Model Driven Paediatric European Digital Repository

Call identifier: FP7-ICT-2011-9 - **Grant agreement no**: 600932

Thematic Priority: ICT - ICT-2011.5.2: Virtual Physiological Human

Deliverable 18.3

Training Event in year 2

Due date of delivery: 30-10-2015

Actual submission date: 22-12-2015

Start of the project: 1st March 2013
Ending Date: 28th February 2017

Partner responsible for this deliverable: UCL

Version: 0.4

Dissemination Level: Public

Document Classification

Title	Training Session in Y2
Deliverable	D18.3
Reporting Period	Second
Authors	UCL
Work Package	18
Security	PU
Nature	Re
Keyword(s)	Training

Document History

Name	Remark	Version	Date
Vanessa Diaz	Original draft – work in years 1 & 2	0.1	23-10-2015
M. Alimohammadi	Additions, meeting in Crete	0.2	26-10-15
Mirko de Malde	Feedback	0.2	28-10-2015
Cesar Pichardo	Corrections and proofreading	0.3	29-10-2015
Vanessa Diaz	Final additions & corrections	0.3	30-10-2015
Mirko de Malde	Final control and fine tuning	0.4	15-11-2015

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1. Introduction

The realities of the training activities of MD Paedigree have changed considerably since the original conception of the project. Initially, training was considered to be part of WP18 "Dissemination and Exploitation"; containing a set of objectives as detailed below, solely focused on the use of training as a vehicle for dissemination and exploitation (verbatim from the DoW).

"Building on the belief that a main goal is to link MD-Paedigree outcomes with clinical practice, the dissemination activities will be developed in close connection with the training. The training activity will be carried out by UCL, that have gained a meaningful experience within the DISCIPULUS (Roadmap Towards the Digital Patient) project. Building on that experience, that brought out the importance of training as the most solid and long-lasting dissemination strategy, MD-Paedigree will organise a number of dedicated workshops with the key aims to expose the outcomes achieved both in disease modelling and in building the Infostructure, highlighting the potential for change management and innovation in the participating clinical centres"

However, the training activities have been expanded considerably in remit and scope, and training is now also part of the implementation of the Infostructure. Training and the development of materials for dissemination and exploitation are integral components of the development of the MD-Paedigree platform and the training team are providing assistance and guided feedback to the developers, as well as feedback in the way the clinicians and platform are interacting.

The training team has organised two sessions: one formal training (and feedback) and a second one for demonstration purposes and feedback so far, and prepared specific online tutorials for the basic features of the MD-Paedigree Infostructure. The description of such activities is provided below.

2. Description of MD Paedigree Preliminary Training Session – September 2014 - during the MD Paedigree Bi-Annual Meeting in Utrecht & Recommendations

It is important to mention that this preliminary training event was successfully delivered considerably earlier than initially anticipated (February 2015), which created an extra set of constraints for the Infostructure and Training teams.

2.1 Preparation prior to the meeting in Utrecht

A meeting was organised between the training team and the manager group in London. It was concluded that it would be most beneficial to include the following:

- An initial questionnaire to be filled in by the end-users on how the training should be delivered, and to get an indication of their initial reactions (feedback) as end users.
- The questionnaire must be delivered in both soft and hard copies to the end users in a presentation prior to the training session.
- Cover multiple routes for delivery of the platform (online-tutorials, one-to-one tutorials).

- Further identify potential problem areas that may become challenging for the end users and try to address them accordingly.
- Try to contact other members to get preliminary data to create examples and etc.

A training meeting/session was carried out with Gnúbila, the Infostructure WP Leader in London. During the meeting, different aspects of the platform were explored and initial potentially problematic areas were highlighted, so that the developers could address them. The following points were covered during this meeting:

- A questionnaire was prepared by the training group and the questions asked were based on the capability, user–friendliness and efficiency of the platform.
- Step-by-step tutorials were uploaded to the MD-PAEDIGREE website. These tutorials cover every aspect of the platform and showed the end users (clinicians) how to begin exploring the database and eventually uploading their data to the platform. A sample clinical workflow was requested by the training team from Marcello Chinali (OPBG). The scenario included anthropometric and clinical data in Excel format, ECG in pdf, ECHO in DICOM and MRI in DICOM. It is important to mention that during the preparatory meetings, it was decided to postpone the Siemens session/tutorial to give more time to the end-users to become more familiar with the MD-Paedigree platform.
- To accelerate the learning process, the training team asked the software developers to create a number of user accounts that have the privilege to access the majority (crucial) of the platform.

2.2 Presentation during the Utrecht meeting

A presentation was given on what the training group would cover, what to expect and what to bring for the training session. During the presentation, multiple routes were given to the end users to contact the training group (email, phone, Skype, Viber, Whatsapp). The aforementioned questionnaire was given prior to the training session so that the end users (clinicians) could fill them during the session. An additional 10 minutes at the end of the session was given to address all questions. A step-by-step session was delivered that covered the platform. All concerns, problems and suggestions were noted to be addressed.

2.3 Tutorial sessions

Two training sessions were provided during the meeting to provide an overview of the platform and to motivate the end users to upload their data and eventually use the platform. As previously mentioned, prior to the meeting, a significant number of user accounts were created to accelerate the signing in process of the users. Two training sessions were performed during each tutorial session: a step-by-step training session, which was mainly for those users with no experience of the platform (basic users); or alternatively for those with more experience of the platform (skilled users), advanced protocols (shortcuts) or problem-solving mini sessions were performed. The tutorials covered every aspect of the platform and showed the end users (clinicians) how to start exploring and eventually uploading their data to the platform.

2.3 Comments and feedback

A brief overview of the feedback is provided below.

At this point in time (early stages of the development of the platform, well ahead of the release of the Beta-version) the overall feedback to the platform was focused on usability and friendliness. Specific capabilities of the platform were addressed in the 2nd training/demonstration event held in Crete (October 2015) and further details will be provided in the relevant section.

In short, the feedback at this stage (that all developers found useful) could be condensed into the statement 'let's focus on making it simple, clean and straightforward for the clinicians'.

The training team produced a guide for developers, trying to use a simplified 'colour-coded' code to separate the different feedback in areas. We felt this classification would potentially assist in the process of identifying what the most pressing matters are (more yellow, less blue, etc.) and in organising the clean-up work afterwards. Since this comes directly from the feedback, by addressing the most pressing matters, we believe users would also positively welcome the novelty of the platform. It is acknowledged that there is some overlap between categories, however, it was felt at the time that classification would help in organising the developers' activities.

A summary of the feedback is provided below, divided as follows:

- Intuitiveness/Usability/Ease of use (yellow)
- Robustness/Technical (green)
- Look and feel (blue)
- Technical content/Change of content/Changes/Suggestions (pink)

2.4 Summary of the 1st MD Paedigree feedback session

Despite being the first ever 'test' of the work done by the developers, the training came into its own by stress-testing vigorously the (then) current state of the platform. In general, clinicians engaged with the work to be done and feedback was provided throughout the process. From the sign-in, to the notification e-mail received (security), to the medical terms used to describe the 'operations' or 'tasks' available in the platform. The robustness of the platform was also tested by having a significant number of users engaging with the work simultaneously and reporting back any weaknesses. Different OS were tested (for Mac & Windows) and also tablets (mainly iPads) and laptops. A number of improvements to functionality (small, since functionality was the objective of the meeting in Crete) in terms of simple upload patients' files and categorisation were also highlighted.

Table 1: Feedback Summary

Small Changes	.Improve (develop) the image viewer, navigation icons are too small to see, reduce number of pages before signing in, increase font size. Patients timeline needs small improvement. Improve calendar option and make it user-friendly.
Important	.Easiness to upload files (organisation, more structured data upload). Test vigorously for stability issues, simplify navigation (including icons) icons, simplify authorisation.
Small Changes	.Debug query errors or when email verification code was not sent. Issues with session cookies. Streamline use of different Java versions needed.
Important	.Check server connectivity or errors, might be linked to security issues or connectivity during the training task in order to avoid crash.
Small Changes	.Requires more tutorials as it was 'easy to follow the instructor but difficult to use it myself'.
Important	.Consider intuitiveness for final development, including structure.
Small Changes	Consider looking at OSIRIX, since is not Mac/iPad compatible, query filter and similarity search needs improvement (becoming also user- friendly in the process). Simplify names.
Important	.Inserting an image reader (Data reader), Patients ID must be reviewed as well as navigation between pages, include derived measurements in the 'medical bag' group, use more explicit names (patient browser)..

2.5 Some Recommendations

The first training event highlighted how important the 'look and feel' of the platform was for users. A conclusion arising from the feedback was that effort should be directed towards simplifying the way to work around the platform, such as fewer required clicks and more directed paths. Whatever feels superfluous and distracts from the main 'purpose' (there is a tension to be resolved between usability, user-friendliness and functionality) should be reconsidered and a formal evaluation on how important it is should be performed. The training team advised to consider if it would be possible to give an 'option' at the start of the process of what is that the clinician would like to do and take them gently down that path (this could very well be a 'what would you like to do?' question with a box to tick). A visual map of the path (perhaps to be clicked on interactively) might be considered and it could prove useful. Additionally, it was highlighted that stress-testing the platform was important. Key functions (an issue that is relatively easy to address, for example, visualisation of imaging data)

should be there, ready and effortlessly. The need for software updates, data downloads (of data or software), re-verification, etc., must be kept to a minimum.

3. Addressing the Feedback: The Agile process as part of Exploitation & Training

3.1 Creating scenario analysis sessions

To cope with the complex issues that MD Paedigree must deal with in terms of functionality and uptake, a number of tasks/interactions have been included within the work plan in order to improve the interplay among clinicians and technical partners, promoting a feedback-based implementation of the tools developed. Among these activities, a scenario analysis session has been included, which has been described in detail in D18.4.1. A brief summary will be presented here, as it is formal part of the training activities of MD Paedigree.

The "scenario analyses session" has been included in WP18 (Dissemination and Training) with the remit of (quoting the DoW) "pre-empt unforeseen technical uptake problems and establishing a smooth and proactive dialogue between technology developers and end-users", thus forecasting the involvement of key personnel from both the clinical and technological partners.

It is important to mention that as a direct outcome of the first training event and the discussions between the 'technical side' and the 'clinical side' as well as the managing team, the Consortium realised that there was a need to implement changes *faster and continuously*. For this reason, an 'Agile' Project Management approach (briefly described in the following section) has been adopted for the implementation of the Infostructure

3.2 Agile management – Brief Description

The agile methodology is focused on the users' needs and the implementation of a working software that matches these needs: according to the Agile Manifesto and its twelve principles [Agile manifesto][1], the key values are the continuous cooperation with the end-users, the frequent delivery of products, the adaptation to new requirements, and working software as a primary measure of success.

This is exemplified by the figure below [K. Gaddam, 2012][2]. The starting point of the agile process is the product backlog, which is made up by a number of users' stories. A user's story is a "very high-level definition of a requirement, containing just enough information so that the developers can

[1] See http://agilemanifesto.org/

[2] K. Gaddam, *Creating a Scrum Team Project in Visual Studio 2012 using Visual Studio Scrum 2.0 process*, available online at http://www.codeproject.com/Articles/432074/Creating-a-Scrum-Team-Project-in-Visual-Studio, 2012.

produce a reasonable estimate of the effort to implement it without a lot of detail. The user story should describe the user need from the user's perspective" [C. G. Cobb, 2011][3].

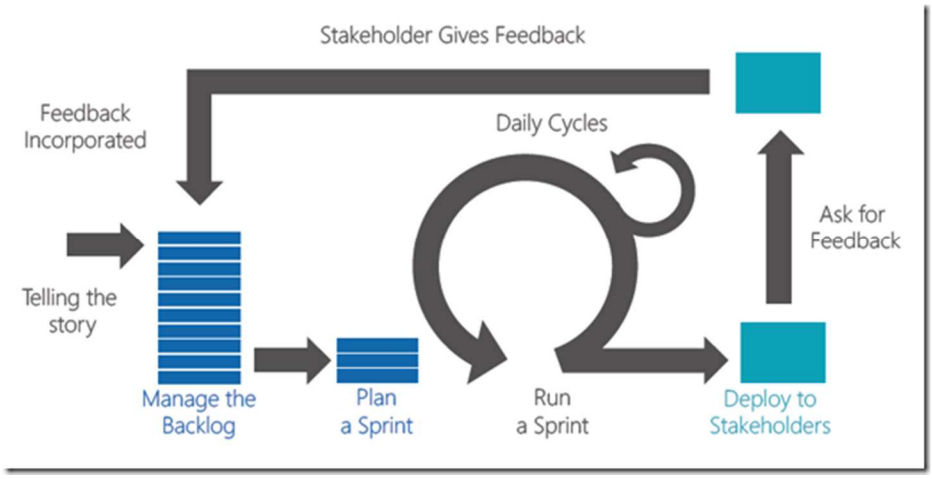

Fig.1 – Representation of the Scrum/Agile development
(from D18.4.1)

Once the users' stories have been defined, they have to be prioritised and included in a specific "Sprint", which is usually short, from two weeks to a maximum of two months. The outcome of each sprint will be a working piece of software that satisfies a specific user need.

This process ensures that the software is actually compliant with the user needs and, if any problems or different requirements arise, the software can be easily adapted/fixed in the next sprint, without a need to re-start from the beginning.

The training team has been participating in the Agile sessions from the start by testing the platform, reporting issues and collaborating with the Infostructure team in order to address the users' needs *timely and effectively*.

3.3 The role of the scenario analysis in the agile process

As stated in D17.1, testing and validation have evolved so as to take into account the adoption of the agile methodology. Subsequently, the scenario analysis sessions have also evolved to better fit the new project needs. In a nutshell, the scenario analysis will require clinicians to draft specific use-case scenarios, from which the users' stories will be translated into technical requirements. This process is linked to the elicitation of the user requirements, which started at the beginning of the project and is currently ongoing in parallel with the revision and update process.

In order to catch-up with the backlog, due also to the delay in the implementation, this process is going to be continuous and will be paired with the testing, training and validation activities.

[3] C. G. Cobb, *Making sense of agile project management*, op. cit. A user story it is generally of the following form: "As a <type of user>, I want to <goal>, so that <reason>."

This means that the input provided by clinicians (use-cases/workflows) will be included in the project backlog, and the tools will eventually be tested against the clinical users' stories as well, i.e. their capability to be used effectively within the scenario/workflow, defined by the clinicians, will be analysed.

4. Description of MD Paedigree 2nd Training/Demonstration Session – October 2015 during the MD Paedigree Bi-Annual Meeting in Crete & Recommendations

A number of demo sessions were presented by each developer during the meeting, in order to get early feedback from the end users on the platform and to see how it might be able to reach their expectations in terms of functionality, ease of use and effectiveness, and to learn how it could be improved further.

4.1 Preparation prior to the meeting in Crete.

Prior to the meeting, the developers were asked to share their demo session with the training team to see if these were user-friendly for the meeting (particularly the end users) and also to see if the content of the demos was as expected. This process was also used to provide advice on improvements to the demos. A total of four demos were shown prior to the meeting from those listed below.

1. Gnúbila: data anonymisation tool
2. ATHENA: data curation and validation (mainly based on one of the end users cases)
3. Siemens: Case reasoner; showing the same similarity search features based on several variables such as age and vessel diameter.
4. HESSO: case based retrieval service

A number of comments and suggestions were given to the software developers by the training team on their demos; these were mainly on the examples used (if it was easy to follow and challenging/useful enough to show) or if there was a missing function (for example a legend or use of a better colour tab).

4.2 Presentation during the Crete meeting

Prior to the demo presentations, the training team asked the end users to provide their constructive comments and to feel free to interrupt the presenter or wait for the time given in the end of each presentation.

As previously indicated, in total, four demos were presented by the developers and a number of suggestions and comments were given by the end users. These comments are listed below.

1. Gnúbila: A general question was asked regarding the anonymisation time.

2. ATHENA: a few comments were given regarding
    - A better definition for time-woke and time-bed options

- The connection between the patients in a line chart
- Ordering the x-axis in a plot
- Filtering down the data
- Scaling the parameters

3. HESSO: several comments were given to improve the functionality, the comments were on;
    - Discharge summary
    - English translation (it is only in Italian at the moment)
    - The ranking of the similarity algorithm
    - The outcome of the time function
    - How is the query defined
    - Weighing the importance of the similarity (if certain things are important than others, to prioritise)
    - A better visualisation of different icons
    - Inclusion and exclusion of time
    - The conclusion of each patient must be better accessed
    - The type of data that can be processed

4. Siemens: A general set of questions were asked and addressed;
    - How many features can be handled?
    - How many options can you select?
    - What type of data will be needed?
    - Can it be completely automated?
    - Can the engine be taken out so the data run is performed elsewhere?

4.3 Conclusion

All of the concerns and questions were asked during and after each demo presentation, and ultimately it was deemed necessary for HES-SO and Siemens to work closely together to group the different tools they have and eventually to include them in the similarity search. Also, Gnúbila and Siemens could potentially connect their work to each other.

4.4 Future work

The tutorials based on the demos will be uploaded. These tutorials will be for both basic and skilled users to be able to use the new features of the platform. Additionally, each site will have their site-specific tuned tutorials to help them even further with the use of the platform. There will be actual examples based on each demo. The examples will follow the same routine: easy examples to follow and also examples for more skilled users.

The training team will also have finely tuned tutorials for each site's leaders (managers), to make sure that their general expectations from the platform are met, to create a more case-specific tutorial and to explore further possibilities for both end users and the software developers.

Last but not least, there are two final training sessions planned, one in February 2016 (with online tutorials and specific demo and training session for each tools) and one towards the end of the project. The final one, which could be conceived as a training/demonstration on real clinical scenario, would have a clear dissemination role in showing the final results of the project, and which should be organised within the MD-Paedigree final conference. The blueprint for the event in 2016 was detailed in documentation provided already in 2014 (D 18.1) but this will require fine tuning.