✓ Residents directly input missing BIM information (e.g., operational usage patterns) and see details about the building equipment/components
  - ✓ Residents can report any building weak points, accompanied by complementary information, such as notes and photos
  - ✓ Residents can provide information regarding their comfort status at various environmental condition, but also their preferred use of the spaces and components

##### **3.1.2 Proposed content**

Based on the successful outcome of the second round of living lab activities (organized in May in Spain and in June in Poland), it is planned to organize a similar workshop with different focus groups:

- The residents:
  - in the case of Spain, that would be the five families living in the five flats that are monitored
  - in case of Poland, it would be eight families in eight flats that are monitored

In both cases FER an BX will try to enlarge the participation group by organizing meetings with residents in coordination with building administrator, during which the benefits of participating in project will be shown.

- Flat owners (if these are different from the residents)
- The building administrator
  - Viviendas de Bilbao in the case of Spain
  - ZGN Praga Południe in case of Poland

### **3.1.3 Expected feedback**

The two tool developers (CERTH and SUITE5) prepared a list of questions that shall be addressed with the residents. Below these questions are listed.

#### PWMA for Residents

- Do you find the "Calendar View" of the task list useful?  
*1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
- Are you satisfied with the way in which you comment on the tasks? If not, what would you change in this segment?
- Do you think that the Notifications Settings cover all your preferences about the notifications?  
*1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
- Are you satisfied with the way in which you report the issues? If not, what would you change in this segment?
- Do you find the PWMA For Residents application user friendly?  
*1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
- Do you need more information about the tasks? If so, please mention them
- Do you find any functionality difficult to use or follow? If so, please list the specific parts.

#### BICA User's Feedback questionnaire

Please rate the following statements, using an X, according to the scale:

1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree), 5 (Strongly Agree)

**Table 3 BICA User's feedback questionnaire**

| <b>No.</b> | <b>Statement</b>  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|------------|---|----------|----------|----------|----------|----------|
| 01         | I found the BICA application easy to use.   |          |          |          |          |          |
| 02         | I think that I would need technical support to be able to use this application.   |          |          |          |          |          |
| 03         | I find the information provided through the BICA app, easy to understand  |          |          |          |          |          |
| 04         | I find it easy to navigate through the BICA app.  |          |          |          |          |          |
| 05         | I find that the User Interface (look and feel) of the BICA app has an intuitive design.                                 |          |          |          |          |          |
| 06         | I believe that I will be using the BICA app frequently.   |          |          |          |          |          |
| 07         | I found the various functions of the BICA app well integrated.  |          |          |          |          |          |
| 08         | I find it likely that I will recommend the use of BICA to other members of my household, residents, friends, etc.       |          |          |          |          |          |
| 09         | Through the use of the BICA app, it will be easier for me to provide information when required by the building manager. |          |          |          |          |          |

|    |   |  |  |  |  |
|----|---|--|--|--|--|
| 10 | Through the use of the BICA app, I will be able to provide information related to the equipment/components in my apartment, without affecting my daily schedule.  |  |  |  |  |
| 11 | Through the use of the BICA app, it will be easier for me to track all the components/equipment in my apartment and their details.                                |  |  |  |  |
| 12 | Through the use of the BICA app, it will be easier for me to monitor the ambient conditions in my apartment.  |  |  |  |  |
| 13 | I find the feature of reporting my actual comfort state particularly useful for identifying my comfort boundaries/preferences.                                    |  |  |  |  |
| 14 | I find the feature of "Report Log", very useful in having an overview of my submitted reports and tracking their status their status.                             |  |  |  |  |
| 15 | Through the use of the BICA app and the "Report Issue" feature, it will be easier for me to report any issues and faults of equipment/components in my apartment. |  |  |  |  |
| 16 | Through the use of the BICA app, I will feel more engaged in the renovation design stage of my building, compared to a traditional renovation design approach.    |  |  |  |  |



|    |  |  |  |  |  |  |
|----|--|--|--|--|--|--|
| 17 | I believe that with the use of the BICA app, the renovation design of my building will be customized to the needs of its actual residents. |  |  |  |  |  |
|----|--|--|--|--|--|--|

### 3.1.4 Timeline

Regarding the training sessions, as most of the tools will be tested the beginning of 2022 (realistic estimate based on ongoing demo scenarios plan, no exact dates have been established in the moment of this report’s delivery), it has been decided to wait for the right moment to do the training sessions, i.e. ideally two or three weeks before the actual validation takes place, so that all information is fresh in the minds of the persons in charge of using the BIMERR tools. Information to be released in D9.1 end of this month will contain the validation schedule related to the tool in section 3. The training dates are going to be based on that information. In the second version of this deliverable, a thorough reporting of all training activities (and timeline) will be made. Nevertheless, an estimate can be shared regarding the Spanish pilot: taking into account arrangements from demo scenarios’ plans, that are the latest at the time of writing this report, training seminars for BICA and PWMA for residents applications should take place at the turn of February and March. In case of the Polish pilot site, an exact schedule for the validation activities is not yet in place (because it is still depending on the public tender), nevertheless the most probable date for training activities is Q2 2022.

## 3.2 AEC PROFESSIONALS – WORKERS, TRAININGS ON SITE

### 3.2.1 Purpose

Within the BIMERR toolkit, there are two tools that mainly focused on the workers

- PWMA for Workers: an application for the building workers for reporting the status of ongoing works, delays, accidents, or other unexpected events.
- ARIBFA: is responsible for presenting BIM 3D visualizations and spatially annotated information on-site during the renovation process to architects, contractors, and

building managers through an Augmented Reality (AR) interface. The main functionalities covered by ARIBFA involve the localization of the user in an indoor environment, based on which the 3D BIM model will be overlaid on top of the physical location of the building. Using object recognition methodologies, elements to be changed or worked upon during the renovation will be highlighted in the AR visualization, as well as Health and Safety annotations and designated work areas, as defined in the daily work schedule.

### **3.2.2 Proposed Content**

In case of PWMA for Workers and ARIBFA, direct hands - on training is necessary. BX and FER find this way of tool presentation as the most effective regarding their experience in cooperation with on-site workers. The user manual is a useful document for the first element of training, led by the main part which will be direct presentation given by BX and FER employee. During this phase workers will get straightforward answers to their questions. To provide effective training, BX and FER representatives must be trained in the first place by CERTH.

### **3.2.3 Expected feedback**

The two tool developers (NOVITECH and CERTH) prepared a list of questions for AEC professionals. Below those questionnaires are listed.

#### **PWMA for Workers**

1. How would you rate the overall usability of the user interface of both applications?
2. What information would you suggest to get better highlighted or presented more dominant?
3. Are the upper notifications in the Viewer visible enough?
4. Are the field names in Manager Tool clear enough, or should we provide some further explanation/hint to each one?
5. Would you add any additional information to the Flow diagram in the Manager Tool?

#### **ARIBFA**

1. Do you find the localization accuracy reliable?

1. *Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
2. Are you satisfied with the accuracy of the BIM overlaid data on top of the actual building?
  1. *Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
3. Do the IFC properties that are currently visualized by ARIBFA GUI provide sufficient information regarding the building components?
  1. *Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
4. Are you satisfied with the way in which you add annotations? If not, what would you change in this segment?
5. Are you satisfied with the way in which you are informed about tasks? If not, what would you change in this segment?
6. Do you find the ARIBFA application user friendly?
  1. *Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree*
7. Do you find any functionality difficult to use or follow? If so, please list the specific parts.

### **3.2.4 Timeline**

Regarding the training sessions, as most of the tools will be tested at the beginning of 2022 (realistic estimate based on ongoing DS discussions, no specific dates have been established in the moment of this report's delivery), it has been decided to wait for the right moment to do the training sessions (ideally two or three weeks before the actual validation tasks place, so that all information is "fresh" in the minds of the person in charge of using the BIMERR tools). In that sense, the information that will appear in D9.1 (Section 3) will give valuable input of suitable dates for demonstration activities and training dates. In the second version of this deliverable, a thorough reporting of all training activities (and timeline) will be made. Nevertheless, an estimate can be shared regarding the Spanish pilot: taking into account arrangements from demo scenarios meetings, that are the latest at the time of writing this report, training seminars for ARIBFA and PWMA for workers applications should take place in February. In case of Polish pilot site, it is hard to predict the exact moment of when renovation work starts, so it is not possible to plan validation activities, nevertheless the most probable date for training activities is spring 2022.

### **3.3 AEC PROFESSIONALS – MANAGERS AND DESIGNERS TRAININGS**

#### **3.3.1 Purpose**

Within the BIMERR toolkit, there are two tools that mainly focus on professionals:

- PWMA for Managers: an application for the site managers that is giving an opportunity to upload the workflow and create workorders to specific on-site workers. It can help to control status of ongoing works, delays, accidents, or other unexpected events.
- RenoDSS (Renovation Decision Support System): “RenoDSS is a tool with an intuitive, BIM-based, and easy-to-use interface that illustrates the building’s renovation options, evaluates their impact on the building performance and guides the user through various alternatives, towards the optimal choice for given boundary constraints (such as size of intervention, budget, target energy savings, etc.). [5].”

#### **3.3.2 Proposed Content**

Based on the successful outcome of the second round of living lab activities (organized in May in Spain and in June in Poland), it is planned to organize a similar workshop with different focus groups:

- AEC Professionals – on-site - managers
- Other participants
  - Budimex Construction Office
  - Dedeco Architecture Studio – company that BX is cooperating with in case of designing renovations.

This part of training directed to professionals can be performed by partners directly, because it is not necessary to be held in Spanish and Polish. During bilateral discussions with BX, partners responsible for those tools, expressed their will to take to perform direct training/presentation for interested stakeholders in a form of workshop.

### **3.3.3 Expected feedback**

Due to the workshop type of training, feedback from users will be given directly to partners during sessions.

### **3.3.4 Timeline**

Regarding the training sessions, as most of the tools will be tested at the beginning of 2022 (realistic estimate based on ongoing DS discussions, no specific dates have been established in the moment of this report's delivery), it has been decided to wait for the right moment to do the training sessions (ideally two or three weeks before the actual validation tasks place, so that all information is "fresh" in the minds of the person in charge of using the BIMERR tools). In that sense, the information that will appear in D9.1 (Section 3) will give valuable input of suitable dates for demonstration activities and training dates. In the second version of this deliverable, a thorough reporting of all training activities (and timeline) will be made. Nevertheless, an estimate can be shared regarding the Spanish pilot: taking into account arrangements from Demo Scenarios meetings, that are the latest at the time of writing this report, training seminars for PWMA for Managers application should take place February. In case of Polish pilot site, it is hard to predict the exact moment of renovation work start, so it is not possible to plan validation activities, nevertheless the most probable date for training activities is spring 2022.

In case of RenoDSS, the training workshop is to be performed as soon as the BIM models fulfill all requirements, and all data which is needed to perform simulations are uploaded. The BIM models are missing just a few minor things and it is planned to have them complete at the end of this month, the needed data for the simulations is going to be ready 2 weeks prior to it. BX and FER are planning an online workshop meeting with stakeholders and partners to take place in January 2022.

## 4. CONCLUSIONS

This first version of deliverable D9.2 focuses on stakeholder's engagement strategy and training material that is available at the current state of the project. It is planned to reopen the deliverable to complete this document when training activities have been implemented. The main blockers for submitting the final version are:

- Pending public tender in Poland. This situation makes it impossible to define all stakeholders involved and to have a detail planning of the renovation.
- Impossibility to perform hands-on training due to current COVID situation. Hands-on training remains necessary to ensure effectiveness, especially regarding tools focused on workers and residents. We will avoid to schedule training in the peaks of COVID cases and will have the trainings in online form only if strictly necessary.

Due to continuation of work in Task T9.1 regarding planning of demo scenarios, adjustments in schedules, scope of training and training materials may occur. All significant changes will be described in the final version of this deliverable.

## BIBLIOGRAPHY

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[2] "Reno DSS alpha version Demo" Xylem technologies

<https://www.youtube.com/watch?v=BM16jmA9wa4> (13.11.2021)

[3] "PWMA for Residents user manual" – Annex I in D6.11 "Renovation progress monitoring & alerting application for residents 2"

[4] "User manual" – Section 8 in D5.10 "AI-enabled tools (hardware & software) for in-situ digital building model annotation via smart-glasses 2"

[5] Deliverable D7.9 "Integrated BIMERR Renovation Decision support system 1"

## APPENDIX 1 – OFFICIAL LETTER (TRANSLATED)



ZAKŁAD GOSPODAROWANIA NIERUCHOMOŚCIAMI

[Real Estate Management Company]

IN THE PRAGA-POŁUDNIE DISTRICT OF THE CAPITAL CITY OF WARSAW

ul. Walewska 4, 04-022 Warsaw, phone no. 22 277 30 82, 22 277 30 83, 22 277 30 01  
kancelaria@zgnpragapld.pl, zgnpragapld.waw.pl

Warsaw, 7 October 2021

**Letter No.: WP/2021/00013760/K/041930**

**Case No.: TT/7/0772/21**

**Mr.**

**Artur Popko**

**President of the Management Board**

**General Director**

**Budimex S.A.**

**ul. Siedmiogrodzka 9**

**01-204 Warsaw**

**Subject:** Agreement 34/20/TT/GN/PS of 04.05.2020.

*[handwritten:]* Dear Mr. President,



in connection with the provisions of the agreement no. 34/20/TT/GN/PS of 04.05.2020, the subject matter of which is cooperation between

**the Capital City of Warsaw** with its registered office in Warsaw, pl. Bankowy 3/5, 00-950 Warsaw, NIP 525-22- 48-481, REGON 015259640, represented on the basis of the power of attorney of the President of the Capital City of Warsaw of 02.07.2012 no. GP-IX.0052.2545.2012 by Janusz Gronkiewicz – Director of Zakład Gospodarowania Nieruchomościami in the Praga-Południe District of the Capital City of Warsaw, hereinafter referred to as the **“City”**,

and

**Budimex S.A.** with its registered office in Warsaw, ul. Siedmiogrodzka 9, 01-204 Warsaw, entered into the National Register of Entrepreneurs kept by the District Court for the capital city of Warsaw in Warsaw, 12th Commercial Division under the KRS number: 0000001764, NIP 5261003187, REGON 01073263000000, represented by **Mr. Artur Popko** – President of the Management Board, General Director, hereinafter referred to as **“Budimex S.A.”**,

as part of the BIMERR international project – “BIM-based holistic tools for Energy-driven Renovation of existing Residences”, hereinafter referred to as the “Project”, co-financed by the European Commission under the research and innovation program “Horizon 2020” (grant agreement no. 820621).

The parties unanimously declare their will to continue cooperation on the above-mentioned project. At the same time, we would like to inform you that as a result of the SARS-CoV-2 pandemic causing the COVID-19 disease, which has paralysed our country and the whole world since March 2020, there have been delays in the scope of planned and undertaken actions.

The delays, not caused by either party, became the basis for extending the deadlines for the audit procedure, installation of sensors and collection of relevant data accordingly. The necessity to finance other priority projects from the City budget forced the postponement of the planned thermal modernisation of the pilot building indicated by the City and located at ul. Wiarusów 15.

At present, the parties, in the spirit of cooperation, undertake joint activities leading to the possibility of preparing, announcing and selecting a contractor for the design and modernisation in the fourth quarter of 2021. These steps should allow the selected contractor to start construction works in the spring of 2022 (March – April 2022), which will provide the opportunity to test the tools included in the Bimerr project in the second quarter of 2022.

This letter has been prepared to provide relevant explanations and information to the consortium members of the BIMERR project as well as the Financing Institution.

Contact person: Radosław Bujalski [Radosław.Bujalski@zgnpragapld.pl](mailto:Radosław.Bujalski@zgnpragapld.pl), phone no.: 22-277-30-43, correspondence address: ul. Walewska 4, 04-022 Warsaw.

*[handwritten:]* Yours sincerely,

*[stamp:]*  
DIRECTOR  
*[signature – illegible]*  
Janusz  
Gronkiewicz  
-1483-

**Copy to:**

1. TT ad acta

## APPENDIX 2 – USER GUIDE FOR PWMA

# User Guide for PWMA

**Martin Straka**

I3D Team

Novitech a.s.

[straka@novitechgroup.sk](mailto:straka@novitechgroup.sk)

## PWMA FOR MANAGERS

This tool provides various functionalities regarding the workflow management, user management, work order creation, and so forth.

### WORKFLOW MANAGEMENT

To create a work order, the manager needs an approved workflow which will be used as a structure of the work.

There are currently three ways of getting the workflow:

1. Manual workflow definition
2. Manual workflow import
3. Automatic workflow upload

#### Manual workflow definition

This option is currently disabled for optimisation reasons.

#### ***Manual workflow import***

When you choose the **Workflow** option from the main menu, you can see all available workflows currently in the system. Aside from their ID, name, description, and other details, you can see if they're approved.

When you click on the **Add** option above the workflows, you are able to fill in all the details of your desired workflow, and upload the BPMN file representing it in the **BPMN file import tab** above.

Workflow ? 🔒  Add

| ▼ ID | St. | Name                 | Description                | Version | External ID                                  |
|------|-----|----------------------|----------------------------|---------|--|
| 133  | 🔒   | Renovation Process   |                            | 0       | process_19756887-ef3a-4b8e-9860-3445fc1a055e |
| 132  | 🔒   | PWMA                 |                            | 1       | process_699c543d-bbf8-41da-8e0e-f185e302cf2c |
| 131  | 🔒   | PWMA                 |                            | 0       | process_699c543d-bbf8-41da-8e0e-f185e302cf2c |
| 130  | 🔒   | simple bpmn          |                            | 4       | process_04fe9149-8fd0-4a87-8ca5-937bc3132947 |
| 128  | 🔓   | Window replacement 2 | One old window replacement | 1.1     |  |

*List of all available workflows along with their current status*

### **Automatic workflow upload**

In case of automatic workflow upload, there's a webservice endpoint which sends it directly to our database, based on the specified project's keycloak id.

The webservice endpoint url: [https://i3d.econtent.lu/i3d2/webservices-core/bimerr/upload\\_bpmn?project\\_id=\[Project ID\]](https://i3d.econtent.lu/i3d2/webservices-core/bimerr/upload_bpmn?project_id=[Project ID])

### **Project IDs:**

Budimex Pilot - *bdd2c6b8-0fa8-40bb-903c-09cd8b006335*

Ferrovial Pilot - *228270b8-c8cf-4022-b624-366929ed7d19*

After a successful workflow integration, the workflow cannot be used immediately without being labeled as **Approved**. This is a safety measure so that the workflows that are ready to be used, or already in use, cannot be edited or changed in any way.

Clicking on the defined/imported/uploaded workflow and then on the **Approve** button will open the **Workflow approval** menu, and choosing the **Commit approval** option will trigger the approval process.

All workflows have the option to be printed, reported on, cloned, and tested.

Workflows which haven't been approved also have the option to be deleted or approved.

**Workflow item** ? [Details](#) [Report link accesses](#) [Workflow action tree](#) [Flow diagram](#)

**Workflow name** **Workflow ID**

Renovation Process 133

**Description**

This workflow covers the whole stage of the renovation process on one specific floor of the building.

**Version Parent** **Origin**

0

**External ID**

process\_19756887-ef3a-4b8e-9860-3445fc1a055e

*The sample workflow creation with an imported BPMN file*

## WORKORDER MANAGEMENT

While the workflow is only meant as a plan of the work, the workorder is a direct order for a specific person at a specific time, and can be linked to materials, spaces, and devices.

After choosing a **Workorder** submenu, users can view the list of all workorders in the database, or **Add** a new one.

When adding a new workorder, the user needs to specify its unique **Number (ID)**, **Name**, and **Description**.

Clicking on the **Add workflow** option will open the list of all approved workflows in the system, providing the option of selecting one.

If the workorder needs to be linked to a specific Building and/or Space, it can be specified in the **Building name** and **lfc identifier** fields.

Clicking on the **Add provider** option will pop-up the list of all providers (users) in the system.

Each workorder must have one provider assigned to it.

The currently logged user should be automatically set as the **Workorder owner**, which can be changed for someone else if needed.

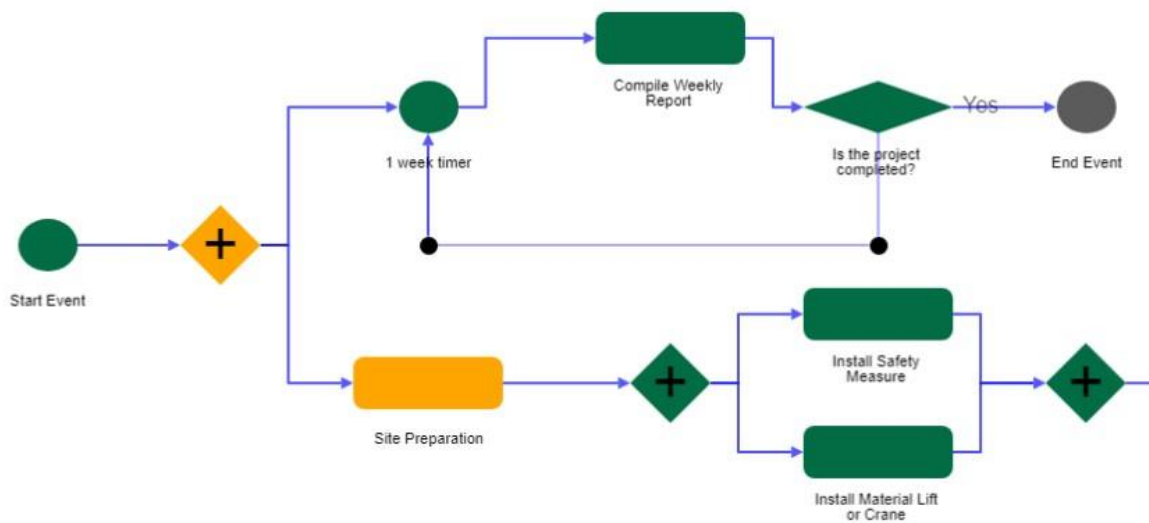
The workorder needs to have its planned **start and finish dates** defined. These can of course be different from the **actual dates**, which will be set automatically during the workorder running.

Lastly, the user needs to define the main **Device**, on which the workorder is meant to be run. This is meant to assure that the workorder is compatible with different types of devices.

| Providers   |                |
|---|----------------|
| Phase 1: Building auditing                                  | Testadmin      |
| Phase 6: Validation   | TestRoles      |
| Phase 3: Permissioning and bidding process                  | Jozef.Mrkvicka |
| Phase 5: Construction and Renovation Project Implementation | John.Doe       |
| Phase 2: Architectural Design if the Renovation             | nttyvoj1       |
| Phase 4: Executive Design                                   | Testadmin      |

*Each lane of the workflow can be assigned to a different worker*

After successfully creating a workorder, it can be further observed in detail. Clicking on **Related action list** reveals the actions/task that are relevant. You can see a **Flow diagram** of the workflow in the next tab. The **Service tasks** tab shows you all fields received from the BPMN file, that are meant for service actions/tasks, and you can set your own values; this screen is also presented immediately after creating the workorder, if it contains any service tasks.



*Flow diagram of a workorder with visible results*

Observing the Flow diagram, you can see all the actions in the workorder, and click on them to see their details. You can change the **Result Text, Result Value, Provider, Start time, End time, and Action Result Status**. The Result status signifies whether the action has already been started and finished, if the result is OK or if it had any problems; and you can also determine it by the colour of the action.

After the workorder has been successfully created and set properly, it can be started and ran by any relevant worker among the assignees, as long as the location conditions are met.

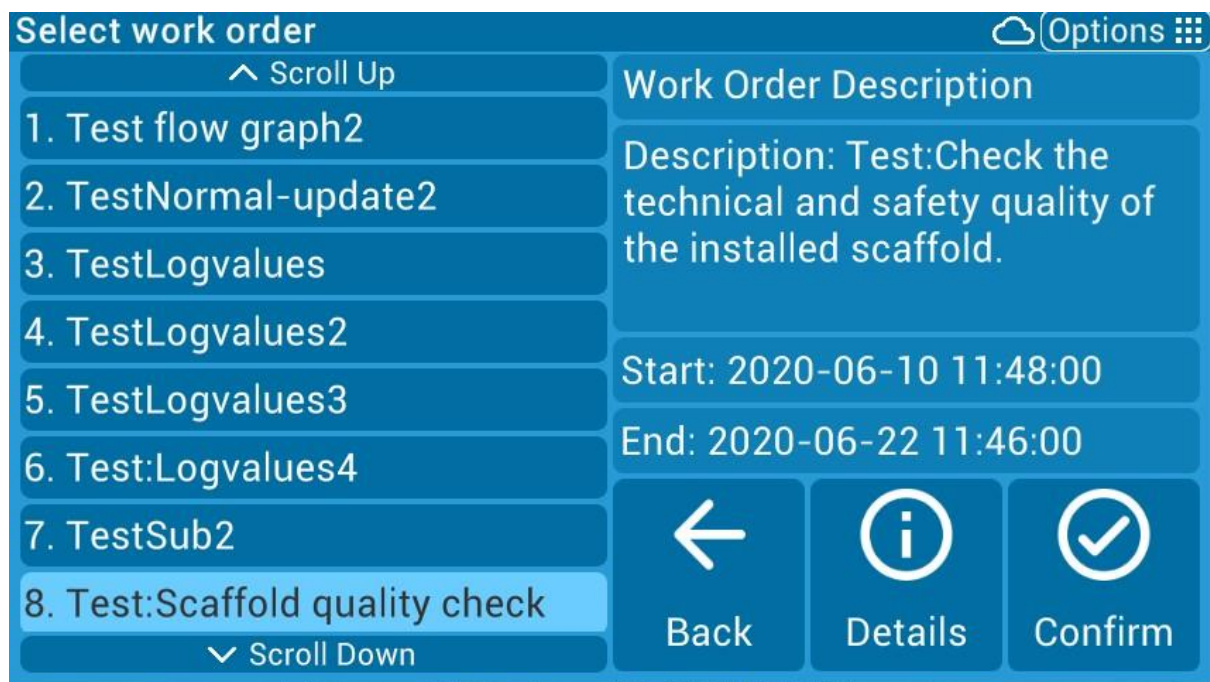


## PWMA FOR WORKERS

This tool allows workers to run previously created workorders and report their work back to the managers.

### CHOOSING A WORKORDER

Users can choose the desired workorder from the **Select workorder** screen. After clicking on the workorder, its name, description, and dates are shown to the right. Additional details can be shown after clicking on the **Details** button. After clicking on the **Confirm** button, the summary screen is shown, where you can **Download** the workorder for offline use, and **Start** it.

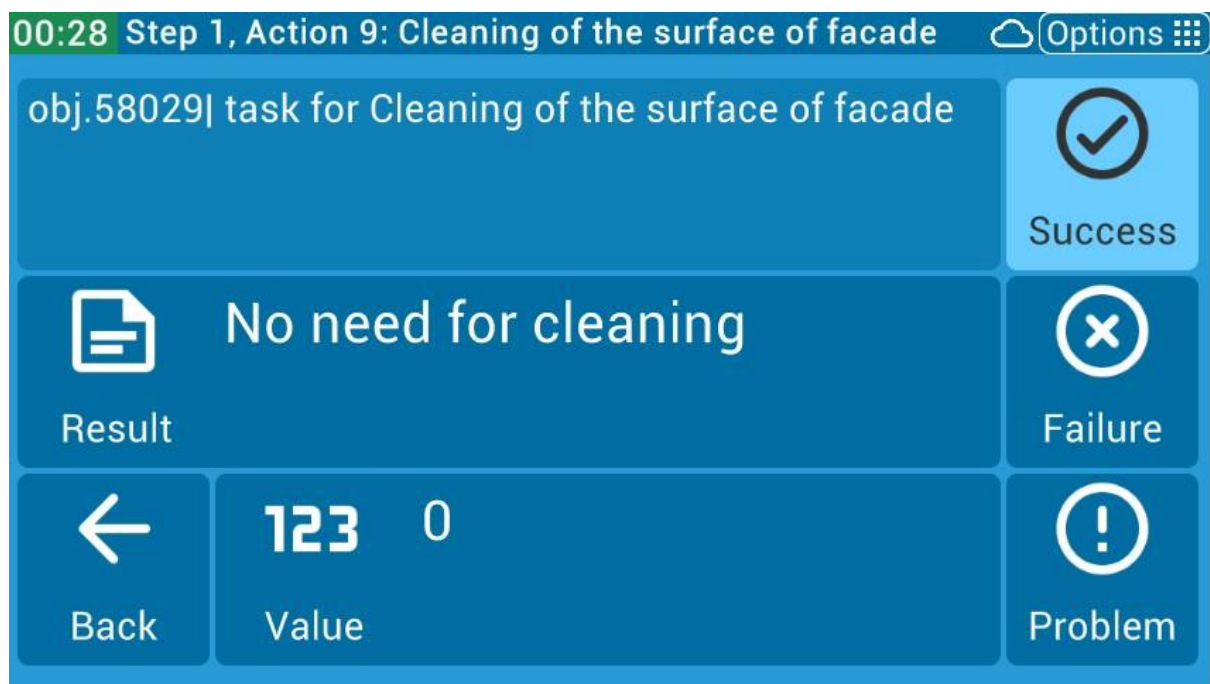


*List of all available workorders filtered by location of the worker*

### COMPLETING ACTIONS

While working on a workorder, each action has to be manually started by choosing the option **Start Action**. After doing so, the timer starts counting and the work can be performed. The action can be paused and resumed at any time. The work can be

snapped as a picture, taped as a video, or recorded as a voice recording. After choosing the stop option, the report screen will show up. Here it's possible to leave a **Result** text describing the result achieved by completing the action, and/or a numeric **Value** if the action's result was any kind of a measurement. Finally, to successfully send the report, the user can choose **Success**, **Failure**, or **Problem**, reflecting their view on the work just performed. Doing so will advance to the next available action, or the end of the workorder.



*Result screen with options to leave a report of the completed action*

## GATEWAYS

In case of a Gateway, the user needs to select one of the provided actions that will start next. It's possible for managers to assign one branch of the gateway to one worker, and other to another one, in which case the gateway selection won't be shown to either of them. It's also possible for managers to set each branch a specific numeric condition, which will be compared to result values from the previous actions, and make the action enabled or disabled respectively.



*A gateway allowing the user to choose which branch they wish to continue on*

## EXECUTION MENU

Clicking on the top right symbol will open the **Execution menu**, which provides several useful functions. The option **Pause Action** allows users to pause the currently running action and come back to it later. The **Stop Action** button allows them to stop the action in its entirety and move to another one. **Action Details** shows details of the action, mainly its description and resources. **Take Photo**, **Record Video**, and **Record Voice** are all working in the same way as their counterparts on the main execution screen. By choosing the **Call** option, the users are able to directly call any other user that is online at the moment, while also having an option to share their screen and resources/media. The **Gallery** option shows all captured media during this instance of the workorder. **Settings** provides various little tweaks and options that can be changed. Choosing **Help** will show all possible voice commands that are currently enabled. The option **Exit Work Order** allows users to halt the currently running workorder, with a status of either **Completed**, **Paused**, or **Aborted**.



*Execution menu options*