PERICLES Training Activities – A final report

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1. Executive Summary

HB has led the Training efforts in the integrated project PERICLES (2013-2017) funded by the EU under its Seventh Framework Programme (ICT Call 9). While briefly outlining the training activities within the project, this report highlights a number of challenges and opportunities that emerged; the way in which some of these challenges were addressed in this project; and some lessons learnt.

A main challenge faced by the training team in PERICLES was that of complexity:

- PERICLES as a larger integrated project involved multiple partners and disciplines; produced substantial publications, research results, and tools; and involved project members with varying backgrounds and levels of expertise.
- The research results on which the training material was to be based were intricate.
- The target audiences of the project were identified to be broad and from different fields, with different backgrounds and professional affiliations, and included a broad spectrum from practitioners dealing with day to day archiving to scientists dealing with space data that would need preservation.
- Target audiences' preferences regarding the modes of training delivery and training material types were varied.

These complexities were addressed by allowing flexibility in our planning, offering diverse training forms, taking advantage of the broad reach that digital media offer, and creation of some material in modular format to allow a better fit for the different needs.

The lessons learnt included the realization that training efforts are well worth a larger investment in terms of time and resources and that a project of this magnitude, with such broad research results is worth the investment in training activities to enable a larger audience to get access to, and make use of its research outcome. In other words, giving prominence to training and knowledge sharing activities is a recommended measure towards extending the impact and societal benefits of research projects.

2. Introduction and rationale

This report provides a summary of the project's Training Activities, the materials produced, the events organised, the user communities reached, and the feedback received. As the project has reached its conclusion we wish to share our experiences in the hope that they may prove useful for others who plan to include a training work package in their (EU-funded RTD) current or upcoming research projects.

Rather than just an additional contractual reporting exercise, this document is, therefore, intended to share insights about challenges and opportunities relating to training engagements in a project such as PERICLES, which has been a large, four-year long, multifaceted, multidisciplinary integrated *Research and Innovation* project, producing a large set of results and multiple tools, while addressing a broad range of audiences and involving partners with varying interests and expertise in different areas.

The training engagements in this project were in different formats at multiple levels including (a) the organisation of a number of workshops and tutorials, (b) production of an online modular training package, (c) introduction and inclusion of PERICLES research in existing educational curricula, (d) development and running of a new PhD course, and (e) production of a MOOC. We believe that each of these training *products* is well worth presentation and discussion. However, the production of training material or 'products', per se, has been just a means towards a goal. That is, the main focus has been on what can be achieved by training activities and products and their role as a 'service delivery instrument' in reaching out and imparting the important knowledge that has evolved through the different researches in the project. While the training activities and material will be outlined later in this document, the main body of this document will be dedicated to a reflective discussion of related considerations, the core aim of the efforts, envisaged impact, and the lessons learnt.

With the collective of the training efforts, we have aimed to reach out and share the knowledge produced within the project with different audiences, both at individual and community levels, in different ways. The issues that were of relevance for these efforts included multiplicity of audiences, their geographical spread and broad variation in their background experiences; intricacy of research outcomes; the maturation of results towards the latter parts of the project; the fit between the needs, resources, and emergent opportunities; adaptation of actual efforts to the activity plans drawn before the project start; and the coordination of training efforts with the many other priorities of the project.

In addition to these, other issues of importance included identification of and addressing needs of audiences and hence the design of training material in a way that would allow flexible learning, relevance, and adaptability to the varying needs. To achieve relevance for and reach to multiple audiences, the training resources were designed to be broadly accessible. A further ambition has been to allow continuation and evolution of our contributions even beyond the project conclusion date. In the chapters that follow we elaborate on some of these issues.

3. Design and Pedagogy

Pedagogical considerations have been of prime importance in the development of the training activities and resources. A core pedagogical aim has been connecting with participants/learners and ensuring that educational activities and materials are learner-centred. Questions about how best to make the learning experiences and content informative, relevant, accessible, engaging and interesting have guided all aspects of design and implementation of programs and activities. The following is an outline of some of our key considerations when making decisions about course design. These might serve as useful criteria for others who intend to develop training material and courses based on research output.

(a) Informative

Endeavours have been made to incorporate both theoretical and practical elements. As expected and planned, the development of courses and materials has been informed by new knowledge and tools generated through PERICLES. This has meant that learners have had access to up-to-the-minute and topical research. The material that we have produced can be seen as resources that a learner can choose to include in his or her tool-box of resources.

(b) Relevant

A key consideration has been ensuring that course material is connected to the real-life work and experiences of the participants so that they can derive meaning from, and apply their new knowledge, to real situations. To this end, efforts have been made to use relevant examples with which participants can connect. Furthermore, in all training programs, the aims, goals and target groups have been made explicit so that participants can make informed decisions about the suitability and applicability of the material we have produced to their needs, thereby ensuring appropriate matches between learner and training activity. For example, when it comes to announcements about the workshops, detailed information has been provided about what the workshop is about, who the workshop is directed at, what can be expected and more. When it comes to the PMTP, each module clearly indicates the target audience, the expected learning outcome, the required time for completion, the level of advancement and more. The PhD course has a course plan that also defines the area of the course, the prerequisites for attendance, the number of credits awarded, the expected learning outcomes, the content of the course and modes of teaching and examination.

Flexibility and openness have also been built into the programs to allow participants to make choices based on their own interests and needs. For example, in the design of the PMTP, the modules allow selection of the topic based on user interest. But more importantly the modular format allows a structured subdivision of user engagement with the package. We have also endeavoured to allow participants to bring their own experiences and knowledge to activities.

(c) Available and accessible

Decisions about course content and approaches have been based on a desire to make the educational activities understandable from a meaning-making perspective. Courses have been

sequenced in such a way that learners/participants are able to progress through a series of steps and build on their prior knowledge and skills (and also at their own pace). This scaffolding[1] is particularly important given the complexity of the topics covered by the courses. Decisions about teaching and learning approaches have centred on using a variety of techniques to cater for diverse learning styles and learner backgrounds, even where pre-requisites have been identified (for example, in the PhD course and the MOOC, which require a high level of prior knowledge). Where appropriate, particular formats and structures have also been used consistently throughout so that participants become more familiar (and comfortable with) the teaching and learning approaches and texts being used, and thus more receptive to learning new concepts. Opportunities for learners/participants to ask questions of fellow participants and of the facilitators, and importantly, the developers of the resources around which the activities have been developed have also been built into our resources.

(d) Engaging/interesting

Making the activities and resources engaging and interesting for learners/participants has been a major consideration, especially in terms of promoting deep approach to learning[2]. We have endeavoured to achieve this by incorporating the following strategies into the training programs:

- opportunities for interaction and discussion, promoting rich communication and the sharing and generation of new knowledge
- hands on application
- variety of media and approaches (including workshops)
- use of open-ended questions that prompt participants to think deeply about topics and their relevance to their own contexts (See also comments in relation to relevance above.)
- interesting course materials
- learner involvement
- reflection activities that prompt learners to think about the significance of what they have learnt in terms of their own practices and professional

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[1] The interested reader can refer to the writings Lev Vygotsky or start with an informative page on this on Wikipedia: https://en.wikipedia.org/wiki/Instructional_scaffolding

[2] Where deep learners derive meaning and explore the knowledge gained beyond the main point, e.g. see:
- Haggis, T. (2003) Constructing Images of Ourselves? A Critical Investigation into 'Approaches to Learning' Research in Higher Education. *British Educational Research Journal*, 29, 1, 89-104.
- Biggs, J, & Tang, C. (2011). *Teaching for quality learning at university: What the student does (4th ed.).* New York: McGraw-Hill and Open University Press

4. Addressing Complexity

As typical of technical and exploratory research projects such as PERICLES, the complexities which were faced in the training efforts were multidimensional:

(a) PERICLES, by its nature, has been a complex research project with many sub sections, partners, varying member expertise, research fields, and backgrounds.
(b) The potential audiences of the project have been multiple and from different fields and professional affiliations.
(c) Temporal dimension and coordination of content availability and training efforts also proved to be a complex endeavour. The project outcomes typically would reach maturity towards the latter parts of the project or the timing of emerging training opportunities would not fit well with the members' schedules or other activities taking place in the project.

A number of steps were taken to address these challenges as described below.

(a) The complex nature of the project
The management of the internal project complexity was generally addressed outside of the training work-package by a rigorous and ubiquitous communication infrastructure that kept the members informed of the activities and progress in different sub-sections of the project. Production of a glossary of terms and internal discussions were also strong contributors towards achieving shared understandings. This infrastructure naturally benefited the WP7 activities in that the training team was kept informed of the progresses in different areas, the opportunities that would emerge, and the relevance of different project members for different training activities. These communication activities also informed the consortium about the training-related plans and activities in return. In addition to these project-wide communications, the training team held multiple meetings, and the teams working with the work packages of Training, Dissemination, and Technology Transfer also held regular joint meetings where reports of progress were shared and efforts became coordinated and improved.

(b) Multiplicity of audiences
As an initial step in the training work package, an interview-based qualitative study[3] was conducted to gain a better understanding of the field, and to identify audiences' potential training needs. In that study, the target audiences were identified as individuals working in seven different types of organisations. On further refinements, the potential audiences were grouped in a number of categories as follows:

• Practitioners (i.e. professionals involved in preservation, archiving, and data management – across different domains)
• Policy-makers (decision-makers in organisations with digital repositories or policy makers at broader national levels)

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[3] A report on that study can be found in a project deliverable document that can be accessed here: http://pericles-project.eu/uploads/files/PERICLES_WP7_HB_D7-1_Training_Needs_V1_0.pdf

- IT developers (those interested in tool development for the preservation community whether placed at repository institutions or organisations involved in digital data management and processing)
- Researchers (including PhD students) in library and information science, archival science, computer science, linguistic, and mathematics
- Trainers and educators for above groups.

These categories illuminate the diversity in potential users and their needs, necessitating flexibility in forms of training engagements and material produced. With the resources available, one could not plan customised sets of material and events directed at each category. Therefore, design considerations were necessary to address the challenges of adaptability and meeting potential needs of a diverse audience, while meeting the bounds of available resources. To meet and cater for the diversity in potential needs, our efforts were inspired by the concept of "modularity" which has received much attention in the fields of management, engineering, innovation, and more, where modularity has been proposed as a powerful means of managing complexity[4]. With this in mind, a core product of our training efforts became the PERICLES Modular Training Package (PMTP)[5] that was made available online, enabling broad access from all corners of the world, and which allowed flexible use based on user interest, background knowledge, and time availability. In PMTP, each module can be followed independently of the other available modules and the user is informed of the level of advancement and expected learning outcome, and more. This enables different users from different backgrounds and fields to put together a personalised collection of sections of the package that meet their own backgrounds, needs and interests.

Other ways of reaching multiple audiences and catering for their varying needs were to organize different training events to take place at different locations and to create multiple modes of delivery which will be further discussed in chapter 5.

(c) Timing and process management

While we managed to master the other challenges faced, the challenge of timing was more difficult to tame. Organisation of training activities and production of training material are time-consuming endeavours that involve a process with different steps that cannot typically be run in parallel. There has to be a topic or a tool in a mature stage before training instructions can be written or the subject can be converted into a course with specific related questions and exercises. While in a project we may have a time-line that indicates the date of readiness for different components, the time indications do not give access to the topic or the knowledge,

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[4] For a few references related to modularity see below.

Baldwin, C. Y., & Clark, K. B. (1997). Managing in an Age of Modularity. *Harvard Business Review*, 75(5 (Septermber-October 1997)), 84-93.

Bask, A., Hsuan, J., Rajahonka, M., & Tinnilä, M. (2016). *Configuring product modularity and service modularity for mass customization strategies*. Paper presented at the World P&OM Conference, Havana, Cuba.

Hsuan, J., Frandsen, T., & Raja, J. Z. (2016). *The impact of product and service modularity on business performance – A survey of Danish manufacturers.* Paper presented at the World P&OM conference, Havana, Cuba.

[5] It should be noted that our use modularity in designing the PMTP with a modular format is inspired by, but different to, the use of the term in the industry.

which first needs to be understood by the training team before that knowledge can be converted to some form of training. Of course, the researchers involved in the development of a theory or tool, or conduct of research may have a better indication of the potential outcomes. But in practice, in our case those involved in research were not typically the same people who convert project research results into training engagements.

Considering that in RTD projects, the emphasis and resources are placed mainly on research and development rather than training activities, one could argue that we have managed to achieve project's training goals well and beyond. Even so, the training efforts in the last stages of the project have been excessive. At the same time there have been relatively late arrivals in form of tools and research results that had to be excluded due to time constraints. There are recordings that could easily be packaged and technical instructions that could be turned into reader-friendly material for broader use. However these efforts are not possible at this late stage in the project.

To give an example, at HB and SSLIS, the process of a course creation from the initial idea to design and development, formal approval by the education board, instructor appointment, advertisement, and running, typically takes around two years. This highlights the problem and why we are not able to produce courses on the later results of the project before the project end. Even for the somewhat faster process of producing new modules for inclusion in PMTP, it has proved difficult to engage the project members who are expert in their specific areas to produce related content as they are typically very much involved in finalizing their findings, producing the related reports, and wrapping up the different sub-activities related to their own priority areas.

It is therefore a recommendation of this project (both to the EU and those in the process of application for funding) to allow a dedicated time after the completion of RTD activities solely for the purposes of training and knowledge transfer (and even continued dissemination) in which all the relevant partners are allocated resources in order to collectively contribute to these efforts.

Taking measures mentioned above allowed us to address the complexities faced. A further complexity that we encountered related to multiple training delivery modes. Blended learning and different possibilities for delivering training content create both challenges as well as opportunities. In PERICLES, we addressed the challenge by embracing the opportunities. We dedicate the next chapter to describe in more details the way we addressed challenge of multiple modes of delivery.

5. Celebrating diversity and multiple modes of training

With the advances of technology, and introduction of new modes of digital communication into educational practices, the notion of flexible learning has gained new dimensions. While blended learning[6] affords many advantages in reaching the audiences, more attuned to their individual learning models and needs, the multiplicity of options, and careful design of each, also brings forth new challenges in terms of technology knowhow, demands on time and other resources, technological infrastructure and more. In the initial study mentioned above, multiple training *forms* were proposed by the study participants. The full list included: Workshop, Webinar, Filmed lecture, Online course, Educational text or article, Individual talks, Lower level demonstration and discussion, Online material, Demonstration, Interactive seminar with individual tasks, Lunch and learn session, A popular article, Live lecture or presentation, a MOOC. However, not all of these were prioritized by the respondents; the training forms at the start of the list were mentioned a larger number of times.

Of course, the PMTP (mentioned above), offers flexibility in mixing and matching its contents to suit different user needs, but PMTP provides only one form of engagement which may not suit all. To attempt provision of multiple training engagements with limited resources is indeed a challenge. In challenge we saw an opportunity, and in the end, with effort and careful planning, we managed to cover a broad range of the training forms listed above. In doing so, we also faced and resolved a number of challenges that are worth consideration.

The following are the modes of training engagement that we offered within PERICLES. We provide actual descriptions of these elsewhere. In this section we outline some of the relevant challenges and our solutions to these:

(i)   **Workshop –** Workshops are an excellent form of interaction for a rich face-to-face exchange, dialogue, feedback and brainstorming. Typically, face-to-face workshops afford a rich exchange of ideas and knowledge and allow the audience to pose questions, seek further clarification, participate in the discussion and contribute to, and enrich the meeting by drawing on their own experiences. These types of knowledge sharing enable a richer access to the core of the topics in hand in an interactive mode. In these, the monitoring of knowledge transfer becomes facilitated due to access to facial expressions, body language, questions and answers and more. Workshops can also be useful in soliciting feedback from the community, for example on the relevance and usability of tools which can then be fed back to the researchers and developers for improved outcomes.
The challenges with organising such events include identification of opportunities in which organisation of workshops would make sense; availability of presenters at the identified occasions; extensive preparations in form of identifying and booking venues, advertising and reaching the right audiences, program and name tag production, organisation of refreshments; the costs involved in booking the location, producing the material and related travel cost for

the presenters; smaller outreach due to physicality of workshops and availability of potential audiences at the given times. To meet these challenges careful planning is needed. In PERICLES, we prepared an extensive set of opportunity capture matrices that helped us to have an overview of upcoming opportunities, tool or research result maturity, and presenter availability. These tools proved instrumental in identifying, prioritizing and taking advantage of different opportunities and can be recommended. In particular they allowed us to take advantage opportunities such as placing our activities within bigger digital preservation events and in that way getting access to a broader audience while eliminating some of the ground work that would have been necessary otherwise. Accordingly we managed to organize a number of different events that took place at different locations in different countries which facilitated access to our events from different parts of Europe.

(ii)   **Webinar** – Webinars or stream casting are useful methods, which offer attendance to a broader audience than just those who can travel to the location of the event. As these are typically recorded and made available for later viewing, they also offer flexibility in time. The primary challenge here is that without the required technology this is not possible. Even in occasions when the technology may be available but an operating human resource is missing this will not be possible. Other considerations are the costs involved and the need for sufficient advertising so that the potential audiences become aware of such opportunities allowing the wider reach. The advantages of closeness of presenter-audience which would be present in for example a live workshop is somewhat lacking in these. In PERICLES, we took advantage of this mode of engagement at bigger events that made this possible.

(iii)   **Filmed lectures** – Recorded lectures allow flexibility for the users to choose the time, location and frequency of viewing. These recordings also allow potential re-purposing of the material for institutional training or inclusion in existing educational curricula by all educators who so wish. The challenge here is to find members who are willing to be recorded while delivering lectures and who feel comfortable with broad dissemination and use of their recordings. In our case, some of the colleagues who were most proficient on a particular topic or a tool were apprehensive about such recordings. Filming equipment and professional editing are also necessary for the lectures to be prepared in suitable ways. Other challenges include creating awareness and easy access to such recordings. Furthermore recorded material can become outdated as the research in the project evolves and new insights and results are achieved. In PERICLES we made use of filming, editing, and advertising resources available at partner organisations (e.g. HB), and hence different recordings were made with multiple participants involving different subject matters. To make these available, various forms of marketing were used and the results were made available on multiple platforms such as PERICLES YouTube channel and website (i.e. as part of the PMTP). The problem of availability and currency is also going to be addressed to some extent for a near future where a partner organisation (HB) will be keeping some of these recordings available and possibly updated.

(iv)   **Online course** – Online courses are a core mode of delivery in distance learning and offer flexibility in terms of time and room, and eliminating the need for travel and co-presence. They are an excellent way of enabling life-long learning even for professionals who wish to combine learning with work and family life. The challenges of online courses are multiple from design of

the course, course content, examination forms, reading lists, learning outcomes to formal approval of the course by credit-awarding institutions; routine enrolment issues including evaluation of eligibility; technological infrastructure; virtual learning environments; availability of instructors and support resources; and more. Although online courses do not necessarily have to include live or recorded lectures, they most often do. Therefore, similar challenges (to that of recorded lectures) also reoccur here. If routines are not in place for organisation of such courses, development of these may prove to be far too demanding. In PERICLES we took advantage of existing well established routines at a partner organisation (HB) and received support from that partner organisation by the involvement of a wider group of the teaching staff in the course design than those involved in the project. We also received strong support and full participation from another partner organisation (CERTH) in development of the course content, lab exercises, examinations, and delivery. The online nature of this course enabled participation of students from different countries which was a very positive outcome. One difficulty that was not fully resolved was the running of lab exercises online. Although detailed instructions were shared with the students beforehand, and the instructors were present and assisting throughout, the technical glitches, or incompatibilities on student computers could not be fully resolved from distance. In short, for those who intend to produce online courses we recommend that the right mind-set, routines for running such courses, and the required technology and infrastructure will need to be in place, and in terms of courses that include hands on lab exercises, a more complex planning is needed.

(v)   **Demonstrations** – Demonstrations facilitate uptake of knowledge through first-hand experience of the tools or products that are demonstrated. They offer the possibility to communicate directly with the instructor, or ask questions and receive answers. By this, a demonstration can provide an interesting and stimulating exchange with the audience about the topic of the presentation. This includes receiving valuable feedback that can inform further development. The challenges here are similar to some of those mentioned above related to the identification and booking of a venue, costs, co-presence, timing, marketing and so on. An added challenge can be that often a demonstration is most typically related to a tool, where the technical people who are involved in the production of the tool and are most knowledgeable about the tool, may not necessarily be the best presenters who can translate their knowledge into a language that is at a level that audiences easily understand. A further challenge is the multiple languages and accents involved due to the project partners being from different countries. In PERICLES we were fortunate to have system developers that engaged audiences and could create a stimulating atmosphere. Furthermore, the slides and written material that accompanied presentation and helped provide overviews and modelled the ways in which different parts came together were also valued supplements. Something that we did not quite have the time for in the project was creation of professional recorded presentations or what can be termed as 'canned demonstrations', but which we recommend. Even so, some of our demonstrations have been filmed and recorded for future use.

(vi)   **Educational texts** – Textual training material is another useful mode of delivery and have the advantage of being easily accessible and which can easily be skimmed through or read (e.g. on a bus or train trip) even annotate and more. Naturally a large body of textual material has been produced in PERICLES in terms of scholarly publications and even deliverables; however

these are not what we consider under this heading. The textual training material was instead produced in the form of, for example, installation instructions for the tools that were experimented with in our on-line course. One difficulty with production of such material is the late maturity of the research results or tools and the extensive time required to create pedagogical material that is based on these late arrivals. In our view, the bulk of such material is likely to be developed after the project end. Similarly in PERICLES, we believe that there is great scope for production of additional educational texts based on the project results by the researchers involved and we hope that their endeavour in this pursuit will continue.

(vii) **MOOC** – MOOCs or Massive Open Online Courses are a more recent phenomenon where a popular course can attract hundreds of thousands enrolment in one instance and as such is an excellent means of reaching to a massive number of audiences. MOOCs also offer the flexibility to the learners to choose whether to complete a course with the aim of achieving a certificate or just to attend a course for gaining knowledge. A challenge related to production of MOOCs is the newness of the phenomena, which meant that at the start of our training activities we did not know even where to start. Of course as this field develops, general knowledge is also improving. In our experience, a first challenge was to identify potential platforms and identify ways to go about learning more. Once we had found a list of possible platforms we needed to assess which may be best suited for provision of advanced level contents based on cutting edge research results. Many of the courses that we explored were of at an introductory level with lighter content and on topics quite different to the subject matter of PERICLES. We also needed project members who were willing to contribute to production of a MOOC, and the responses to our invitation were very limited. At the same time, in viewing some of the available courses we noticed that they were done very professionally with many interesting and engaging contents. The question was whether we could achieve a similar feel and look to our course. We further learned that production of a MOOC from the idea to delivery can take up to two years, a timeframe that we did not have at our disposal.

Regardless, quite late in the project, when we felt confident that there were enough contents in existence that could be re-purposed for the creation of a MOOC, we decided to intensify our investigations and efforts toward creating a MOOC. We were of the opinion that for an advanced level academic course on PERICLES results we should try and find a platform that typically offered similar types of courses. We, however, found that it was not easy to establish a contact with the platforms that seemed most relevant. We solved this challenge initially by taking advantage of the established partnership of one of the partner organisations (KCL) with a MOOC platform. Shortage of time was indeed a major challenge. Whereas we had secured a team of colleagues for the production of the MOOC, bottle necks were created in actions and steps that were beyond our control (e.g. getting access to the platform). Typical issues such as technical support, film recording and editing resources, pedagogical competence in the team to create useful educational material and facilitate learning are of course core elements that need to be in place for a MOOC to be developed. A further challenge in our case that eventually led to abandonment of our initial platform related to involvement of multiple partners and safeguarding of their branding requirements in a fair and acceptable manner.

While we find that creation of our MOOC has been valuable, and will add to the spread of knowledge in a much broader sense than would have been possible by other means, we are hesitant to recommend such an undertaking to other projects' training teams based on the following reasons: production of a MOOC is very time consuming and resource demanding; research results and content that can form the basis of a MOOC are typically made available late in research projects, hence not allowing sufficient time for the production of the MOOC; and finally even if attempts are to be made to produce such a course, the bulk of the work on this will fall in latter parts of the project when there are many other tasks that require finalizing, therefore production of a MOOC, at that time, can become a daunting endeavour.

To get a sense of how these different modes of delivery enabled us to reach multiple audiences and to cater for their needs we provide a few examples.

A workshop was organized at an IDCC event in which automated capture of the environment in a sheer curation and the PET tool were presented to and discussed with the *digital curation community*. A workshop at Borås University attracted *academics* in the fields of *library and information science* and *informatics,* as well as *data service agencies* and *data provision companies*. The nestor PERICLES [school](#) was attended by *students, researchers, representatives from different companies, technical staff from archives, museums and libraries*. A seminar at the Swedish Book and Library fair was received by *professionals in library, archiving*, and *higher education sectors*. A demonstration workshops in Gothenburg and our final event, Eye of the Storm in London, attracted *system developers, organisations in need of digital preservation systems*, and *digital preservation students*, and the demonstration sessions in the conference "Acting on Change: New Approaches and Future practices in LTDP" brought together *key people from all aspects of digital preservation arena*. Other audiences that were reached included *master's students* in *Computer Science, Data Science*, and *Library and Information Science* where knowledge from PERICLES research were integrated in a few elements in existing courses (taught at UEDIN and HB). *Advanced level students* were also targeted in a PhD course that specifically stemmed from, and built on, research and development within PERICLES. The research and results of PERICLES were also introduced to and discussed with *researchers* **in a broad range of fields** at research seminars at HB and in Gothenburg. Soon after the publication of the MOOC, in the last days of the project, *hundreds of students from around 70 different countries* had registered in the course. A better analysis of this group will need to be done after the project end and the time of writing this report. [Even the **general public** were not left out in our out-reach efforts. Although regarded as dissemination activities, the training team on multiple occasions informed about the research conducted in the project, in light popular scientific presentations at different events such as wider organisational staff meetings, interviews with press, and even on the radio.]

Although this combination of training modes may not suit every project, we propose that a combination of different modes will allow a better fit for the varying user needs and accordingly recommend a combination of at least a few different modes of delivery. This set of modes in our case allowed access to the content and training material by a good number of audiences. This set, we hope, will meet varying needs and will allow us to reach different audiences on their own terms. Furthermore, some of these delivery forms will ensure the continuation of discourse beyond the project end.

6. Impact

The goal of achieving positive impacts has been an integral part of our efforts throughout the project. Reaching a wide audience or production of accessible materials is only valuable if it can achieve the goals of sharing knowledge and ensuring impact. As outlined above, we have shared knowledge and research results with a wide spectrum of people. The impact, however, is not always as clear or as easy to quantify. Regardless, we included measures that would offer us some indications of possible impacts. We approached this in two ways: (a) to seek feedback from participants; and (b) to use embedded design based on recommendations that would achieve beneficial impact. These and some indications of impact are discussed further below.

Access to impact through participant feedback – Much thought and efforts were invested into devising evaluation forms that would be spread among the participants at different events and in connection to the online material, as well as academic courses. We found that the most useful feedback was received in follow-up conversations, while feedback in written format in response to evaluation questionnaires remained limited throughout. That is the ratio between the submitted written feedback and the number of attendees remained low. Questionnaires as feedback tools could be valuable and should be included in similar efforts; however, we recommend that space is created for feedback in follow-up conversations at different events. In our case, such conversations were those that afforded us most valuable feedback.

It should be noted that feedback received in connection to events, depending on the questions asked, can only provide indications about the immediate usability and envisaged future impact. To gain a sense of long term impact, other measures are needed. In one instance (related to dissemination efforts rather than training), a twitter data analysis was conducted. Such social media data analysis methods could potentially be a useful instrument in capturing and analysing potential reach and impact of the knowledge and contents shared in the after-the-event exchanges and discussion that may take place in different social media.

Ensuring impact by design – In designing our events, material, and courses, we purposefully sought and followed guidelines and 'best practice' for maximum impact. For example, to reach to and *involve a broad range of people* (from general public to key societal actors) is a recommendation for all EC funded research projects. This relates to the aim that project funded by the public funds should reach and benefit the public. Broad reach was achieved as indicated above. In given events, when possible, the constellation of the presenters was organized to include societal key actors in order to involve, inform, and engage them, but also to initiate wider discussions, and/or influence policy and related issues at a broader societal level. For example, at an event which was held at the Swedish annual Book and Library Fair, the panel included representatives from key institutions such as: the national library; the national archives; a secretariat for national coordination of digitisation, digital preservation and digital access to cultural heritage; and an archival sciences educational programme. The introduction of PERICLES and some PERICLES research outcomes at an event, with key figures as the members of the panel, was a way of connecting research results to challenges and needs that are experienced in real-life work and practices both at local and national levels. While the presentation of results may be valuable, the inclusion of real-life experiences from the field reduces the

abstraction and renders the topic more digestible. Furthermore, the inclusion of key national players who deal with similar concerns is hoped to lead to a return to the topic in their related decisions and work at a national level.

We further aimed our efforts at *encouraging collaboration* on different levels. The inclusion of multiple key participants in the mentioned event, for example, was a promotion of potential future collaborations. Indeed, based on the follow up discussions with two students who were interested in the topic of digital preservation but missed access to a related education programs, an idea was initiated that might lead to a collaboration between different universities in Sweden to develop such a program. In the case of the PhD course, although the students are from different organisations, educational backgrounds and countries, the course design encourages collective discussions and collaboration in learning.

We also took advantage of proven concepts with marked *demonstrated impact*. One such example is a set of modular training material that the Swedish National Agency for Education had produced. These are broadly used by educators throughout Sweden affecting their work and practices. We therefore were inspired by the design ideology of that collection and, with permission, adapted their concept to suit our needs in the creation of PMTP.

In another event, where some of the PERICLES tools were presented, practitioners in the field became interested in the use of these tools in their organisations and have since followed the progress of the project and investigated the possibility of use. The PERICLES PhD course was also designed with *continued impact* in mind as the knowledge imparted to the students in the collection of their courses typically has a long lasting impact on the growth of their thoughts, research and continued work.

Indications of impact – While it is not possible to have a clear idea about the impact that our efforts have had, there are some indications that can be presented.

Some impact is noticed in the feedback which is received in close time proximity to the events held. In relation to most our events some evaluation forms have been distributed among the participants. For example a three day event was held that involved 38 individuals from Germany and Switzerland – including students, researchers, and representatives from different companies, technical staff from archives, museums and libraries. An evaluation sheet was developed to assess the impact of the event. That particular evaluation form was designed to determine the effectiveness of the following:

- organisation of event;
- structure of event;
- content of event;
- speakers;
- learning and teaching methodologies;
- supporting material and documentation
- communication channels and promotion of event.

That overall feedback confirmed that the training event was perceived to be a success. The organisation and structure were highly rated and the teachers and teaching methods received high

praise. Participants particularly appreciated the informal exchange of ideas and group discussions with other researchers, international experts, and practitioners. The course met the participants' expectations, providing them with useful knowledge to take back and utilise within their own institutions. The feedback also indicated a wish for more real-life examples and more hands-on exercises involving specific preservation and curation tools. While such feedback were instructional in continued efforts, indications of impact were noticeable in comments where participants expressed that they felt inspired to become more deeply involved in the field of digital preservation. By providing students with the possibility of meeting colleagues and exchanging information and experiences about digital preservation, a potential follow up could be the establishment of a new community of future collaborators that will endure for times to come.

In feedback, from other events, the participants have similarly indicated a *clearer understanding* of the topics and *deeper appreciation* of the issues involved as a direct result of the event. Other feedback has also identified *areas of application* and *intentions to use*. For example after the tool presentation workshop in Gothenburg, in response to the question participants indicated that the presented tools could be relevant and useful for them and their organisation. An archivist respondent, for example, wrote, that the whole collection of tools presented at that workshop would be of interest and use "*but maybe the PET-tool and the semantic parts for starters*", indicating that these tools would be helpful in keeping "*adequate documentation of our geological databases*". This participant provided sought further contact with project members and in a follow up e-mail he wrote "*Thank you for a very interesting workshop yesterday. I would like to learn more on the tools - I think they can be very useful for us. Next year we are planning to focus much on documenting our geological databases, setup complete ontologies, semantic registries etc and this might be something we can use. It's not my decision to make but if I can get some more information I can discuss it with my colleagues.*" This e-mail continued to include a list of questions that was communicated with PERICLES colleagues. This person also subscribed to the project newsletter and has since followed the progress of the project in different ways. Although difficult to quantify and know exactly what the long-term results may be, the follow up exchanges indicate a level of impact of the event at least for this participant and his organisation.

Another participant at an earlier workshop followed the workshop with a long e-mail that started with this: "*Thanks for a very interesting workshop yesterday.*
From a consultancy and personal viewpoint it was very informative. At X [participant's organisation] *we are very interested in the use of ontologies and linked data to improve our solutions. Extensive use of such technologies has been limited due to knowledge and funding within client organisations but interest is certainly growing, particularly for those publishing data/information but also increasingly those looking at Big Data analysis for unstructured data.*" He then discussed which sections of the presentations were most relevant for his organisation and indicated that he would disseminate what he had learnt at the workshop, internally in his organisation, and with others who might be interested. He even shared some contact information about other interested parties in his e-mail. Contacts with this participant have since been ongoing. These and similar examples provide an indication of impact at an organisational level where we have created an awareness that might lead to PERICLES tool take-up, both for use and even further development.

A very tangible impact of our efforts has been the creation of the PERICLES PhD course on Dynamics of Knowledge Organisation which introduces the knowledge developed within the project. By this, some sections of the project have become institutionalised and part of the established educational system. It would also be safe to say that the integration of some of the findings in a number of master's courses and the PhD course would have some impact on the students' academic and research lives and their future research. The students who have enrolled in the course are all very much interested in the topic and have chosen the course with intent based on their research interests rather the course being part of their obligatory curricula. It is, therefore, likely that they will integrate the knowledge they have gained in this course in their future research. Through this course, not only are the PERICLES results put to good use, but the students have gained the required knowledge and become equipped with the capacity to subsequently improve and extend the research conducted in PERICLES.

Further impact is implied in the invitations received by project members to present different aspects of the project in different settings. Obviously someone somewhere has found the communicated contents of enough interest to wish to learn more.

In addition to impacts that can be more directly linked to our efforts, there are also some *complementary impacts* that have emerged. For example currently a vacancy for a four year, full time PhD studentship in Knowledge Organisation is offered by HB which is very much related to some sub-sections of the project. In another instance collaboration between HB and Gothenburg University has been initiated in providing a master's program in digital humanities. Furthermore an organisation dealing with open data (whose members have been participating in PERICLES related events), is planning to offer a course on issues of open research data (including preservation) nation-wide, in collaboration with HB. These few examples relate to only one partner, HB. Similar stories can be found at the other ten partner organisation. We therefore are hopeful that the knowledge that we have shared in our activities are taken up and absorbed and, in turn, can lead to potential impact on some related practices and decisions.

Quantified impact – In some of the efforts it has been possible to gather usage statistics.

For example, when it comes to the **Dynamics of Knowledge Organisation MOOC** that was published on Udemy, as mentioned earlier the usage statistics after a week of use can be presented as follows:

- 109 students from 33 countries within 24 hours
- 411 from 64 countries on day 2
- 553 from 69 countries on day 3
- 641 from 73 countries on day 6
- 649 from 73 countries on day 7

At the time of writing this report, the number of students registered in the course was 955.
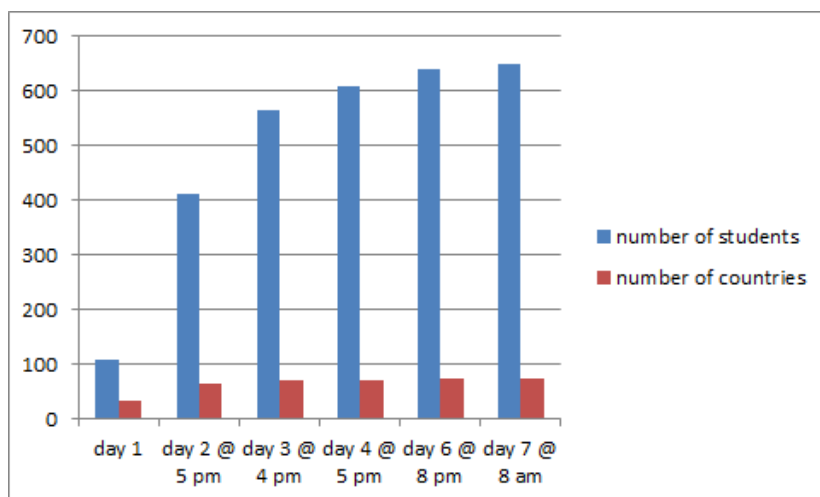
Figure 1. DKO MOOC enrolment statistics after a week of publication

The top enrolments per country are listed below:

- Thailand 17%
- United States 14%
- India 11%
- Vietnam 8%
- Pakistan 3%

Regarding PERICLES Modular Training Package (PMTP), simple access statistics were collected for the period April 2016 – March 2017 and the number of monthly hits were as presented in Table 1.

Table 1
Total number of hits per month on the PMTP website (data collected on March 27, 2017)

Month	Total number of hits
04/2016	571
05/2016	2914
06/2016	3928
07/2016	363
08/2016	4377
09/2016	4485
10/2016	2112
11/2016	1114
12/2016	1054
01/2017	561
02/2017	657
03/2017	1647

More detailed statistics were also accesses via Google analytics during the period March 15 – May 15, 2017. The usage pattern for that period is presented in Figure 2.
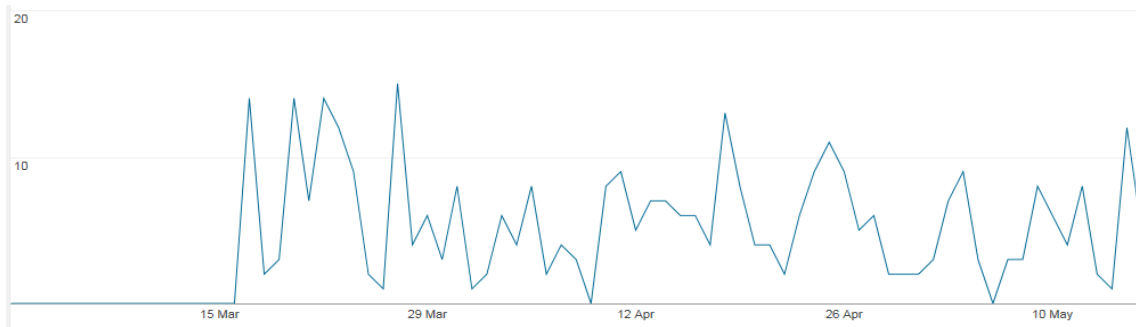
Figure 2. *Pattern of PMTP access March 15 – May 17 2017.*

Figure 3 depicts the spread of access in different countries. While much access from Sweden was expected due to promotional efforts, it has been encouraging to see the broad spread of access to PMTP in many other areas around the world.
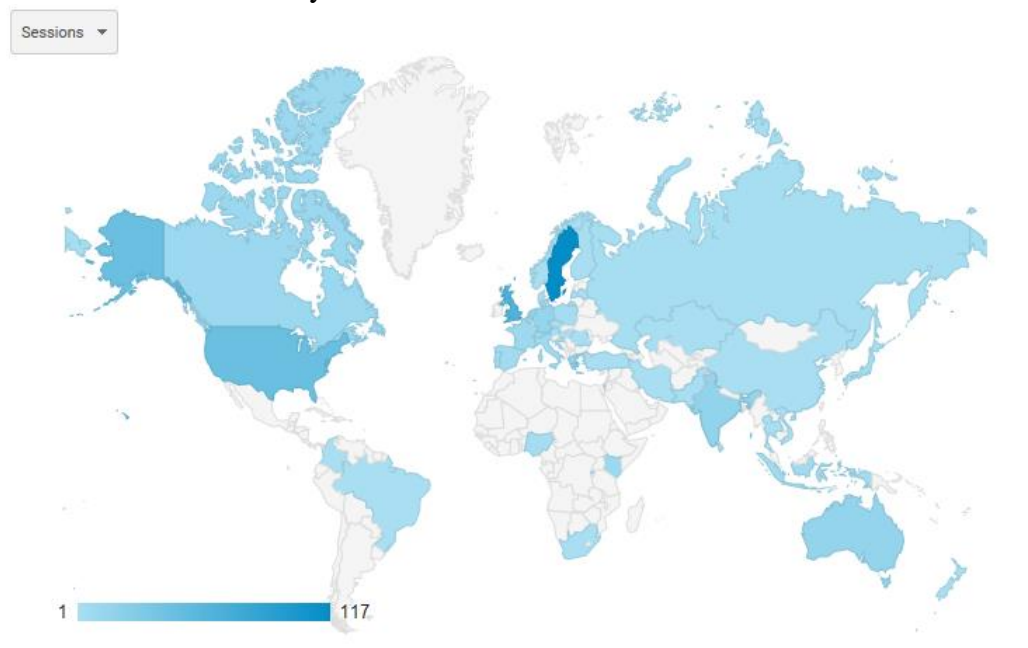

Figure 3. *The spread of use of PMTP across the world.*

The detailed statistics about the access from different countries is provided in Table 2. As shown, in this short time period, people from 45 countries have access the PMTP. The table clearly indicates both returning and new users (see also Figure 3). It is hoped that returning users are an indication of the usefulness of these pages and the new users would be an indication that the use of these pages are still spreading further.
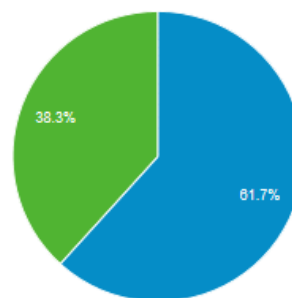

Figure 4. *The ratio of new vs returning users.*

Table 2
PMTP access from different countries

	Country	Sessions		% New Sessions	New Users	
		418		61.72%	258	
		% of Total: 100.00% (418)		Avg for View: 61.72% (0.00%)	% of Total: 100.00% (258)	
1.	Sweden	117	(27.99%)	35.04%	41	(15.89%)
2.	United Kingdom	63	(15.07%)	49.21%	31	(12.02%)
3.	United States	45	(10.77%)	73.33%	33	(12.79%)
4.	Greece	18	(4.31%)	55.56%	10	(3.88%)
5.	India	17	(4.07%)	88.24%	15	(5.81%)
6.	Australia	16	(3.83%)	56.25%	9	(3.49%)
7.	Germany	15	(3.59%)	66.67%	10	(3.88%)
8.	Netherlands	13	(3.11%)	92.31%	12	(4.65%)
9.	Canada	11	(2.63%)	90.91%	10	(3.88%)
10.	Kenya	10	(2.39%)	90.00%	9	(3.49%)
11.	France	9	(2.15%)	88.89%	8	(3.10%)
12.	Italy	7	(1.67%)	71.43%	5	(1.94%)
13.	Portugal	7	(1.67%)	85.71%	6	(2.33%)
14.	Belgium	6	(1.44%)	50.00%	3	(1.16%)
15.	Spain	6	(1.44%)	100.00%	6	(2.33%)
16.	Indonesia	6	(1.44%)	33.33%	2	(0.78%)
17.	Austria	4	(0.96%)	100.00%	4	(1.55%)
18.	Japan	4	(0.96%)	25.00%	1	(0.39%)
19.	Nigeria	4	(0.96%)	100.00%	4	(1.55%)
20.	Poland	4	(0.96%)	100.00%	4	(1.55%)
21.	Russia	3	(0.72%)	66.67%	2	(0.78%)
22.	Czechia	2	(0.48%)	100.00%	2	(0.78%)
23.	Denmark	2	(0.48%)	100.00%	2	(0.78%)
24.	Croatia	2	(0.48%)	100.00%	2	(0.78%)
25.	Hungary	2	(0.48%)	100.00%	2	(0.78%)
26.	Iran	2	(0.48%)	100.00%	2	(0.78%)
27.	Latvia	2	(0.48%)	100.00%	2	(0.78%)
28.	Romania	2	(0.48%)	100.00%	2	(0.78%)
29.	Thailand	2	(0.48%)	100.00%	2	(0.78%)
30.	Turkey	2	(0.48%)	100.00%	2	(0.78%)
31.	Brazil	1	(0.24%)	100.00%	1	(0.39%)
32.	Switzerland	1	(0.24%)	100.00%	1	(0.39%)
33.	China	1	(0.24%)	100.00%	1	(0.39%)
34.	Colombia	1	(0.24%)	100.00%	1	(0.39%)
35.	Finland	1	(0.24%)	100.00%	1	(0.39%)
36.	Hong Kong	1	(0.24%)	100.00%	1	(0.39%)
37.	Israel	1	(0.24%)	100.00%	1	(0.39%)
38.	Kazakhstan	1	(0.24%)	100.00%	1	(0.39%)
39.	Sri Lanka	1	(0.24%)	100.00%	1	(0.39%)
40.	Norway	1	(0.24%)	100.00%	1	(0.39%)
41.	New Zealand	1	(0.24%)	100.00%	1	(0.39%)
42.	Pakistan	1	(0.24%)	100.00%	1	(0.39%)
43.	Rwanda	1	(0.24%)	100.00%	1	(0.39%)
44.	Vietnam	1	(0.24%)	100.00%	1	(0.39%)
45.	South Africa	1	(0.24%)	100.00%	1	(0.39%)

The 161 cities from which the PMTP pages have accessed are listed below.

Aalborg
Aberdeen
Abuja
Agra
Ajax
Amritsar
Amsterdam
Ankara
Arboga
Arlington
Athens
Auckland
Aurangabad
Bad Vilbel
Bangkok
Barcelona
Basingstoke
Beijing
Bengaluru
Berlin
Birkenhead
Bonn
Boone
Boras
Brasilia
Bremen
Bridgewater
Bristol
Broadbridge
Heath
Brussels
Bucharest
Budapest
Burkesville

Canberra
Cape Town
Cardiff
Catonsville
Chennai
Clifton
Colombo
Copenhagen
Courtenay
Delft
Denpasar
Dortmund
Druid Hills
Dusseldorf
Edinburgh
Erba
Gatineau
Gavle
Getzville
Gillett
Glasgow
Gothenburg
Greeley
Hachioji
Halmstad
Hamilton
Heraklion
Ho Chi
Minh City
Hong Kong
Hove
Huntsville
Huskvarna
Hyderabad

Innsbruck
Ioannina
Karachi
Karlstad
Kauniainen
Kigali
Kostanay
Krakow
Lagos
Lansing
Lebanon
Leeds
Linkoping
Lisbon
Liverpool
Livingston
London
Los Alamos
Lucknow
Lund
Lyon
Madison
Madrid
Melbourne
Meylan
Milan
Mooresville
Moscow
Mumbai
Munich
Nairobi
Nerviano
New Delhi
Noida

Noordwijk
North
Berwick
Novokuybys
hevsk
Oradea
Ostersund
Ottawa
Oxford
Palermo
Palmira
Paris
Patna
Phoenix
Pisa
Portland
Porto
Prague
Pune
Quebec City
Reading
Riga
San
Francisco
San Mateo
Sassenheim
Seattle
Seymour
Silver
Spring
Slough
Stamford
Stockach
Stockholm

Strasbourg
Stuttgart
Sydney
Tallahassee
Tarragona
Teddington
Tel Aviv-
Yafo
Telford
The Hague
Thessaloniki
Tonekabon
Tonsberg
Toronto
Toulouse
Trabzon
Urbana
Vienna
Vigo
Vila Nova
de Gaia
Visby
Wantagh
Warsaw
Washington
Wavre
Wejherowo
Wroclaw
Zadar
Zagreb
Zaventem
Zurich

This spread of use is hoped that is linked with potential impact that our efforts would entail.

7. The legacy

As per definition, a project has a limited lifespan as does PERICLES. To ensure continuity and extension of the discourse and the use of the training material produced, we have been inspired by the Open Access movement, where a reasonable section of our material has been produced online for free access and use. PreserveWare will continue to host some training material and in that case the contributing members and the user community are intended to ensure continuity and currency.

As the modular format of the PMTP, which is a core design feature of the package, will not be repeatable on PreserveWare, we have also negotiated and received approval to extend the life of PERICLES material by hosting the collection at the partner organisation HB. By this, the existing collection can continue to be available in its current modular format for the foreseeable future and even potentially be kept updated and even extended if possible. Fortunately, the end of a project does not mean the end of members' interest in the project topic and research. The researchers in the project continue to have professional interest in the research conducted within PERICLES and will continue their work in related areas.

It is also intended that the PhD course developed within the project will be offered again in improved format. A local website for PERICLES is also created at HB (www.hb.se/PERICLES) which will host information about training activities and material and provides links to other PERICLES-related resources such as publications and more. The local HB-PERICLES webpage will be a hub that will continue to connect the PhD course, the PMTP, and potentially the work of the new PhD in Knowledge Organisation (to be appointed in 2017). After the first run of the MOOC, the feasibility and desirability of a repeat run will be investigated. By all these plans, we are confident that our training work package output will have a life even beyond the project end.

8. Lessons learnt

The training activities in PERICLES started on the second year of the project and hence lasted over a period of three years. In that period we faced a number of challenges and learned lessons about the process some of which were discussed above. Some of these insights are summarised below.

- Everything takes more time than anticipated. As training team needs a good overview of the happenings within the project, much time is needed for keeping up with both expected and achieved results. This involves many meetings, accessing and reading many publications and documentations, and thousands of email exchanges. Then the actual production of the material and the organisation of the events are also very time consuming and involve tasks such as identifying the right participants or contributors, negotiations, ensuring engagement from project members, issuing potential reminders, investigating technological requirements, facilitating and producing material, designing workshops, creating courses and more.

- It would be good to define and aim for a few events or opportunities that are known at the time of project planning. However, a system should also be in place to take advantage of emerging opportunities. To note is that such emerging opportunities often   allow little time for planning and organising, and more importantly to market the event. If one is to take full advantage of such opportunities, not only the team needs to act quickly, but the marketing and advertising routines should be in place to reach the potential target audiences effectively and in time.

- Training work package is not just an administrative effort, to use the time and resources effectively, there is a need to include researchers, educators and communicators in the training work package. The experienced educators have a routine in designing and delivering training output and participants from the RTD teams would have an up-to-date knowledge of the status of the on-going research. In the absence of such a constellation, much time and effort will have to be dedicated to learning about, and catching up with the on-going research.

- Training activities relay on contributions and participation from the project members. There is a need for close collaboration with partners and other work packages. A professional tone of communication and good understanding of cultural differences is needed in multicultural projects such as PERICLES.

- Much of the results and tools in a research project reach maturity and become available late in the project. This is a major consideration that needs to be included in the planning of training work packages. Training efforts make complex results accessible to a broad audience and are therefore an important step in ensuring impact. Therefore importance should be placed in allowing dedicated time for training efforts after the arrival of the results as a last stage of the project.

- The use of training output can be extended beyond the end of the project by solid plans and actions that would ensure a continued use of the outcomes. Creation of courses based on

research results that will continue and evolved is one way to achieve this. Furthermore the developed training resources could be promoted to be used by learners and or educators in different ways. Such a use is facilitated if the material is readily available online and its availability is well publicized.

9. Concluding remarks

Training activities in externally funded research projects often receive little attention and form a small subsection of the project. For example, in European Union's Seventh Framework Programme (FP7) (i.e. the programme in which PERICLES received funding); three types of activities were defined[7], namely "RTD and innovation", "Demonstration", and "Other". In FP7, the *RTD and innovation activities* are given a central position while training efforts receive less attention by being placed under the "Other" activity type, which is defined as "any specific activities not covered by the above mentioned types of activities such as training, coordination, networking, and dissemination (including publications)". Even management activities are included in the other activities. On the other hand the importance of relating research results to everyday lives and making better use of the results by ensuring that "they are taken up by decision-makers to influence policy-making and by industry and the scientific community"[8] is often presented as desirable objectives. While much research is continually conducted, often the research results remain inaccessible to the general public and policy makers. Extra steps are needed to optimally utilize the research findings, something that could be better achieved if training and knowledge transfer activities were given more prominence. In H2020 while 'training' is not outlined as a specific activity, the term communication is used to refer to the measures that would promote the project and "and its results to a multitude of audiences, including the media and the public, and possibly engaging in a two-way exchange. The aim is to reach out to the society as a whole and in particular to some specific audiences while demonstrating how EU funding contributes to tackling societal challenges."

This is what we have tried to achieve in this project; however, we believe that it is needed to allow a wider scope for training and communication activities if the research results are to be truly utilized and made accessible to the society in line with such ambitions. This document should give an indication of the complexity of the efforts towards reaching training objectives. More importantly we would like to highlight the importance of training activities in reaching out to individuals and multitude of audiences in order that the society as a whole participates in the process of knowledge creation and consumption and to collectively tackle societal challenges.

Scholarly publications are typically the most important output in research projects and the main form of communicating research results with the outside world. However, in the case of state-of-the-art, highly technical topics, the scope of reach to audiences outside the privileged few with specialised expertise in the field remains limited. While research is a noble endeavour, research in isolation, by itself will not lead to innovation and developments in the society. Training efforts can therefore, be central in providing access to research findings in a more digestible manner to a broader audience (including the practitioners in the field, politicians, decision makers, social scientists, general public, and more). If the goal of achieving impact is truly central, and an aim in the EU financing, it is our recommendation that more emphasis and resources should be allocated to the training activities.

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[7] (See e.g. goo.gl/KlfQ8d)
[8] (See e.g. https://goo.gl/XauJRX)