Multiple benefits of energy efficiency

M-Benefits Serious Game

www.m-benefits.eu

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Introduction

The "Serious Game M-Benefits" (hereafter *serious game*) is the deliverable of task 4.4, linked to Work Package 4 "Toolkit Development".

The Toolkit of WP4 includes three main tools:

- Evaluation Tools: enabling professionals to include energy benefits and non-energy benefits in their project evaluations and proposals.
- Communication Tools: enabling professionals to present benefits of energy efficiency projects in a way that is attractive to any decision-maker.
- Training Tools: training of professionals to apply the Evaluation and Communication tools. These educational tools will be applied in workshops, webinars and online courses.

The serious game is one of the project's main training tools, that will be used for training purposes during workshops, webinars or online courses.

This final report presents some of the main aspects of the developed serious game.

Access to Test Game and Game Sources

The Serious Game M-Benefits is developed and available on wegas.albasim.ch. In order to test it:

- Wegas.albasim.ch
- Create an account
- Enter the access key "mbtest"
- Click on the "Play" icon.

The source code of the open source Wegas environment can be downloaded at: https://github.com/Heigvd/Wegas

The source code of the MBenefit serious game can be downloaded at: https://github.com/Heigvd/Wegas/tree/master/wegas-app/src/main/webapp/wegas-mbenefits

M-Benefits Serious Game Overview

The serious game is a training tool that uses game mechanics for achieving the training purpose. It is based on a mix of virtual activities (software simulation) and real activities (teamwork and oral presentations).

The serious game is aimed at an already highly qualified audience of energy professionals. Its intention is not to communicate on the importance of energy savings, but on the need to take into account strategic, financial, organisational and human factors in order to have energy-efficiency projects approved by top management. Thus the game should train participants to adopt a systemic and transcultural[1] view in order to obtain high-level support for energy-efficiency projects.

At the end of a training session with the serious game, participants will be able to:

- Explain the Multiple Benefits Methodology,
- Identify, and evaluate in operational, financial and strategic terms, the multiple benefits of energy efficiency projects
- Use the Evaluation and Communication tools to present their energy-efficiency projects

[1] "Transcultural" in the sense of being able to adapt to diverse business and professional cultures to develop and communicate their projects.

The serious game has already been the subject of a first user test in a real training situation, with a group of 20 people from the academic, industrial and political worlds. This test allowed the validation of the Serious Game.

Serious Game Development

The development was guided on the one hand by the search for consistency between the M-Benefits methodology and the activities inside the serious game. On the other hand, the mechanics and interfaces of the Serious Game were developed taking into account that it will be used by multiple trainers in different countries.

UNIL has been responsible for the content of the Serious Game. The content is based on the framework developed in tasks 4.1, 4.2 and 4.3 and on the information given – on condition of anonymity – by a real industrial company. This information concerned the company's business model and management systems, the drivers of investment decision-making, production processes and figures, and included an in-depth energy audit (dated 2015). The real case study was then adapted to best serve the training objectives of the serious game, which are to get the participants to: 1) understand the importance of non-energy benefits to increase the attractiveness of energy-efficiency projects for business leaders; 2) apply the M-Benefits methodology to identify, value and communicate these benefits.

HES-SO has been responsible for the development of the Serious Game, content integration and content gamification. The Serious Game is developed with the Wegas open source environment.

Results

The serious game is developed and is available on wegas.albasim.ch, both for trainers and participants.

The serious game includes three main interfaces which correspond to the three following roles:

- Players: participants to the training session who will play the serious game
- Trainers: facilitators of the training session
- Scenario developers: people who may update the content of the serious game

Players' interfaces and activities

Players are the participants to the training session, who will play the serious game. They have an online access to the serious game: using an access key, each player joins his training session.

The simulation takes place in teams of 3 to 5 players. In the serious game, each team takes on the role of a newly hired energy manager in a canned food production company. The objective of each team is to identify the most relevant energy efficiency measures based on energy and non-energy benefits. At the end of the game, players, in the role of the energy manager, prepare a real presentation (outside the software simulation) for the internal project selection committee in order to get their energy efficiency measures funded. This presentation is based on information discovered in the software part of the Serious Game.

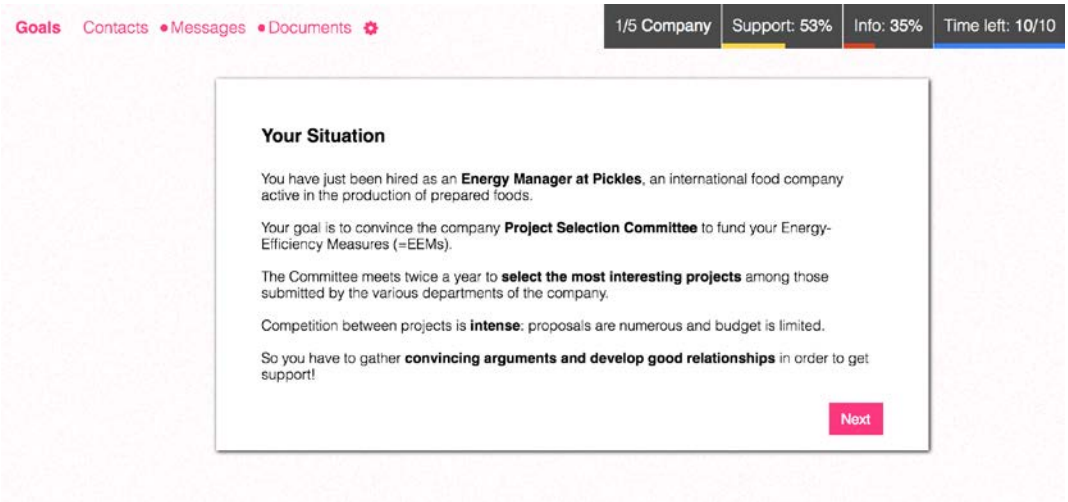

Figure 1. Home page of the serious game, with goals of the game

While playing the serious games, in order to achieve their goals, players can virtually meet different actors of the company (e.g. general manager, HR manager, technical staff, sales director) and ask them questions about their objectives and concerns regarding business, process, economic or strategic aspects.

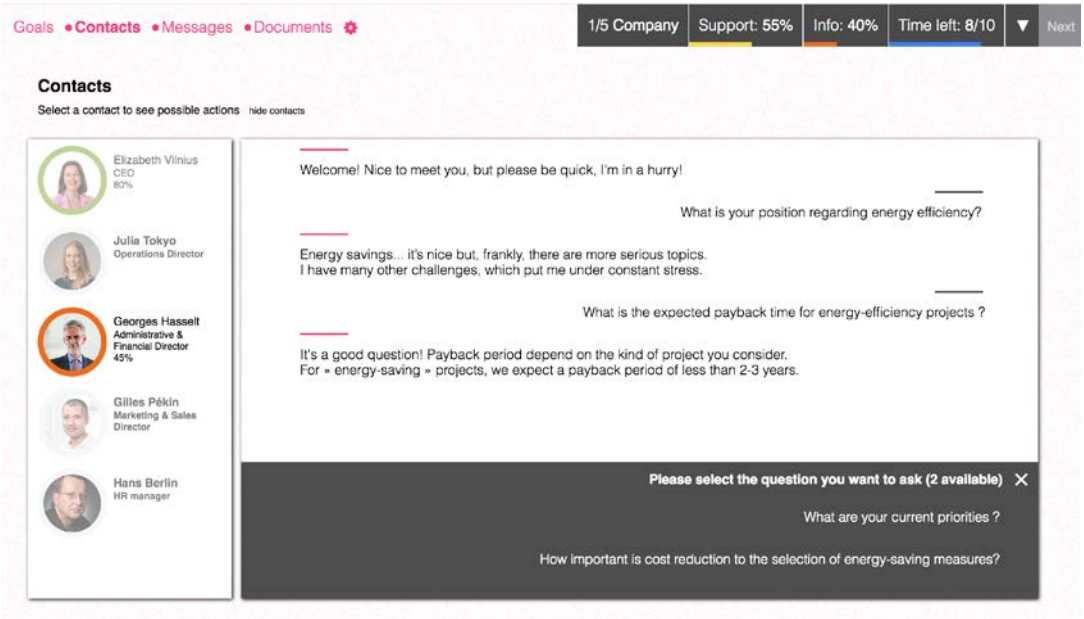

Figure 2. Virtual discussion with company actors

Based on these discussions, players will receive information either by e-mail or in the form of documents. This information will allow players to select the most relevant energy efficiency measures.

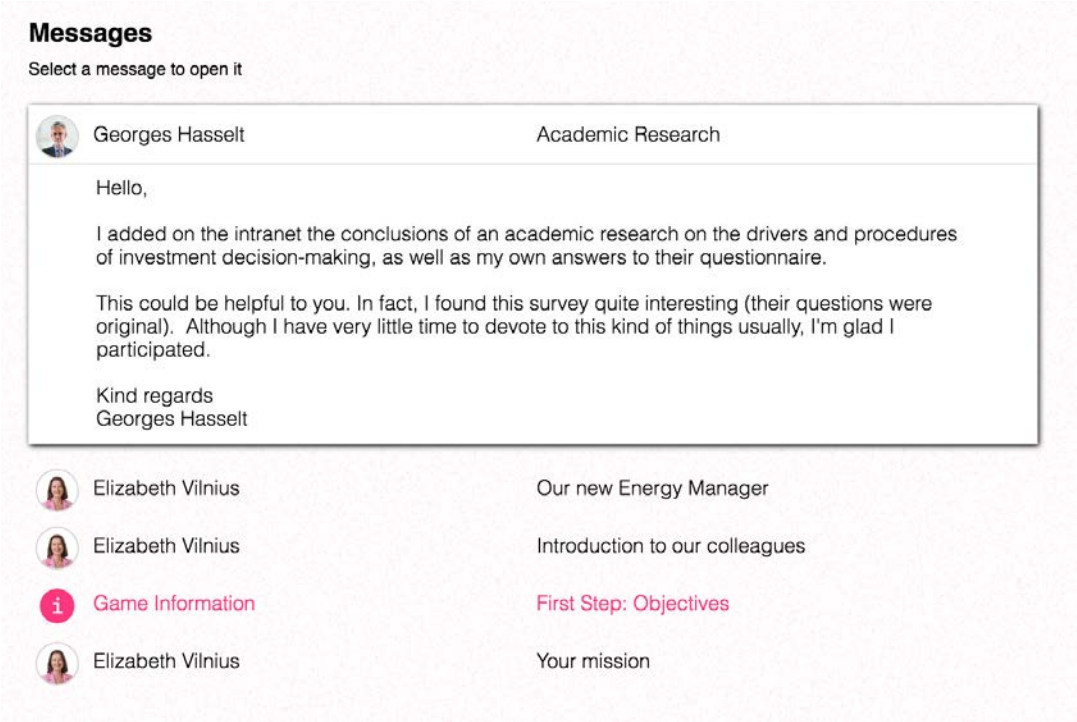

Figure 3. Example of emails received

The serious game also includes exercises in the form of interactive documents to be completed as the project progresses. Information to complete those documents is collected through discussions with actors and document analysis.

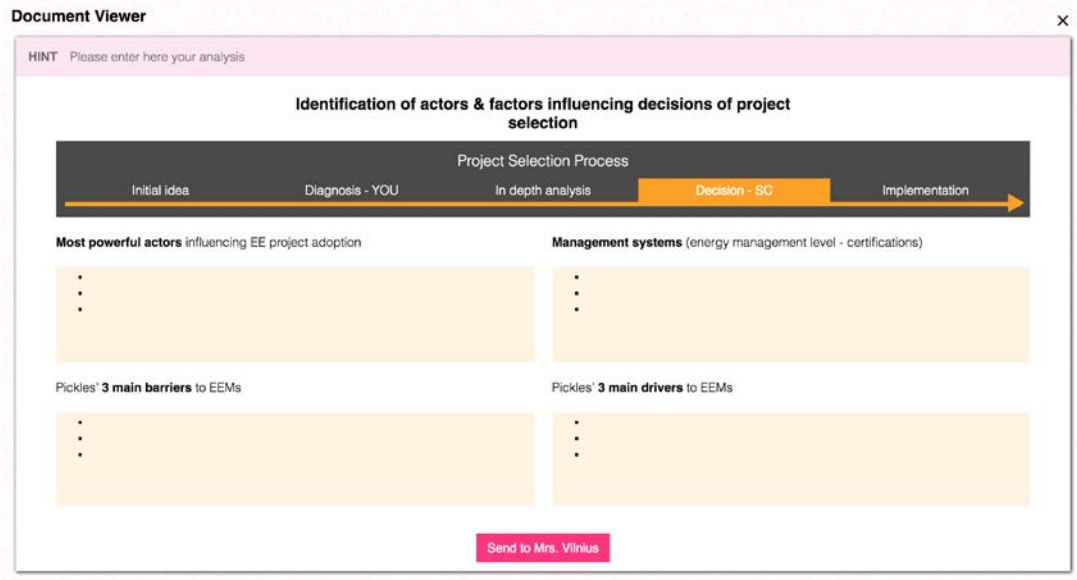

Figure 4. Interactive document: analysis of project selection process

The serious game includes all multidisciplinary aspects of the five-step M-Benefits methodology: 1) Business model and decision-making system analysis; 2) process and energy services analysis, together with the sources of operational excellence; 3) strategic analysis (impact of the energy-efficiency project on risk decrease, value proposition increase and cost decrease); 4) finance analysis (computation of Net Present Value, Internal Rate of Return and Payback Time, based on the figures supplied by the strategic analysis) and 5) communication.

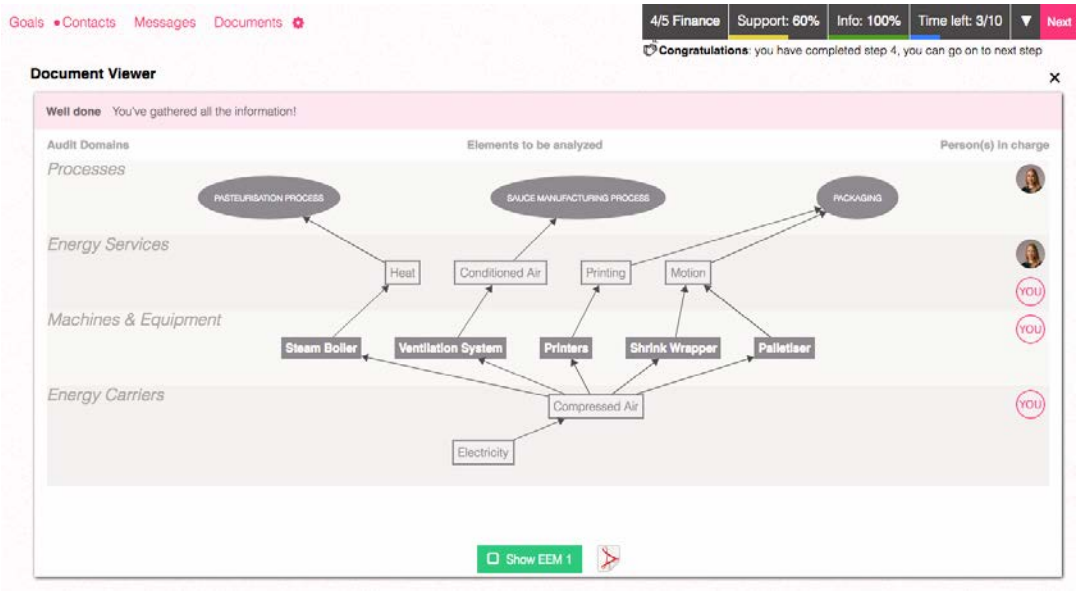

Figure 5. Process and energy services analysis

Trainer interface

This interface allows the trainer to create training sessions, manage game parameters and monitor participants' work.

Each trainer has access to the following functionalities:

- visualization of teams' composition
- visualization of the work done by the teams (progress, decision history, interactive documents)
- possibility to intervene in the simulation (send an email as a virtual character, impact the support of the different actors)
- possibility to communicate with the teams (with real email)

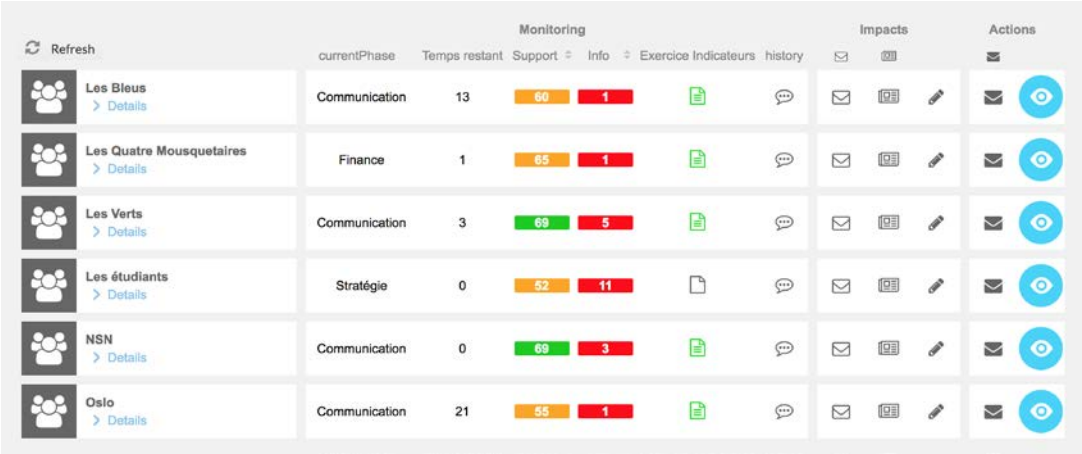

Figure 6. Trainer interface: overview of the participants' work

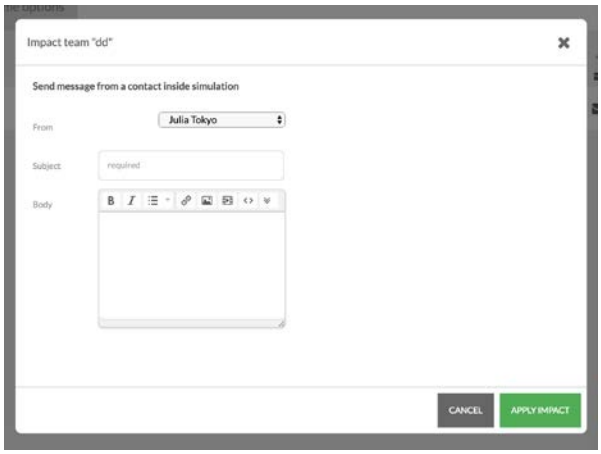

Figure 7. Example of functionality for the trainer: sending an email inside the simulation

Scenario developers interfaces: Content management

The Serious Game M-Benefits will evolve, either to update its content or to create new simulation scenarios (for example, another type of industrial sector). It is also necessary to take into account the fact that the serious game must be translated into several languages and that both the initial translations as well as the maintenance of the game in several languages will have to be managed.

This interface should thus support both the global management of simulation contents and corresponding translations. Although the Serious Game is a computer application and the overall understanding of its software operation requires computer scientist skills, the interface is designed in such a way that non-computer specialists can update most of the scenario content.

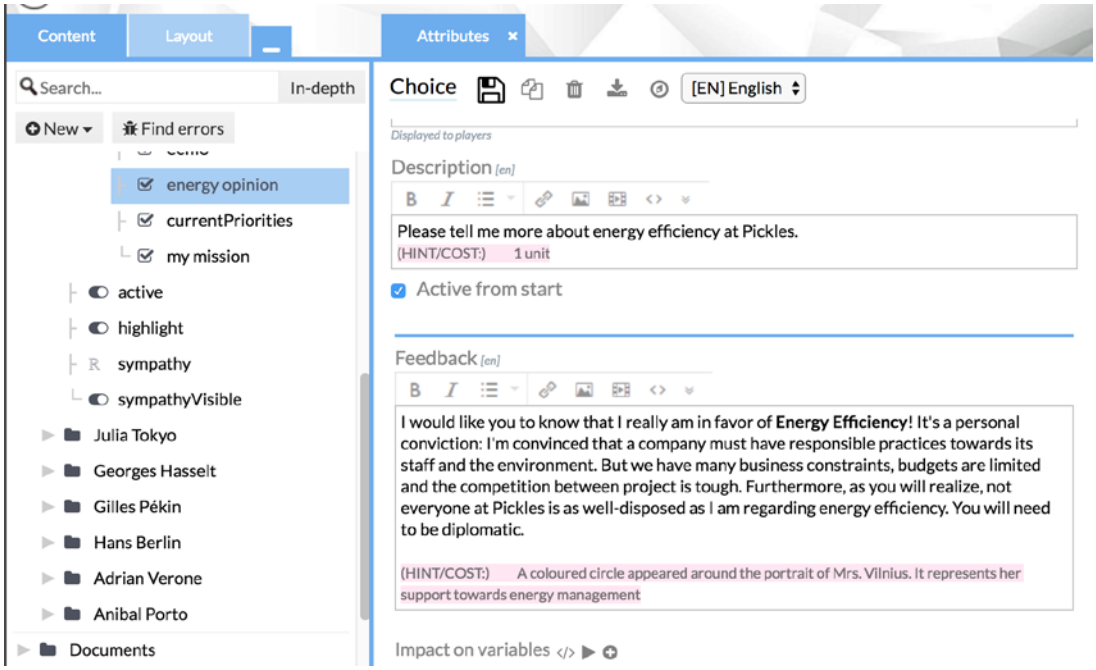

Figure 8. Example of interface for updating the content of the simulation

A global translation management system has been developed. It enables the management of the different languages the game is available in. The "Translation" option allows one to view the list of all game texts in the different languages, to create translations into new languages, as well as the management of updates in these languages.

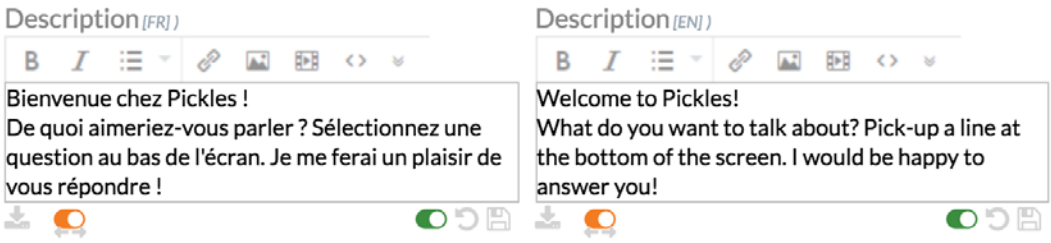

Figure 9. Sample view of the translation interface

Next Steps: Evolution, Maintenance and Dissemination

Next steps include:

- training M-Benefits trainers in the use of the serious game,
- supporting the translators team,
- adapting the screen layouts to new languages,
- supporting trainers during their training sessions,
- adapting and improving the serious game based on trainers' and participants' feedback.

In order to simplify the operation, HES-SO offers hosting and maintenance of the serious game for the entire duration of the M-Benefits project.

Presentations of the serious game to scientific conferences and journals are planned. A first paper[2] – entitled "Play the game – Learning energy efficiency can be fun. Seriously!" - has been accepted by the ECEEE 2019 Summer Study (3-8 June, 2019).

[2] Paper no. 1-307-19, panel 1 of the Summer Study. https://www.eceee.org/summerstudy/