Final publishable summary report

Executive Summary

Personal health system (PHS) technologies can enhance public and private health service delivery and provide new business opportunities in Europe and globally. Although plenty of PHS technology has already been developed and is potentially available to technically provide virtually everyone with an access to actively participate in personalized health care, research undertakings driven primarily by a technology push may fail as they do not situate PHS within the wider health and social care service systems they have to form a part of.

Hence we argued for a wider systems approach in the analysis of PHS, which takes into account the need to design complex architectures relating together first, people who are recipients of care, care-givers, and others, second, organisational structures and processes that determine divisions of labour and responsibilities, flow of resources etc., and third, technologies, especially the information technologies, but also other health and social care-related devices and software. Our guiding questions were: What issues are critical for the uptake of PHS technologies in new services? Which is the role for policy to assist in the diffusion process of PHS?

The PHS Foresight project captures various aspects of the scattered PHS research and innovation landscape and markets: In reviewing and characterizing research and innovation efforts in PHS we deployed several kinds of analyses. An online platform and consultation process allowed us to engage a wide variety of stakeholders. A bibliometric analysis and a patent analysis provide results directly associated with the term personal health system. A social network analysis provided results on R&D collaboration networks financed by different recent PHS initiatives on the EU level. A literature review of PHS projects informed on the one hand about research and development processes in the PHS area, on the other hand these projects also marked diffusion processes of best practices. Stakeholder workshops and interviews, and complementing literature reviews provided us with insights on drivers and barriers and how we may define success.

As results of our analyses we identified critical issues in the development and implementation of service systems around PHS technologies. Critical may be issues in terms of markets for PHS, products and services, technological aspects (standards, interfaces), culture and values, and framework conditions (legal, ethical). This has then resulted in an analysis of governance deficits and possible policy designs to overcome the variety of thresholds in the adoption and diffusion processes in PHS technologies and the services around them. We then discussed this in relation to the variety of existing policy designs in the PHS area.

Various results in this project indicate that there is an important role for governments and public action in the PHS area. In other words, increases in market volumes would not be achieved at all, or lack the necessary speed, scale and sustainability without public action. First, it seems a significant barrier to investment in PHS that any resulting cost savings may not always be incurred by the investor, but may accrue to a third party, so that benefits and cost commitments appear in different budgets to a considerable extent. Health care providers' incentives differ in implementing ICT in health care services to the extent that there may even be disincentives to invest. To overcome these there are different forms of governmental intervention in order to promote the adoption of ICTs in

health and counteract disincentives. Second, public funding of pilots and public procurement in health care seems a major leverage for establishing PHS. Third, the public role in pushing for higher levels of interoperability has to be further analysed and discussed, in particular the interaction of governmental activities with industry driven and not-for profit interoperability initiatives in the field of PHS. Fourth, there are a number of legal and ethical issues to be solved for the efficient implementation of PHS related projects, like liability, security and confidentiality as well as regulatory issues like the question whether or which part of a given PHS is a medical device or not.

This is a policy challenge as the issue of trust will be key for the acceptance of PHS service solutions by users. Associated with this public added value, there seem to be first indications of a EU-level public added value and rationale for integrating PHS perspectives in R&I instruments in Europe:

- First, EU-level financing plays an important role in the meta- and meso- level PHS projects with a focus also on the internationalization of the PHS service solutions. However, this would not come easily without the EU contribution. Thus these projects prove that many PHS service solutions are apt to be implemented in different national settings.
- Second, if there is a public role in defining interoperability standards these would be of European responsibility; otherwise PHS solutions are forced to remain national or regional.
- Third, also the legal, ethical and regulatory issues are a European policy challenge if the implementation of PHS solutions shall not be limited by national borders.

There is an apparent need to coordinate efforts and develop mechanisms for international mutual learning and streamlining framework conditions. Overarching and all inclusive initiatives like EIP could well make the difference and generate the required momentum for European PHS breakthroughs. The collected evidence indicates that there are only few European initiatives that specifically build around the concept of PHS. Instead, it seems that different dimensions of the PHS are addressed in numerous governance initiatives. While this richness of initiatives is promising it also raises the question if the existing or planned efforts entail also sufficiently overarching approaches integrating wide array of stakeholders in the development of the overall health systems like PHS; including seemless data flows, holistic health concepts, eco-systems and service and business models.

To some degree, the PHS Foresight project has continued some of the work initiated by the EIP AHA. The strong overlap in focus and activity – though still charting different directions for different or additional topics – makes clear that they complement one another and that the end of the PHS project marks a point where our recommendations need to be directed to the EIP AHA and other platforms as well. This approach seems to be a much more feasible way to continue the work of both initiatives instead of creating an EIP on PHS of its own. While many initiatives indeed engage wider set of stakeholders, the concern remains how various agendas can be conducted to stimulate system change. We share the concern identified in the mid-term evaluation of the EIPs (Aho et al.2014) that further attention and efforts are needed to clarify the joint visions for health system changes and to formulate action plans to get there. Here the concept of PHS may well serve as a useful umbrella to bring together comprehensive set of stakeholders and multiple perspectives of the PHS.

Summary description of project context and objectives

Building on the earlier definitions, we have defined personal health systems (PHS) for the purposes of this project to consist of:

- Ambient, wearable and/or in-body devices, which acquire, monitor and com-municate physiological and other health-related data
- Intelligent processing of the acquired information (data analytics), and coupling it with expert biomedical knowledge and in some cases, knowledge of social circumstances and living conditions
- Action based on the processing of acquired information, either applied to the individuals being monitored, or to health practice more generally, concerning information provision and/or more active engagement in anything from disease and disability prevention (for example through diet and lifestyle management) to diagnosis, treatment and rehabilitation.

Former research in the area of PHS has often given little account of special patterns of innovation in the PHS sector (Cunningham, C. et al. 2005), as the knowledge and experience about how to implement research results into concrete policy and strategy development in health is still in its infancy, particularly with regard to the specific needs of the European level.

However, there is a widespread view that PHS can contribute to improved health outcomes as well as increasing the efficiency of health services. In principle these should be very substantial contributions, enhancing public and private health service delivery and providing new business opportunities in Europe and globally. PHS are also expected to improve quality of care, support quality of life more generally, and increase the cost efficiency of health care processes.

Still, diffusion of PHS technologies seems to fall behind expectations. This being said although reliable data on the markets for personal health systems seem hardly available. There is a variety of market reports by market research companies and consultancy firms that share a common optimistic view on the markets, or particular market segments , of PHS. However, these market reports by market research companies tend to use a technology-driven market segmentation, and often are methodologically unclear as to what units are actually counted in sales figures. Some of the reports note that ehealthcare investment has generally been proxied by ICT investment rather than healthcare investment. Considering all available material and qualitative research carried out in the PHS Foresight project we assume that that the optimistic market prospects by market research and consultancy firms may fail to take into account the demand side, and in general, a wider systems view, which seems particularly complex considering health technologies like PHS.

A wider systems approach reflects the fact that we are dealing with "wicked problems" involving numerous stakeholders, numerous specialised types of expertise, and indeed a multiplicity of specific problems aggregated together under the healthcare rubric. "Wicked problems" evolve, and PHS are emerging at a time when complex restructuring of health systems - and even of the notion of health itself - is being prompted by demographic, technological and social changes. Personal health systems will be part of this restructuring, and the extent to which the potential gains of PHS are achieved will be affected by the form it takes. Substantial challenges are involved in shaping this restructuring so that it can rapidly capitalise on the potential of PHS, while supporting equity, patient empowerment and moves to more healthy lifestyles.

Numerous stakeholders will have to be part of this process, which involves building "a PHS Innovation eco-system". It will be important to recognise the very real interests of different

stakeholders - for avoiding deterioration in health outcomes, for maintaining and extending the equity and social inclusion elements of health systems, for stimulating the development of innovative and effective health interventions and medical technologies, for maintaining professional competences and social status, for rewarding entrepreneurial behaviour, for protecting and for using personal data. At present the emergence and potential of PHS has not been widely debated beyond expert communities, and much wider processes of consultation, dialogue and vision-creation will be required to ensure that interests can be articulated and - where necessary - challenged in a transparent manner.

Meeting these challenges will require experimentation, dialogue, and monitoring of change. The PHS Foresight project indicated some of the major aspects of change that will need to be addressed. They range from the creation of new business models and partnerships between organisations of different kinds, through stimulating the acquisition of new skills and the emergence of new professions in health (and related) workforces, to putting regulatory frameworks into place that can allow for informed acceptance of evidence-based solutions. In all of these aspects of change, public attitudes will need to be taken into account, since citizens are crucial stakeholders in these processes. This will need to be the focus of much greater effort in the near future. Still, the PHS Foresight project has already been one step in this direction. Hence, with this project we aimed to acieve:

- a deeper understanding of mismatches between the potential of PHS and current policy and innovation initiatives and framework conditions;
- more mobilized and networked innovation communities, promoting PHS around jointly formulated issues which support pooling resources and streamlining diverse innovation initiatives;
- tackling future opportunities and alternative trajectories, aligning actor perspectives for the development of a joint strategic action plan, including recommendations for a possible new European Innovation Partnership (EIP);
- a transparent, open and inclusive engagement of stakeholders, and targeted dissemination of results in society.

Description of main S & T results/foregrounds

The following reports resulted from the work of the PHS Foresight project:

PHS: State of the Art

- This report takes stock on the wide range of initiatives in the area of PHS. We examine the PHS research, innovation and policy areas to attain deeper understanding of mismatches between the potential of, and need for, PHS, and current policy and innovation initiatives and framework conditions.

PHS: Opportunities for Innovation Partnerships

- This report provides an overview on the PHS Foresight community contributions to envisioning PHS futures, including: a) Joint formulation and assessment of visions on PHS futures and b) Analysis of the visions and opportunities to generate breakthrough innovations.

PHS: Foresight community and Synergies

- This report describes the community engagements and synergies with other initiatives within the project 'PHS Foresight'. The project team mediates and structures the dialogue process by using different formats and media including workshops, seminars, conferences and in particular the interactive social online platform.

PHS: Scenarios

- This report offers insights on two PHS Foresight Scenario Workshops, which were concerned with scenarios for the development of PHS. They explored the range of ways in which PHS might be applied to a number of health circumstances. Also success scenario was developed to provide guidance to the governance of PHS.

PHS: Strategic Plan

- This report pays attention to streamlining different initiatives and establish basis for further cooperation. A strategic plan for future developments in PHS is prepared. It is necessary to consider explicitly the role of policy with respect to different types of objectives.

All the project deliverables are available in electronic format in the project website, where users can also join the online PHS Foresight community, informing and engaging users around the world. The gist of these reports is briefly summarized in the following section.

TRANSITIONS BETWEEN SERVICE SYSTEMS

The concept of PHS is often collapsed into the technological systems that are constructed to support new HSC services; or even into the specific devices that are employed within these information technology systems, such as wearable sensors to monitor health conditions and/or behavior patterns. This fails to take into account the importance of a wider systems view, one which situates PHS within health and social care service systems. This puts the focus on the important issue of social organization of PHS, including business models in order to capture the key processes and key actors in the implementation of personal health systems in national/regional/local health care services. This is the highest form of implementation of PHS products/ solutions and is apt to cover all aspects of drivers and barriers in the different implementation phases.

Rotmans (2006) has described system innovations as "organization-transcending innovations that drastically alter the relationship between the companies, organizations and individuals involved in the system". Such an ambitious type of innovation is required to address many of society's grand challenges, including those associated with active independent living and the introduction of PHS.

MARKETS FOR PERSONALIZED HEALTH SYSTEMS

It seems to be a characteristic of the PHS markets that users are on the one hand clients and may on the other hand be patients, in which case the client may be a different kind of person/organisation. This depends of course on the type of PHS service solution. Accordingly, the literature on PHS markets is torn between the focus on users (ICT focus) and on patients (health focus).

The market for PHS does not seem to rise substantially on the basis of out-of-pocket money from patients or on the basis of private insurances who acquire additional services for their clients. Lack of trust plays a role here which hampers technology transfer (there is a risk of disorientated markets: If there are a million applications out there, which one should a patient/user trust? And is it

necessary the same their doctor trusts?) Furthermore, the age-specialisation of innovations poses particular challenges in expression of demand and sales processes.

Instead, there will have to be clear financing and/ or spending decisions on the part of public health care bodies. However, there seems to be only anecdotal evidence of PHS market players negotiating agreements with public health care bodies, and these were the results of longstanding, resource-consuming individual efforts. Which public health care bodies to address depends on the institutional set-up of the public health care systems, implementation processes have a high degree of fuzziness with regard to the relevant public decision making authorities as well as with regard to (the lack of) a clear public procurement process. Entering the health care market at the level of providers also proved to be difficult as health care organizations are a difficult market who are reluctant to accept "outsider" suppliers due to a variety of reasons, data security, health risks and liability issues among them.

Another aspect of the PHS market is its limited possibility of cross-border operations up to date. Both SMEs as well as large companies operate locally and nationally for a long period of time before they make attempts to extend to international markets. This may change now as a consequence of the Cross-Border Healthcare directive 2011/24/EU, which is supposed to make it easier to cross-border market a PHS service which has already been established in an EU member state.

NEW MARKET OPPORTUNITIES

We have derived four types of stylized markets, which are distinct in their characteristics of supply and demand, and are hence distinct in their particular drivers and barriers. On the basis of these stylized markets we derived new market opportunities from the various workshops dicussions and interviews during the PHS project, which may lead to additional market opportunities in PHS:

Rooms for manouvre may be provided by the

- Third sector, charities, NGOs, and private health insurances. They all may generate considerable demand apart from public health care providers and private customers/patients. These may also be services for specialized groups provided by the Third sector.
- Housing and real estate developers are potential customers as they equip their compounds increasingly with telecare systems and services which are complemented by safety and security services.
- mHealth services can be part of corporate social responsibility (CSR) activities of companies. Firms purchase PHS solutions /services for their employees. CSR initiatives may also promote healthy lifestyles.
- Conventional and standardized, publicly funded PHS services for less advantaged social groups (REDs); sophisticated, highly personalized services for more advantaged social groups (RADs, e.g. financed through private insurances);
- Crucial for the self-organiation processes in complex systems is the spread of information about successful applications, but also about failures. The dissemination of good practice and modes of PHS applications through an easy-to access information portal was estimated increase diffusion.

- On a more general level, public and public-private measures (in collaboration e.g. with food industry, sports clubs, etc.) are important to promote healthy lifestyles and wellness, as well as general measures to increase health literacy in the population.

EUROPEAN PHS R&I ACTIVITIES

The shift to PHS may be understood as a system transition in the sorts of terms established in transition management accounts, and which draw on ideas from the approaches developed in Social Construction of Technology and similar approaches to innovation studies. Based on the joint participation of organizations in PHS projects on the European level, we construct an affiliation network of collaborative research projects and participating organization. Annex Table 1 (taken from Deliverable 1.1. p. 11) gives an overview about the number of selected projects in each identified initiative, the duration of the selected projects and the number of participating organizations (for more details, see D1.1 PHS: State of the Art report on the project website).

An affiliation network can be represented by a bipartite graph, which consists of two subsets of nodes – projects and organizations – with edges existing only between the two sets. Annex Figure 1 (taken from Deliverable 1.1, p. 15) presents the bipartite network of projects in the different initiatives (displayed as yellow, green, red, blue, pink and orange nodes) and participating organizations (grey nodes). The size of each node is its degree in the bipartite graph, e.g. a project comprising ten organizations has size ten, as does an organization participating in ten projects. The degree is defined as the number of direct neighbours in a graph. Annex Figure 1 shows that projects within the same initiative are often grouped together in the same part of the network. In contrast, projects of the very first call in FP7-ICT PHS (FP7-ICT_2007) are close to AAL JP and CP-ICT PSP projects. This implies that at the beginning of PHS project funding on the European level several organizations participated simultaneously in each of these three initiatives and several new actors were involved in PHS research on the European level by the second call in FP7-ICT PHS (FP7-ICT_2009).

PHS RELATED R&I GOVERNANCE

Within the European governance landscape there seems to be considerable attention given to the personalised medicine and health care. In particular, the European Commission has identified active and healthy ageing as a major societal challenge common to all European countries, and an area which presents considerable potential for Europe to lead the world in providing innovative responses to this challenge. Within these lines Horizon 2020 Health, Demographic Change and Wellbeing area aims to keep older people active and independent for longer and supports the development of new, safer and more effective interventions. R&I under Horizon 2020 also contribute to the sustainability of health and care systems. During the first two years of Horizon 2020 (Work Programme for 2014/15), the EU will invest some €1200 million in this challenge. The Third Health Programme, eHealth Action Plan (and more recently the mHealth green paper) and a number of actions coordinated by the Digital Agenda for Europe as well as health and ICT objectives of the cohesion policy instruments all together indicate a wider perspective taken to the development of the European health systems. This offers also a reasonable basis for the further development of PHS.

Arenas and Modes of R&I Governance

It is worth reflecting how various initiatives contribute to overall development and coordination of PHS that as an umbrella concept brings together expectations on seemless data flows, holistic health concepts, eco-systems and services. Many of the PHS related issues identified may not be within the competence of EU, but the EU can still act as a clearing house for best practice and can help to stimulate innovation in an area of huge potential. Member States and other stakeholders may also take a driving seat and foster international efforts that benefit their own constituencies.

Towards the comprehensive understanding of institutional arrangements of governance in the realm of R&I for PHS the three arenas of governance in strategic, programming and performance levels provide a relevant starting point for the analysis. To conceptualise how the actors interact on these arenas the analysis can be linked with the four modes of R&I governance (see Annex Figure 2, taken from Deliverable 4.2, p 12). This supports the characterisation of the institutional arrangements in view of both the level (the arenas) and the form (the modes) of governance (see Annex Table 3, taken from Deliverable 4.2, p 13; for some of the key initiatives; for more detailed analysis, ref. D4.1 Strategic Plan).

The collected evidence indicates that there are only few initiatives that specifically build around the concept of PHS. Instead, it seems that different dimensions of the PHS are addressed in numerous governance initiatives. While this richness of initiatives is promising it also raises the question if the existing or planned efforts entail also sufficiently overarching approaches. While many initiatives indeed engage wider set of stakeholders, the concern remains how various agendas can be conducted to stimulate system change. We share the concern identified in the mid-term evaluation of the EIPs that further attention and efforts are needed to clarify the joint visions for health system changes and to formulate action plans to get there. Here the concept of PHS may well serve as a useful umbrella to bring together comprehensive set of stakeholders and multiple perspectives of the PHS.

PHS VISIONS

In the PHS Foresight online platform the stakeholders were engaged to solicit, comment and assess visions on PHS (see Annex Figure 3, taken from Deliverable 2.1, p.8). The user-generated visions are open for stakeholder comments and the cycles of modifying the original idea. Further on, contributors assess each other's ideas they consider interesting with multiple criteria including novelty, relevance and feasibility for the implementation. The assessment of visions supports the identification of most feasible, relevant and novel visions and provide improved understanding of the PHS community preferences and future directions. Users ranked the visions in view of their feasibility, relevance and novelty:

1. Augmented Reality Apps
2. Medical Diagnosis Platform
3. Prevention support system
4. Medication Interaction App
5. Chronic Gastritis Monitoring
6. Mobile biosensor
7. E-therapy to lower stress levels
8. Certificated hard- and software

9. Supervised Teletherapy
10. Using standards in PHS
11. Personal Health Forecasting
12. Portable device for health checks
13. mHealth based medication management
14. Personalised disease prevention
15. Home monitoring of transplant patients
16. gPHS - Personal Health Systems in focus
17. Non-invasive, wireless blood pressure readings
18. Mobile pregnancy councelor
19. Robots as personal health assistants
20. Implantable Bionics of the Future
21. Track Yourself
22. Mobile application for connected healthcare
23. P4 Medicine Revolution
24. App for multiple sclerosis patients
25. Diabetes Watchdog App
26. Nutrition support system
27. Passive sensors in patient care
28. Assistive tech for dementia patients
29. Radiological diagnosis via telemedicine
30. Collaborative relationships
31. e-COUNSELLOR
32. AiQ BioMan t-shirt
33. PHS watchdog
34. Patient empowerment with the use of apps
35. Healthy lifestyle reminder
36. EU system for personal health
37. Mobile Devices as Health-Managers
38. Insulin 'Robot'
39. Medical home in the future
40. Tele-emergency system
41. Life expectancy indicator app
42. Value-based healthcare with RPP.

PHS SCENARIOS

The approach taken in the first scenario workshop was to develop in the expert small groups scenarios based on those established in an earlier study of PHS (Personal Health Systems), and

originally published in the PHS2020 Scenarios report D3.1 (PHS2020, 2008). This earlier study reviewed a large range of drivers of change in the PHS context, before elaborating four scenarios, which in the end were condensed to three.

“THE DREAM SCENARIO”

The government has moved to a steering role, overseeing outcomes and stimulating compliance through soft methods. Its direct intervention in and financing of healthcare has been substantially reduced, except for acute problems.

“TRANSITIONAL SCENARIO”

Social gaps between RADs and REDs with respect to key dimensions (health consumerism, access to, and confidence in, technologies) have persisted (constraining take up and mainstreaming of PHS and other eHealth innovations), the role of government related healthcare institutions and basic financing mechanisms have not changed but rising costs are de facto eroding the full public coverage.

“SHARED RESPONSIBILITY FOR A HEALTHY SOCIETY”

Although pervasive health consumerist attitudes and behaviours became dominant, the outbreak of acute crisis management have led the government to retain and increase control and direct financing and production of all healthcare services including PHS. This helped reach high levels of public financing of healthcare expenditure with little, if any, reliance on private players.

SCENARIOS, NOT PREDICTIONS

The scenarios are not intended to be predictions of what will happen, but to provide some idea of the range of plausible developments that might characterise the PHS field. The purpose of scenarios is to provide us with insight into the circumstances under which different developments might unfold, and the relations between different issues. The three scenarios that were eventually elaborated had a good deal in common, and while they retained some features of the original PHS2020 starter scenarios, they could quite reasonably be seen as minor variations on an overall scenario of fairly steady but still rather incremental change. Much modification of health systems and their financing was anticipated through the application of PHS, but there was less of a break with current systems than many proponents of PHS might anticipate.

A SUCCESS SCENARIO

The second PHS Foresight workshop was organised to develop a "success scenario". Through a series of steps, the workshop developed elements of a vision for PHS for 2030. There was general consensus among workshop participants that PHS can contribute to improved health outcomes as well as increasing the efficiency of health services.

Annex Table 3, taken from Deliverable 3.1, part II, p. 17 presents the results of a survey on how to define success of PHS, in the basic form of average score (mean) and standard deviation (a measure of the dispersion of people's choices around the mean) for each item. We do not wish to suggest that this is a comprehensive and complete list of indicators. However, it does represent a wide-ranging set of highly relevant indicators, most of which can be seen as both feasible to produce and as highly relevant to the evaluation of PHS policies and programmes. The participants were asked to estimate what value might each indicator have achieved by 2030, by selecting one of 10 percentage point

ranges. This gives an assessment of how far people expect the "trend" to develop, and thus of how far participants agree in their assessments. They were also asked to assess the importance of the respective outcome to the achievement of the PHS success scenario.

STREATEGIC PLAN

The strategic plan developed in the PHS Foresight project (see also D 4.1 PHS: Strategic Plan) goes one step further in building on earlier works and identifying a plausible and desirable course of development, and strategic actions required to get onto it.

Naturally most actions suggested by the various stakeholders refer to market development and increased PHS diffusion. Actions range from introducing new regulations or adopting/harmonizing existing regulations to promote PHS for which public authorities are mainly responsible, to creating user-friendly and easily accessible products and services where it is suggested that the private sector collaborates closely with the users. Actions also include the development of a PHS vision to guide developments supported by with a gap analysis and establishment of value chains from priority setting, selection of technologies, manufacturing (main and suppliers) and implementation. PHS should be integrated in healthcare service provisions targeting public health bodies in the first instance. Furthermore, PHS would benefit from promotion through modelling labs and public procurement initiatives.

Incentives to develop PHS strategies / programs should be created as well as for the creation of new businesses. The focus should be on high-risk target groups underlined also by a preventive approach in leading healthy life-styles. From a technical perspective, interoperability is a primary issue to deal with. It is evident that actions in relation to market development and PHS diffusion require the collaboration of all major stakeholders.

Financial issues refer to boosting and funding PHS development which is envisaged through public procurement, Venture Capital, or even crowd-funding. This brings together the public, private as well as the third sectors. Financial issues also refer to the reimbursing PHS use through public or private insurance systems. This calls for the collaboration of public authorities with health insurances.

STAKEHOLDER GOVERNANCE

Suggested actions in relation to governance highlight the importance of understanding the roles of different stakeholders and how these change with the wide diffusion of PHS and due to emerging trends identified. Bringing all major stakeholders together is of primary importance in this regard. A concrete suggestion in this direction is the creation of the European Healthcare Council to drive PHS developments. PHS research and innovation should be supported by a PHS eco-system involving all key actors and applying user-centered innovation. This stresses the importance of engaging user associations and NGOs. Research and innovation should not only advance PHS technologies and services but should also focus on solving issues such as those due to lack of interoperability, use of big data, etc. as well as on documenting benefits from PHS use.

Social acceptance of PHS cannot be taken for granted. Actions should span a wide including raising awareness and training of society, public debates, help lines, showcasing PHS benefits, solving ethical, legal and societal issues and more broadly promoting healthy life-styles. These actions too demand close collaboration and engagement with societal organisations. Many actions related to technology-rated issues are included in the market development group as they directly contribute to

the wider PHS use and diffusion. Additional suggestions related to technical features refer to dealing with Information and data tracking systems, as well as data access restrictions and ways of collecting and analysing Big Data. Here the primary role is with the technology developers and research community while the governments are also important in setting appropriate regulations. Workforce-related actions refer to the provision of training in PHS where medical schools have a primary role, as well as understanding how the roles of health care personnel and other professionals change with the wider adoption of PHS. Changes in classification of professionals and definition in new professions should be done in close collaboration with current professional organisations. Carers using PHS are a group to taget in identifying related benefits. As expected the role of certain stakeholders is more important than others for certain groups of actions (for example national and EU authorities for regulations, technology developers and research community for dealing with technical issues, societal organisations in promoting social acceptance of PHS, etc.) However, it becomes evident that above key responsibility of the close collaboration of all stakeholders in PHS development and diffusion.

Potential impact and main dissemination activities and exploitation results

POTENTIAL IMPACT

The project we report about here is a foresight project. Foresight projects are systemic instruments and aim at contributing to complex and continuous processes like strategy-finding, policy formulation and/or the development of communities of understanding and practice. To isolate the effects of one particular foresight project, as is the PHS Foresight project, in the short term is inherently difficult. But the PHS Foresight project represented one step in the direction of adopting a holistic and combined approach in understanding PHS and establishing and sharing visions of the desirable futures that can be achieved with the use of PHS, and the problems that may be encountered and the ways in which these may be addressed, in the course of shaping these desirable futures.

Intermediately and ultimately, foresight processes produce impacts over two mechanisms Schartinger et al (2012)[1]:

1. Tangible foresight products (e.g. reports) diffuse and may make a difference in subsequent decision processes. Here the PHS Foresight project has produced and series of reports (Deliverables), conference papers and presentations to share information gathered and results of analyses and promote discussions about PHS. All tangible results were actively distributed via the project website and the online community.

2. Participants of foresight processes, possibly equipped with a differentiated perspective and additional information, act in their (home) organizations, environments, and systems (policy, economy, science etc). Here the PHS Foresight project tried to widen the effect in not only engaging people who were physically present in the two stakeholder workshops but also developing and engaging an online community in an interactive social online platform who were informed and could contribute. The project website served as an online platform and was open to everyone.

[1] Schartinger, D., Holste, D., Wilhelmer, D. and Kubeczko, K. (2012) Assessing immediate learning impacts of large foresight processes. Foresight. Special Issue: Foresight impacts from around the world, 14, 1, 41-55

In an ultimate perspective, impacts of foresight processes are not restricted to the participants (physically present at workshops or virtually present) but may spread through organizations and systems, enabling learning and a growing community of understanding and practice. A sound and comprehensive scientific evaluation of such ultimate impacts in wider social systems is not likely.

DISSEMINATION

For dissemination our project set up a Communication Plan and a Report on the PHS Foresight Community and Synergies (both are deliverables). The aim of the communication plan was to identify and organise the activities to be performed to engage, promote and diffuse awareness and results of PHS Foresight among the potential users and beneficiaries.

The communication plan consists of the strategy for the mobilisation of the PHS community, targeted dissemination and used instruments and tools, a working plan and timetable and the share of responsibilities. Furthermore, quality standards, visual image and templates are defined so as to maintain the integrity of the project through the production of high-quality deliverables. The Communication Plan is updated on a continuous basis.

This communication plan provides guidance for the partners to coordinate and establish communication channels to engage stakeholders in the project and improve the visibility and take up of results. The plan was implemented in support of other WPs and in dedicated tasks such as the online community establishment, the project website, publishing and the workshops. The implementation of the plan is continuously monitored among the project partners and in the online platform.

The Report on the PHS Foresight Community and Synergies describes the community engagements and synergies with other initiatives within the project 'PHS Foresight'. This report described how the PHS Foresight project, in particular Work Package 5 has implemented a process of dialogue, where communication with different stakeholders on different levels involves them throughout the whole process to include the diversity of perspectives. The project team has mediated and structured the dialogue process by using different formats and media including workshops, seminars, and conferences as well as the interactive social online platform.

The project website has been deployed to establish the online platform engaging stakeholders in various forms in the realm of PHS. Furthermore, outreach activities have been established through social networks, printed leaflets, targeted promotion (by way of emailing to the stakeholders of initiatives and through the website visibility. While some social networks offer targeted outreach to larger user-groups and opportunity to generate traffic in the platform, in our experience it is crucial to establish personal contacts with the selected stakeholder community to strengthen collaboration and engagement of stakeholders in the platform. Towards this end, the stakeholder interviews combined with online engagements were considered fruitful. Social networks, in particular LinkedIn, seemed to work well in generating also discussion around selected topics. While the online platform established its own discussion forums, most of the discussions took place in LinkedIn discussion groups. This has also a benefit the discussions are directly shared with many potential new members of the platform and easily available for sharing across different discussion groups and thus promoting the platform efficiently.

Considering the benefits of social networks, efforts in integrating further in the online platform to create a unique user experience is an interesting area for future developments. For instance, now comments on visions made in LinkedIn groups. The platform has been visited almost 3500 times around the world of which more than one third is referral traffic coming mainly from LinkedIn, Twitter and ePRactice.eu social networks.

One of the key objectives of the project has been to coordinate efforts between different FP projects related to PHS to bring different areas of application closer together. Towards this end, the Cordis database was applied to identify and contact relevant projects. Cordis provided a valuable tool for identifying related projects. Further to related PHS projects, we have mapped and established linkages with other initiatives, in particular with most prominently knowledge sharing platforms and networks.

The results of the stakeholder interviews consisting of Advisory Board members and Stakeholder Panelists created stronger connections with key experts that has led to collaboration in dissemination efforts but also allowed gathered insights on this field of practice that otherwise might not have been possible. Building on these experiences, the series of audio-podcasts are developed to gather and share insights of experts in different areas attached to PHS. It is worth exploring further other similar type of activities that allow in-depth interaction with key stakeholders as well as offers opportunities for reaching out the wider community.