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Interaction design principles in WYRED platform

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Abstract. This paper presents the requirements elicitation phase for the WYRED platform. WYRED (netWorked Youth Research for Empowerment in the Digital society) is a European H2020 Project that aims to provide a framework for research in which children and young people can express and explore their perspectives and interests in relation to digital society, but also a platform from which they can communicate their perspectives to other stakeholders effectively through innovative engagement processes. The requirement elicitation is a basic step to design the interactive mechanism to build up the needed social dialog among the involved stakeholders. In order to set up the right interactive tasks, not only functional requirements are elicited, the non-functional requirements play a key role in this project, specially regarding to ensure the security and privacy of the underage people that will be presented in the development of this project.

Keywords. WYRED; Social structure; Inequalities; Social mobility; Interethnic relations; Communication networks; Media; Information Society; Innovation policy; Technological ecosystems; Requirement Elicitation; Non-functional Requirements; Privacy.

1 Introduction

WYRED (netWorked Youth Research for Empowerment in the Digital society) [1, 2] is a European H2020 Project that aims to provide a framework for research in which children and young people can express and explore their perspectives and interests in relation to digital society, but also a platform from which they can communicate their perspectives to other stakeholders effectively through innovative engagement processes. It will do this by implementing a generative research cycle involving networking, dialogue, participatory research and interpretation phases centered around and driven by children and young people, out of which a diverse range of outputs, critical perspectives and other insights will emerge to inform policy and

decision-making in relation to children and young people's needs in relation to digital society.

WYRED aims to give young people a voice, and a space to explore their concerns and interests in relation to digital society and share their perspectives and insights to stakeholders with other strata of society.

To do that, WYRED should engage youngers in a process of social dialogue based on participatory research projects that allow them to surface and explore their concerns in ways defined by them. These projects may explore the issues chosen for investigation through a variety of approaches, including:

- Research projects where a social issue is addressed and solutions explored and discussed, surfacing attitudes and understandings through reflection in the process.
- Creative projects involving among others video, theatre, web publishing, comics, music, art, events of different kinds, that express attitudes and understanding through these media.
- Journalistic approaches, observing, documenting, recording and commenting on social phenomena, either online or off, producing documentary outputs in different media.
- Action research and ethnographic projects in which the participants explore their own perceptions as they play in their day-to-day lives, for example through journals or video blogging.
- Solidarity projects, where a specific problem is identified, and practical solutions implemented, where the output is a narrative of the process and the problems faced in solving them.

The central element in common to all the WYRED approach is that they will be driven by the young themselves. The projects will be self-directed, though supported by the WYRED project consortium; the research and youth partners have extensive experience in facilitating this range of different processes. The work will therefore generate a wide range of artefacts, and insights and recommendations grounded firmly in the concerns of the young themselves.

From a technological point of view, in order to fulfil WYRED goals successfully, a support platform should be developed that allows an easy interaction process among the involved stakeholders; high-level engagement conditions; a secure environment in which all the participants feel comfortable enough with the privacy issues, but with a special attention to the underage ones; and a suitable dashboard for data analytics. The development approach will be based on the ecosystem metaphor [3-9] in which one the users are an essential component of the resulting ecology [10, 11].

To define the technological platform, putting a special care in the requirements elicitation process is fully indispensable, for both obtaining the basic functional services, and, more important, gathering the non-functional requirements to allow the needed user experience and privacy conditions.

This paper summarizes the first iteration of this process under an Open Unified Process framework [12].

The rest of the papers is organized as follows. Section 2 includes the basic WYRED project information data-sheet; Section 3 introduces the technological

background for WYRED project to understand better some defined non-functional requirements; Section 4 presents the most outstanding elicited requirements; Finally, Section 5 closes the paper with the most significant remarks.

2 WYRED project information data-sheet

WYRED (netWorked Youth Research for Empowerment in the Digital society) is a European Project (Ref. 727066.) funded by the Horizon 2020 Programme in its “Europe in a changing world – inclusive, innovative and reflective Societies (HORIZON 2020: REV-INEQUAL-10-2016: Multi-stakeholder platform for enhancing youth digital opportunities)” Call.

The project is coordinated by GRIAL research group [13] of the University of Salamanca (Spain), starting at November 2016 and ending at October 2019. The consortium is completed with the following partners:

- Oxfam Italia Onlus (Italy).
- PYE Global (United Kingdom).
- Asis Ogretim Kurumlari A.S. (Turkey).
- Early Years - The organization for young children LBG (United Kingdom).
- Youth for exchange and understanding international AISBL (Belgium).
- Zauchner - Studnicka Sabine (MOVES) (Austria).
- Boundaries Observatory CIC (United Kingdom).
- Tel Aviv University (Israel).

The total projects budget is 993,662.50€.

3 WYRED platform technological base

WYRED platform will be based on a well-established technological ecosystem [14-17] that supports the interaction platform, taking into account that users are a component more in this ecosystem. This ecosystem must guarantee three main features in the project lifecycle: interaction facilitator, security and privacy supporter, and data analysis platform.

3.1 Interaction facilitator

Most of the discussions will be done inside the platform. Given the importance of mobile online spaces [18-22], especially among children and young people, it is considered vital that the platform exist as a web-based platform and a mobile app with extensive integration with the social media in which the target groups are active. It will contain profiling functionalities, interaction spaces that facilitate and promote exchange of messages, videos and other artefacts in different formats, a repository for

the artefacts generated in the research process, and a range of analytics instruments for the processing of the dialogue that takes place between WYRED participants.

3.2 Security and privacy supporter

The WYRED platform represents a safe space in which children and experts will be able to express their views and reflections on the influence of technology in their lives. As technology affects transversally all social areas and involves people of different nationalities and beliefs, the platform must make a double effort to preserve the space in which they will express personal opinions and monitor that will not be any type of abusive situation / cyber bullying among participants.

3.3 Data analysis platform

The social dialogue and participatory research activities in the project will generate heterogeneous data including transcripts, analysis, hypotheses, artefacts, workflows, narratives, quantitative and qualitative data related to perceptions and understandings around social change. The storage of this data will be based upon recent developments in Open Source grid-based Citizen Science platforms [23, 24] like MyExperiment (<http://myexperiment.org>) and open data formats including the Research Object standard (<http://www.researchobject.org>) and Linked Data (<http://linkeddata.org>). WYRED will exploit these and other standards and tools to provide flexibility in the ways the data can be managed, organized and made available in different formats and contexts. WYRED will actively engage a wide range of stakeholders by making the project platform a space where all can access the data and artefacts generated, explore and interpret them. The process of interpretation which will be managed by the consortium but open to all is expected to generate elements for potential new models and strategies for transitioning towards these models. These will permit automatic processing and analysis of the raw data from conversations and its visualization so that the user can interact with the visualizations in order to extract new knowledge or select data to be qualitatively analyzed [25-28] (as in the Keim cycle [29, 30] or VeLA model [31]). These visualizations will include word-cloud-based visualizations and social graph based visualizations [32].

4 WYRED platform requirements

The requirements elicitation is an indispensable task in order to define, design and implement the WYRED technological ecosystem as a highly interactive system. Three different kind of requirements are gathered and documented: information requirements, functional requirements and non-functional requirements [33].

Next subsections try to summarize the most important requirements of the WYRED platform, the full requirements catalog is available at [34].

4.1 Information requirements

This category represents all the requirements about the information that the WYRED platform is going to manage. There is very important to set these requirements in order to know the data that is going to be managed in the proposed ecosystem.

4.1.1 Users' visible information

In WYRED one of the most important thing is to maximize the users' privacy. We are going to split the user's information between public and private in the platform.

The project partners answered a questionnaire about which should be the minimum required data to develop a right social dialogue. The selected data fields are: a nickname (no real names will be used in the interactive processes); the language; an avatar image, a localization (partners will have to agree which one: country, city, region, etc.); and a list of topics of interest.

4.1.2 Users' private information

The platform also has to manage more information about its users due to this can help us to extract patterns and get conclusions. However, this information will be private and nobody will see the private information of a specific user. Therefore, it will be treated anonymously in order to respect the users' privacy.

The information that we keep private is: the name; the surname; the country; the city; the sex; the age (birth date); the education level; and the email.

4.1.3 Platform information

Data about the platform itself is needed to be managed. Two types of data will be distinguished:

- Documents shared in the platform, which can be editable, such as text documents, images, audios and videos.
- Usage statistics, where we can find information about how the users interact with WYRED system and data regarding the platform evolution.

The main problem to manage documents is that there are many formats that the platform has to support and they use many resources. For this reason, keeping them in a dedicate server to improve the platform performance has been decided.

The statistics save data about the number of publications for each user, her time in the platform, how many pages she has visited, in how many projects she is involved, etc.

4.2 Functional requirements

This kind of requirements is related to the functions that the system has to support. A first questionnaire about services and functionality of the platform was sent to the project partners. This questionnaire allowed us to have a first approach to the core functionality of the platform, but we know more functional requirements will be

included when other information requesting tasks will be performed such as stakeholders' questionnaires and a Delphi process.

4.2.1 Content moderation

One of the aspect related to the privacy is how to keep the users' information private and avoid arguments in the platform. The solution that we have planned is to use an automatic system that checks all messages looking for a list of alert words. Although the intelligent system can find messages with marked words, these should be checked manually, for this reason we are going to develop a group of moderation tools for editing, deleting, moving, etc. messages. Moreover, we will put an option where the users can inform a moderator that there is a message that should be analyze.

4.2.2 Social dialogue

The WYRED objective is that the youth people can interact themselves and speak things that are important for them, in some cases, they also can offer solutions for their own problems. For this reason, we have to allow that a user can register in WYRED. However, WYRED is not a chat but a platform where there should exist a structured social dialogue, so we are going to develop something like forum topics. This system helps the users answer questions and create discussion threads with their comments.

With the objective of having a good response, first of all, the users will fill a form where they can say in which things they are interested in. Therefore, a researcher or a user will create a project, this will be hidden for all that are not invited to participate; for achieving this, the creator will select what kind of users are going to be invited using the public user's information.

4.2.3 Engagement

One of the key elements to attracting young people is working on functionalities that improve the users' engagement. This helps to improve a lot of metrics such as page views, used time and social sharing.

The first requirement, which we have defined with this aim, is a translation system due to there are users from different countries that speak different languages. We have also thought that it would be interesting to use a gamification system to increase the users' engagement, due to it is one of the most common technique used right now. For improving the usability, we have planned to design custom styles for each age group, because of teenagers do not want to use a childish platform. We have also kept in mind that if a user likes our platform, she would like to share it with her friends, for this reason, we will develop an easy tool for social sharing.

4.2.4 Documents

In the social dialogue process, the researchers need to work with many kind of documents, such as text, audio, images and video. These documents are a relevant part in the WYRED project, so we have planned to develop tools for showing and

sharing them. The researchers also suggested that they need an online editor and an easy way for adding annotation in audio and video files.

4.2.5 Research area

The researchers are also an important part of the WYRED project, for this reason, they are going to have a private area. In this one, they will be able to monitor their own social dialogues, share information with other researchers and analyze their data.

In order to improve the data analysis process, we are going to develop visualization tools and a pattern matching system. The visualization tools will help the researchers to discover knowledge using charts, trees and other representations. The pattern matching system will use techniques such as datamining or natural language processing, in order to give to the researchers some patterns about the stored data.

4.3 Non-functional requirements

These are very important for the effective use of a software system but also for the user experience. Besides, WYRED has to involve underage people, this means security and privacy requirements will be very important and significant for the success of the project goals.

So, these requirements group the restrictions and constraints related to the technical decisions and security issues.

The same as for the other requirements, a specific questionnaire was developed to inquiry the project partners.

4.3.1 Platform design

When we planned how to design a platform for youth people, we checked that they use more their mobiles than other classic devices such as laptops or desktops. For this reason, we decided to use a responsive design that can work well in all kinds of devices. However, creating a platform where our users are going to use mainly mobiles has other problem, the performance. Usually mobiles have wireless connections and, depending on the country, they can be a bit slow, so we add a requirement about the platform performance.

We also would like to develop a mobile application for the more common mobile systems (Android and iOS), in order to get a better response from the user. However, this requirement is more a wish than an urgent necessity and for this reason, it will have a minor priority.

4.3.2 Platform technologies

One of the objectives of WYRED is to develop a platform without spending money in non-relevant functions. Due to this, we have planned to use *Linux* servers and free technologies. *Linux* servers are cheaper than *Windows* servers and offer a solid base to develop a complete web platform, in the same way, there are free

technologies/software such as *PHP* or *MySQL* that are widely used in web development and we can use them without a specific cost.

4.3.3 Security and privacy issues

Security and privacy are very important aspect to be tackled in an interactive platform with users from different profiles, nationalities, cultural backgrounds and so on, if we want to ensure the creation of a significant social dialogue. This is more relevant in WYRED ecosystem due to the most of the involved users are underage people.

These non-functional requirements have been presented in the definition of the information constraints and the functional requirements. Hidden data, restricted participation in the projects and activities, using of avatars instead of real personal information are some examples of what these requirements mean for the WYRED ecosystem.

Moreover, in order to ensure the privacy and keep the all the sensible content of the platform hidden for non-authorized and public users, all the content will not be indexed.

5 Conclusions

WYRED project has a very interesting challenge in order to aim its objectives regarding young people engagement into an interactive and creative process to know their opinion, expressed with their own voices, about the technological world they live including their relationships, experiences, believes and thoughts.

To do that, in an international and intercultural context, the technological ecosystem is an essential element. Without this platform, the project is non-viable, also with a wrong design of the interactive processes.

For this reason, one of the firsts tasks to be performed in this project has been the requirements elicitation process. It has been done in an iterative and incremental way, requesting information to every project partner regarding three areas: the data we need to manage, the services we have to offer and the non-functional aspects that cover the more technical issues of the system and, more in a more important way, the security and the privacy issues.

The requirement elicitation is not an easy task, especially if your stakeholders are geographically dispersed by seven countries, they have very different interests and cultural background and the most are not in habit to be involved in software requirements definition processes.

In order to manage these difficulties different elicitation techniques have been used, mainly based on online questionnaires, but this gathering method has been complemented with forum-based discussions and videoconference sessions.

Finally, a first version of the WYRED requirement document is available with enough information to start the ecosystem development and deployment. We know, especially with regard to the system functionality, these requirements will evolve and grow, but the basis to the interaction design is yet defined.

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References

1. García-Peñalvo, F.J.: The WYRED Project: A Technological Platform for a Generative Research and Dialogue about Youth Perspectives and Interests in Digital Society. *Journal of Information Technology Research* 9, vi-x (2016)
2. García-Peñalvo, F.J., Kearney, N.A.: Networked youth research for empowerment in digital society. The WYRED project. In: García-Peñalvo, F.J. (ed.) *Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'16)* (Salamanca, Spain, November 2-4, 2016), pp. 3-9. ACM, New York, NY, USA (2016)
3. Dini, P., Darking, M., Rathbone, N., Vidal, M., Hernández, P., Ferronato, P., Briscoe, G., Hendryx, S.: *The digital ecosystems research vision: 2010 and beyond*. European Commission (2005)
4. European Commission: *Digital Ecosystems: The New Global Commons for SMEs and local growth*. (2006)
5. García-Peñalvo, F.J.: Technological Ecosystems. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje* 11, 31-32 (2016)
6. García-Peñalvo, F.J., García-Holgado, A. (eds.): *Open Source Solutions for Knowledge Management and Technological Ecosystems*. IGI Global, Hershey PA, USA (2017)
7. García-Peñalvo, F.J., Hernández-García, Á., Conde-González, M.Á., Fidalgo-Blanco, Á., Sein-Echaluce Lacleta, M.L., Alier-Forment, M., Llorens-Largo, F., Iglesias-Pradas, S.: Learning services-based technological ecosystems. In: Alves, G.R., Felgueiras, M.C. (eds.) *Proceedings of the Third International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'15)* (Porto, Portugal, October 7-9, 2015), pp. 467-472. ACM, New York, USA (2015)
8. Gustavsson, R., Fredriksson, M.: Sustainable Information Ecosystems. In: García, A., Lucena, C., Zambonelli, F., Omicini, A., Castro, J. (eds.) *Software*

- Engineering for Large-Scale Multi-Agent Systems, pp. 123-138. Springer, Berlin, Heidelberg (2003)
9. Jansen, S., Finkelstein, A., Brinkkemper, S.: A Sense of Community: A Research Agenda for Software Ecosystems. 31st International Conference on Software Engineering - Companion Volume, 2009. ICSE-Companion 2009. Vancouver, BC, 16-24 May 2009, pp. 187-190. IEEE, USA (2009)
 10. García-Peñalvo, F.J., Hernández-García, Á., Conde, M.Á., Fidalgo-Blanco, Á., Sein-Echaluce, M.L., Alier-Forment, M., Llorens-Largo, F., Iglesias-Pradas, S.: Enhancing Education for the Knowledge Society Era with Learning Ecosystems. In: García-Peñalvo, F.J., García-Holgado, A. (eds.) Open Source Solutions for Knowledge Management and Technological Ecosystems, pp. 1-24. IGI Global, Hershey PA, USA (2017)
 11. García-Peñalvo, F.J.: En clave de innovación educativa. Construyendo el nuevo ecosistema de aprendizaje. I Congreso Internacional de Tendencias en Innovación Educativa, CITIE 2016, Arequipa, Perú (2016)
 12. Balduino, R.: Introduction to OpenUP (Open Unified Process). Eclipse Foundation (2007)
 13. García-Peñalvo, F.J., Rodríguez-Conde, M.J., Seoane-Pardo, A.M., Conde-González, M.Á., Zangrando, V., García-Holgado, A.: GRIAL (GRupo de investigación en InterAcción y eLearning), USAL. IE Comunicaciones. Revista Iberoamericana de Informática Educativa 85-94 (2012)
 14. García-Holgado, A., García-Peñalvo, F.J.: The evolution of the technological ecosystems: An architectural proposal to enhancing learning processes. In: García-Peñalvo, F.J. (ed.) Proceedings of the First International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'13) (Salamanca, Spain, November 14-15, 2013), pp. 565-571. ACM, New York, NY, USA (2013)
 15. García-Holgado, A., García-Peñalvo, F.J.: Architectural pattern for the definition of eLearning ecosystems based on Open Source developments. In: Sierra-Rodríguez, J.L., Doderó-Beardo, J.M., Burgos, D. (eds.) Proceedings of 2014 International Symposium on Computers in Education (SIIE), Logrono, La Rioja, Spain, 12-14 Nov. 2014, pp. 93-98. Institute of Electrical and Electronics Engineers, USA (2014)
 16. García-Holgado, A., García-Peñalvo, F.J., Hernández-García, Á., Llorens-Largo, F.: Analysis and Improvement of Knowledge Management Processes in Organizations Using the Business Process Model Notation. In: Palacios-Marqués, D., Ribeiro Soriano, D., Huarng, K.H. (eds.) New Information and Communication Technologies for Knowledge Management in Organizations. 5th Global Innovation and Knowledge Academy Conference, GIKA 2015, Valencia, Spain, July 14-16, 2015, Proceedings, pp. 93-101. Springer International Publishing, Switzerland (2015)
 17. García-Peñalvo, F.J., Johnson, M., Ribeiro Alves, G., Minovic, M., Conde-González, M.Á.: Informal learning recognition through a cloud ecosystem. Future Generation Computer Systems 32, 282-294 (2014)

18. Alonso de Castro, M.G.: Educational projects based on mobile learning. *Education in the Knowledge Society* 15, 10-19 (2014)
19. Sánchez Prieto, J.C., Olmos Migueláñez, S., García-Peñalvo, F.J.: Understanding mobile learning: devices, pedagogical implications and research lines. *Education in the Knowledge Society* 15, 20-42 (2014)
20. Sánchez Prieto, J.C., Olmos Migueláñez, S., García-Peñalvo, F.J.: ¿Utilizarán los futuros docentes las tecnologías móviles? Validación de una propuesta de modelo TAM extendido. *RED-Revista de Educación a Distancia* 52, Artículo 5 (2017)
21. Sánchez Prieto, J.C., Olmos-Migueláñez, S., García-Peñalvo, F.J.: A TAM based tool for the assessment of the acceptance of mobile technologies among teachers. GRIAL Research Group / University of Salamanca (2016)
22. Sánchez-Prieto, J.C., Olmos-Migueláñez, S., García-Peñalvo, F.J.: MLearning and pre-service teachers: An assessment of the behavioral intention using an expanded TAM model. *Computers in Human Behavior* In Press, (2017)
23. Blanke, T., Hedges, M.: Scholarly primitives: Building institutional infrastructure for humanities e-Science. *Future Generation Computer Systems* 29, 654-661 (2013)
24. Florio, L., Reilly, S., Demchenko, Y., Varga, T., Harangi, G.: Advancing technologies and federating communities: a study on authentication and authorisation platforms for scientific resources in Europe. European Commission (2012)
25. García-Peñalvo, F.J.: Issue on Visual Analytics. *Journal of Information Technology Research* 8, iv-vi (2015)
26. González-Torres, A., García-Peñalvo, F.J., Therón, R.: How Evolutionary Visual Software Analytics Supports Knowledge Discovery. *Journal of Information Science and Engineering* 29, 17-34 (2013)
27. González-Torres, A., García-Peñalvo, F.J., Therón, R.: Human-computer interaction in evolutionary visual software analytics. *Computers in Human Behavior* 29, 486-495 (2013)
28. García-Peñalvo, F.J., Colomo-Palacios, R., Hsu, J.Y.J.: Discovering Knowledge through Highly Interactive Information Based Systems Foreword. *Journal of Information Science and Engineering* 29, (2013)
29. Keim, D.A., Andrienko, G., Fekete, J., Görg, C., Kohlhammer, J., Melançon, G.: Visual analytics: Definition, process, and challenges. In: Kerren, A., Stasko, J., Fekete, J., North, C. (eds.) *Information visualization*, pp. 154-175. Springer, Berlin, Heidelberg (2008)
30. Keim, D.A., Mansmann, F., Schneidewind, J., Ziegler, H.: Challenges in Visual Data Analysis. *Proceedings of the Tenth International Conference on Information Visualization, 2006*. London, England. 5-7 July 2006, pp. 9-16. IEEE, USA (2006)
31. Gómez-Aguilar, D.A., García-Peñalvo, F.J., Therón, R.: Analítica Visual en eLearning. *El Profesional de la Información* 23, 236-245 (2014)

32. Gómez-Aguilar, D.A., Hernández-García, Á., García-Peñalvo, F.J., Therón, R.: Tap into visual analysis of customization of grouping of activities in eLearning. *Computers in Human Behavior* 47, 60-67 (2015)
33. Pohl, K.: Requirements Engineering: An Overview. In: Kent, A., Williams, J. (eds.) *Encyclopedia of Computer Science and Technology*, vol. 36. Marcel Dekker, New York, USA (1997)
34. WYRED Consortium: Requirements Document. WYRED Consortium (2017)

