MOMENTUM

European Momentum for Mainstreaming Telemedicine Deployment in Daily Practice

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Report on SIG 4 - Technical infrastructure and market relations

'Technical infrastructure and market relations section of the Blueprint developed by practitioners'

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Author:	Montse Meya, Francesc Moya, Izaro Lopez Garcia, Tino Marti
Reviewed by:	Marc Lange, Diane Whitehouse, Gérard Comyn, Ellen K. Christiansen, Claus Duedal Pedersen, Tomasz Cedro, Philippe de Lorme, Frank Gitt
Approved by:	EXCO
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Abstract: This deliverable represents the first results of the work done inside SIG 4, on the basis of the 26 responses received to the on-line questionnaire distributed during 2012. This deliverable provides the data analysis of this questionnaire, some observations about the vendors of products and products in use in telemedicine, and a set of suggestions for the procurement of telemedicine solutions and services. The work contained in this report aims at identifying the common trends as well as the main differences that occur in the technological environment and procurement processes surrounding telemedicine services. One of the main findings of this report is that health service providers deploying telemedicine services must pay special attention to the initial, target size of any regular, new telemedicine service. They must ensure that the equipment/software used meets the relevant standards so as to be able to scale up requirements.

Key Word List: change management; commercial procurement; security; service maintenance; special interest group (SIG); standards; technical infrastructure.

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1	Initial version subject to first review.
2	First review. Version including main findings discussed in February Brussels in meeting with other SIGs responsible and editorial groups.
3	Version of 5-6 April 2013, entailing amendments received from several members of the editorial group.
4	Version incorporating stakeholders' comments in the meetings in Brussels on 6th February and Berlin 8th April, 2013
5	Incorporation of comments from Diane Whitehouse on style and content.
6	Final quality checking of changes made by SIG 4 authors.
7	Review for formatting, consistency, typos (Michael Strübin).
8	Round of further edits between Diane and Michael.
9	Round of further edits between Izaro and Diane.
10	Implementation of the Review comments on "market deficiencies"
11	Internal review and submission to EC

Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise.

Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Glossary: Definitions and Abbreviations

This is the terminology that is relevant to the work of SIG 4, that was created by the group.

Concept	Provisional definition
ADSL	Asymmetric digital subscriber line (ADSL) is a type of digital subscriber line (DSL) technology, a data communications technology that enables faster data transmission over copper telephone lines than a conventional voice band modem can provide.
Broadband	Broadband is generally understood to be a service that enables reliable, high-speed transfer of data, voice and video over the Internet. Broadband speeds vary greatly depending on technology, location, applications and other factors. Broadband networks can be accessed through a variety of wired and wireless services.
Bandwidth requirements	Type of multimedia data — bandwidth (from lowest to highest) Usual data — 100 bps – 2 Kbps Image — 40 Kbps – 150 Kbps Voice — 4 Kbps – 700 Kbps Stereo audio — 125 Kbps- 700 Kbps VCR quality video — 1.5 Mbps – 4 Mbps 3D medical images — 6 Mbps – 120 Mbps HDTV — 110 Mbps -800 Mbps
Clinical Documentation Architecture (CDA®)	This is a document mark-up standard that specifies the structure and semantics of "clinical documents" for the purpose of exchange between healthcare providers and patients.
Device technologies	These technologies often involve not only the device itself, but also related services and consumables (e.g., glucose strips).
Electrocardiography (ECG)	Electrocardiography is a transthoracic (across the thorax or chest) interpretation of the electrical activity of the heart over a period of time, as detected by electrodes attached to the surface of the skin and recorded by a device external to the body.
General packet radio service (GPRS)	This is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).
Global System for Mobile Communications (GSM)	Originally Groupe Spécial Mobile, GSM is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones.
H.232	H.323 is a protocol standard for multimedia communications. H.323 was designed to support real-time transfer of audio and video data over packet networks.
Health Level Seven (HL7) International	HL7 is the global authority on standards for interoperability of health information technology.
Internet Protocol (IP)-based infrastructure	The Internet Protocol (IP) is the primary protocol in the Internet Layer of the Internet Protocol Suite. It has the task of delivering packets from the source host to the destination host solely based on the addresses.

Concept	Provisional definition
Integrated Services Digital Network (ISDN)	This is a set of communication standards for simultaneous digital transmission of voice, video, data, and other network services over the traditional circuits of the public switched telephone network.
Information technology (IT) risk management	Risk management involves analysing the risk, identifying the risk, assessing the likelihood of the event occurring, and defining the severity of the event's consequences. Once the relevant risks and vulnerabilities have been identified, four types of defensive responses can be considered: Protective measures, mitigation measures, recovery activities, and contingency plans.
Local Area Network (LAN)	A local area network interconnects computers in a limited area such as a home, a clinic, or a hospital.
Network connectivity	Network connectivity refers to whether or not a user has access to a specific network. This notion is particularly relevant when considering the "tail-ends" of the high-speed network. At To these ends, users may require wireless access, to allow for mobility or due to the physical distance from the nearest fibre access point to the specific network. An example of what can go wrong, in clinical setting, would be when a physician attempts to offer a consultation after-hours from home but is not able to reach the hospital's internal network because no VPN access is allowed or enabled (NICTA, 2010, p/29).[1] Network connectivity is a measure of the extent to which the components (nodes) of a network are connected to one another, and the ease (speed) with which they can "converse".
Public-key infrastructure (PKI)	This is the set of hardware, software, people, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificates. In cryptography, a PKI is an arrangement that binds public keys with respective user identities by means of a certificate authority (CA). The user identity must be unique within each CA domain.
Service maintenance	Service maintenance must deal with a possible changed environment, maximise a product's useful life, and meet new requirements in a system of continuous improvement. It means learning from the past in order to improve the ability to maintain systems, or improve reliability of systems based on maintenance experience. Maintenance is a natural extension to services and solutions. Maintenance has a twofold perspective: first, the maintenance of the technical platform to offer a secure uninterrupted and undisturbed functioning of services; second, the maintenance understood as the means to obtain support alongside organisation. Thus, in the case of problems, both professional and patient users of the particular service are able to receive assistance by phone or through remote connection. In other words, maintenance can be either "preventive maintenance" that avoids harm or mitigates the consequences of failure, or it can be "curative/corrective maintenance".

[1] http://www.nicta.com.au/pub?doc=4421&filename=nicta_publication_4421.pdf, accessed 11 July 2013.

Concept	Provisional definition
SaaS	Software as a Service (SaaS) is a software distribution model in which applications are hosted by a vendor or service provider and are made available to customers over a network, typically the Internet.
Technology deployment	The methodical procedure of introducing an activity, process, program, or system to all applicable areas of an organization.
Virtual Private Network	This form of network extends a private network across a public network (such as the Internet).

Executive Summary

The aim of this SIG report is to identify the common trends and the main differences that occur in the technological environment and the procurement of telemedicine services.

Broadband-enabled telemedicine services are shifting the healthcare paradigm. Among other developments, they are enabling in-home care and real-time patient monitoring and focusing on disease prevention by enhancing personal wellbeing. High-speed data networks have played a key role in the innovation and mainstream adoption of more robust telemedicine applications (Davidson & Santorelli, 2009, p.12).

Several technology trends are influencing telemedicine services today. The transition to strong infrastructures, together with the use of digital tools and Internet-enhanced service offerings (e.g., remote two-way video consultations, and social web 2.0 tools), the ability to transfer high-resolution images and test results at much greater speeds, have all led to telemedicine services becoming more complex.

In this survey, several topics were considered crucial in terms of this SIG's interest in technical infrastructures and vendor relations. Examples include the existing link between those services that perform assessment of risks to the information security with the methods put in place for the risk management of the devices and/or systems of the telemedicine service. Another is the integration of telemedicine data in the ordinary electronic health care record of the health district or in the hospital or in the region/nation. It is relevant to understand how telemedicine is paving the way towards (technologically) integrated care throughout the whole care continuum.

The transition from a pilot telemedicine service to scaled-up routine care service requires the implementation of new, follow-up, impact indicators as well as the endorsement and commitment of large healthcare organisations, including national entities and private entities (which must have a strategic plan in place that is endorsed by an “operational institutional plan“). Technology is just an enabler.

In this regard, therefore, a service that moves from being a pilot to a regular service is strongly associated with the fact that technology evolves very rapidly. Technology moves so rapidly that, by the end of a pilot phase, a specific technological solution may no longer be current or up-to-date.

A number of observations about this transition relation to the fact that:

- Pilots are often the result of research programmes that use and create their own dedicated technology solutions.
- A niche solution is often an evolution of the initial technical solution developed by the same providers, or a combination of new tools embedded in the initial bespoke platform.
- A regular service provision is based on new procurement of market solutions that cover the requested functionality of an initial pilot platform.

When a healthcare service provider decides to deploy a telemedicine service, it must pay attention to the initial size, and the target size, of the regular, new telemedicine service. It must also ensure that the equipment/software meets the relevant standards to meet the scaling requirements (examples include standards detailed in the Continua Health Alliance guidelines, HL7, and Integrating the Healthcare Enterprise).

Technology deployment includes support for the deployment phase as well as throughout the operational phase. Support should be offered at both the technical and the organisational levels with regard to how to install and sustain the system.

Since technology changes so rapidly, in-house dedicated systems must be replaced by new market alternatives. This usually implies additional maintenance and licensing costs. These costs, together with interoperability issues that may arise, are the determining factors that impinge on the successful incorporation of the (new) technology into regular care/telemedicine implementations.

Foreword to the resubmission

The original version 09 of this report on technical infrastructure and market relations was submitted as “final version” in August 2013.

The midterm review of this report concluded “*The deliverable describes different standards and technological details which today are not very often a problem, but fails to elaborate on market deficiencies influencing the rate of implementation of telemedicine. Furthermore, the presentation of the results by successful vs. unsuccessful cases would be very useful*”.

In response to the reviewer’s comments, the authors have re-scanned the input collected from field experience via the questionnaire in order to identify the market deficiencies that were resolved by those who successfully deployed the service in routine care and those that remain unresolved and either prevented the service to be deployed in routine care, either locally or at large, i.e. to the benefit of the health care system. As a result, this version of the deliverables includes the identification of success/failure factors for routine care large-scale deployment in infrastructure, connectivity and integration aspects that can be considered as market deficiencies or regulation slack.

1 Introduction

Special Interest Group 4 (SIG 4) is the Momentum team responsible for investigating the technical infrastructure and market relations aspect of the thematic network's work. The objective of the team's work is the in-depth exploration of issues, problems and obstacles to telemedicine implementation from a technical infrastructure perspective, covering both the procurement of telemedicine and information about the kinds of partnership that can be established with vendors when developing innovative solutions.

This report is intended to analyse the work done by SIG 4 to date, and incorporate the stakeholder feedback provided by the network's second workshop.

In the opinion of this SIG, derived from the work undertaken to date, **from the technical and market point of view, the success of telemedicine is based on two cornerstones**,[2] (1) a meaningful use of electronic health records (EHRs) and (2) having a national/regional implication with both a telemedicine strategy and a resource centre available[3]. Hospitals and healthcare providers can then take advantage of the resources afforded to them by this strategy and resource centre to support the required national/regional momentum.

It is true that there are examples of companies such as Alere[4], that have large regional insurers behind them, which have had success, but in the case of the work of SIG 4 there are multiple regional insurers involved in the payment of the (largely) public services involved. If a telemedicine service is used only in a very local area (such as around a specific hospital or with a group of primary doctors) it cannot be scaled up. Patients cannot take their data to another area or region or country without having an EHR.

Telehealth and health IT networks do not create themselves. Region-wide health networks are the highways of telehealth. No one can drive anywhere unless the highways are able to support the future healthcare delivery system and are well-connected. Similarly, hospitals and providers need to have established networks of action, if telehealth is to be a serious feature of their future plans. It is necessary to have the means to deliver physically high-speed, high-quality infrastructure that can support current and future applications. Outfitting a network infrastructure with the necessary hardware or services may mean a large initial investment, but will prove to be a wise investment in making telemedicine a major delivery model in the future.

Telemedicine demands a high degree of telecommunications network security, a high efficiency level, and adequate transmission capacity. For practical and economic reasons, security and reliability of telecommunications networks are decisive factors in introducing telemedicine applications. In a modern health service, providing diagnoses, treatment and care depends on the quality of both the biomedical equipment and available professional expertise.

[2] Emboldening has been added by the authors throughout.

[3] This SIG understands telemedicine strategy and resource centres to be a single, “entangled” issue. It believes that the two issues should not be considered in isolation from each other in the context of this work.

[4] See http://www.alere.com, accessed 11 July 2013.

1.1 Findings

On network security and connectivity, the common trends in the 26 reported Momentum cases are:

- Availability of national/regional public-key infrastructure (PKI) among healthcare facilities doing videoconferencing for teleconsultation or serving any healthcare teleservice.
- The majority of the cases have a national or regional Internet Protocol (IP)-based network, and in five cases they have a PKI network.
- Infrastructures in use regularly dedicate more than 2 MB bandwidth to upload/download teleconsultation-related information. Moreover, in other EU reports, infrastructures in hospitals have a larger bandwidth availability[5], which is essential in order to offer telemedicine services such as teleradiology.
- Patients can access most of services via ordinary Internet connection (with no strict requirement for a high bandwidth). Patients' data is sent wirelessly. This data is then sent via a general packet radio service (GPRS) to a Communications Gateway.

One can derive from this that network security and connectivity have been therefore instrumental in the successful deployment of the services and may not have played a role in the reported deployment failure. The continuous investments of public and private operators in network connectivity and bandwidth may suggest that the market is likely to be able to support large scale deployment of telemedicine services. Also, the emergence of GPRS as communication standard for communicating with medical device in patient's home may suggest that requirements for high bandwidth would only exist for some type of telemedicine services, e.g. those using video. This should however be subject to further investigations and attention will have to be paid to the risk of inequalities in access.

On service integration with IT infrastructure (Q34) and EHR (Q38), including the use of standards, the common trend indicates a low level integration and a rather low level use of standards. Since the reported services have been successfully deployed, this suggests that integration and interoperability may not be a major issue. However, subject to further investigation, the explanation of this finding may lie in the fact that the information came from services which have be deployed at small scale, within a local organisation, where the need for integration and standards is rather limited or – as an alternative explanation – where the difficulties faced by the market to offer standard solutions has a limited impact. In turn, these issues may become critical for deploying the service on a large scale.

Also the data collected on procurements (Q36) and on alternative equipment (Q37) may reinforce the idea that the need for integration and standards is less critical when the service is being deployed within an organisation and increase in importance when the service is to be deployed on a large scale. Indeed, the technology used for a service deployed locally is often an evolution of the initial technical solution developed by the same providers, or a combination of new tools embedded in an initial bespoke platform. In turn, a regular service provision deployed on a large scale is based on new procurement of market solutions that cover the requested functionality of an initial pilot platform.

[5] In the *Benchmarking of eHealth in EU acute hospitals* study *(*Codagnone and Lupiañez-Villanueva 2011) http://ec.europa.eu/digital-agenda/sites/digital-agenda/files/jrcehealth.pdf, accessed 11 July 2013, more than half of the respondents (53.3%) reported that hospitals support wireless communication, while around 40% stated that hospitals have videoconference facilities and broadband above 50MBps.

1.2 Literature search strategy

The literature that has been used to support this SIG's report was first obtained through an Internet Google search that used the following search terms: ‘telemedicine’, ‘telemedicine’, ‘tele*medicine’, ‘telehealth’, ‘tele*health’, ‘bandwidth telemedicine requirements’, and ‘clinical need’. The literature search further included searches of the terms, World Health Organization (WHO), and WHO Global Observatory for eHealth. Reference sites and reports more than two years old were excluded. The focus was mostly on European Union (EU) reports, sites of the official authorities, and relevant consultancy organisations. (See Appendix A - Bibliography.)

2 Infrastructure [Question 32]

This question deals with issues of infrastructure.

Q32.1 Please indicate which overall infrastructure (regional, national or organisational) is available to run the telemedicine services.

Q32.2 Please indicate the specific infrastructure used to run the telemedicine service

2.1 Synthesis of the answers to the questionnaire

The responses to this question on infrastructure allow reflections to be made on national and regional networks, and on videoconferencing communications.

Respondents have selected one out of seven different options in relation to the different types of infrastructure that support their telemedicine services e.g., Internet Protocol (IP), videoconferencing, message-based communication and public-key infrastructure (PKI).

The majority of the cases have either their own national (eight cases) or regional (eight cases) infrastructure. In several cases, the telemedicine service is available as a result of a national or regional PKI, namely:

National or regional PKI:[6]

- Estonia: Doc@home,Norway: Teledialysis,
- Norway: COPD patients briefcase,
- Sweden: RxEye Reading,
- United Kingdom (Scotland): Telescot_UK.

Videoconference infrastructures:[7]

Shifts in global work practices require a new approach to video communication. The majority of respondents' cases use Microsoft, Polycom or a Virtual Private Network (VPN) via Integrated Services Digital Network (ISDN) point-to-point. Examples include:

- Denmark: Teleinterpreting_DK; Diabetes Health Optimum,
- Greece: Sismanoglio General Hospital,
- Israel: Chronic Disease Management,
- Spain (Catalonia): Tele_Ictus Catalonia VC among local Hospital with Specialised reference hospital (
- Sweden: Electronic Healthcare _Teleconference.

2.2 Synthesis of the stakeholder feedback process

In the Arctic Light conference 2012 in Luleå, Sweden, the telemedicine cases presented were not regional/national telehealth solutions, and there were no large-scale service infrastructures involved. The services presented and discussed focused on telemedicine resource centres in specific territories.

[6] Listed in alphabetic order of the country concerned.

[7] Listed in alphabetic order of the country concerned.

In further discussions, no detailed information was disseminated about the patients' communications with the service centre or professionals. Concerning "machine_to_machine" (M2M) device communications, new solutions are designed to enable standards-based connectivity to third-party medical devices and videoconferencing services as well as to enable flexibility in the choice of hardware and deployment resources.

Stakeholders' feedback in Brussels during the meeting held on 6 February 2013 indicated that the main results correspond to the reality in the territories where the reported services belong.

No pertinent stakeholder feedback from the April 2013 meeting in Berlin was gathered.

2.3 Synthesis of the literature review

In the documentation published by NICTA (2009) the conclusions concerning broadband assets in infrastructures are as follows: "without an appropriate architectural approach, a large high-bandwidth physical network becomes fragmented into multiple, disparate (real or virtual) private networks that limit the scalability of telehealth" (Op. Cit., 2009, p14). Moreover, the availability of robust broadband technology has increased the speed of healthcare and expanded the geographic availability of telemedicine applications such as teleconsultations, teleradiology, and remote monitoring. These assertions are also to be found in many other literature sources (e.g. Deloitte, 2012).

3 Connections and networks [Question 33]

Many challenges to telemedicine connectivity lie on the patient side of the equation. Theoretically, telemedicine is ideal for the rural patient because it removes the geographic barriers that exist in accessing general practitioners, physicians, and specialists. However, a lack of strong broadband and wireless network connections in many rural areas can be a major hindrance to adoption. This lack of connectivity is of greater concern where bandwidth-intensive video consultations, whether smartphone, tablet, or personal computer-enabled, are involved. In efforts to bridge the rural connectivity gap, authorities in Australia (NICTA, 2010) have already established Rural Health Care Pilot Programs in order to provide funding for the development of a national/regional wide broadband network dedicated to healthcare.

On the provider side of the equation, a powerful network is also vital for a successful telemedicine implementation. Such a network must be able to withstand a constant stream of data from patient medical devices, as well as video consultations. Central providers may not have the same connectivity access limits as their patients; the network, hardware or services that patients have in place may not support the requirements of a large telemedicine implementation.

The situation in the 26 reported cases in the Momentum survey presents a large variety in connections. They range over the following types of applications:[8]

- Video conferencing in a Local Area Network (LAN),
- Direct dedicated Integrated Services Digital Network (ISDN) lines between primary health care and telemedicine centres,
- Ordinary Internet connection (with no requirement for high bandwidth) and usual mobile phone coverage (no mobile Internet required),
- Asymmetric Digital Subscriber Line (ADSL).

Connectivity methods for telediagnostics consist at the moment mainly of video conferencing connections among professionals over large-scale broadband, while home telemonitoring is done via ADSL and in some cases, where the ADSL infrastructure is still to be deployed, with wireless Global System for Mobile Communications (GSM) connections. This last form, the use of GPRS communication standards, is becoming increasingly important in machine to machine communications, in particular when referring to data transmission of medical devices at patient's homes. One can derive from this that requirements for high bandwidth would only exist for some type of telemedicine services, e.g. those using video.

Although reliable connectivity is crucial for successfully implement telemedicine, particularly for patients living in remote areas, public and private operators investments in telecommunications and networks have considerably improved and are continuing to improve services provided to the market.

3.1 Synthesis of the answers to the questionnaire

There is currently one question only on the topic of connectivity and networks in the November 2012, version 2.0 of the Momentum questionnaire:

[8] The ordering of this list is intended to reflect the relevant importance of each form of connectivity.

Q33.1 Please describe the connections and networks and the locations on which your service is dependent. i.e. what you need for the devices and systems to function and where (e.g. wireless network for mobile devices; telephone line, broadband, ADSL, Videoconferencing or satellite in the home).

This sub-section therefore describes the systems, connections and locations on which the telemedicine service is dependent (e.g., wireless network for mobile services or broadband in the home). Descriptions provided by the respondents refer to connectivity among health care providers (teleconsultation) and connectivity between patients and professionals.

An overview of the main findings extracted from the survey responses follows. It lists particular examples of cases.

In the first list, the type of connectivity for health providers or health professionals is described, and in the second, the type of connectivity for patients:

Health providers/professionals (type of connectivity):[9]

- Broadband videoconferencing networks (usually used in hospitals, and among different facilities), with medical record and medical images (such as ultrasound, or x-rays). This can be seen in Spain, in Catalonia in the TeleIctus service and, in Sweden, in the “Electronic Healthcare service”. Sometimes this service is combined with regular telephone lines, and at other times wireless mobility is also used (e.g., in Sweden),
- Secure server accessed via PKI web 2.0 virtual community for professionals interconsulting (e.g., in the ECOPIH and ENDOBLOC cases in Spain (Catalonia)),
- Direct dedicated ISDN lines between primary healthcare units and the reference telemedicine service providing the teleconsulting service,
- Internet connection Cisco Webex or VPN connection. Sometimes this connection is via a wireless network for mobile device (such as tablet computers and smart phones), and it sometimes takes place via Skype.

Patients (type of connectivity):[10]

- ADSL, broadband, wireless network for mobile devices in the home,
- Mobile network or broadband in the home (e.g., for treating ulcers in Norway),
- Most of the services can be accessed via a normal Internet connection (there is no requirement for a high bandwidth). For instance, a subscriber calls the Receiving Centre (in the case of CARDIOEXPRESS, or the specialised support centres). To upload images, care givers can choose to use national isolated PKIs to increase security,
- Measuring Devices: Send data via a GPRS Gateway Communications and send the signal (specialised software, into an electrocardiograph (ECG) and display it on the cardiologist’s monitor in real-time). Usually patients’ data are sent via Wi-Fi to their own ADSL router using Web Services Patient Record, Web Forms and other components,
- Task Scheduler: Sending short messaging services among patient-professionals,
- The Danish Health Data Network was upgraded in 2009 so that video conferences can run smoothly, as well as other related services that demand large broadband requirements.

[9] The ordering of this list is intended to reflect the relevant importance of each.

[10] The ordering of this list is intended to reflect the relevant importance of each.

3.2 Synthesis of the stakeholder feedback process

The main stakeholders' feedback in the workshops held in Brussels and Berlin in 2013 was that data transfer needs to focus on speed of transmissions. CATEL explicitly commented that the "communication pipe" is very important, and that today telemedicine is fuelled by the desire to provide healthcare to people with limited access while reducing the cost of health care delivery. Stakeholders emphasised that highlighting the notion of core infrastructure is not enough.

The concept of "digital territories" promoted by some governments was also discussed. This "connectivity" principle is directly linked to the "smart cities" concept (Alcatel-Lucent 2012) and to research. It was commented that recent – although unspecified – studies provide insights into opportunities for service providers to leverage their assets in a proactive way by partnering with the key players in a smart city or in a "digital territory" project.

3.3 Synthesis of the literature review

The relevant literature with regard to broadband availability, systems, connections and locations to the various telemedicine services differs substantially depending on whether the service is a mobile service or not (e.g., whether it is a wireless network for mobile services or broadband in the home). Relevant information is to be found both in reports by Deloitte (2012a; 2012b), HIMSS (2012 and NICTA (2010).

Europe also provides measures and initiatives in the context of the European Innovation Partnership Active and Healthy Ageing (EIP AHA) Initiative for the rural areas where those initiatives must combine connectivity deployment with human support to fragile populations. The Digital Agenda 2020 also states that the European Commission has proposed the need for EUR 9.2 billion support for ICT investments in the Connecting Europe Facility (CEF) (European Commission, 2011) for the period of 2014-2020 (although it is unlikely, from current Parliamentary and Council negotiations that this full amount will be allotted). The Commission intends to propose a bold action plan on wireless communications in 2013 (European Commission, 2012a).

In the CIP ICT PSP Work Programme for 2013, broadband and networking for health is essential for the objective 3.3 on Networking for health, ageing well and inclusion which is linked to EIP AHA priority action D4 on Innovation for age-friendly cities, buildings and environments.

4 Integration, standards and interoperability [Question 34]

Telemedicine is only achievable with the exchange of information between patients, practitioners, suppliers and policy-makers. A common basis for data exchange is needed for purposes such as real-time communication, access to health records and other clinical documentation, access to specialised data (for example, images), and software system interfacing.

4.1 Synthesis of the answers to the questionnaire

This sub-section describes the aspects of the telemedicine service in relation to integration, standards and interoperability. The responses to the ten separate sections of question 34 are given here. The first question and its responses relate to the technology used to run the telemedicine service and its integration.

The nine remaining questions refer to the degree of integration of the service in terms of the technology used and the basic information technology (IT) system; whether the integration is achieved by using standards; whether relevant identity verifications are interoperable; whether only certified systems are used (and the types of certification used); whether sensor devices interact with controlling devices; whether seamless transfer of data takes place; whether any of the devices used are certified in relation to other devices e.g., via the Continua Health Alliance; and the family of services used in relation to a plug-and-play context; and, finally, whether the public authority has a mechanism or procedure to deal with the accreditation/certification of providers.

Q. 34.1 Please indicate if the technology used to run the telemedicine service (devices and/or systems) and basic IT-systems are integrated.

The illustration below depicts the respondents' answers to Q34.1 with regard to the integration of the technologies used.

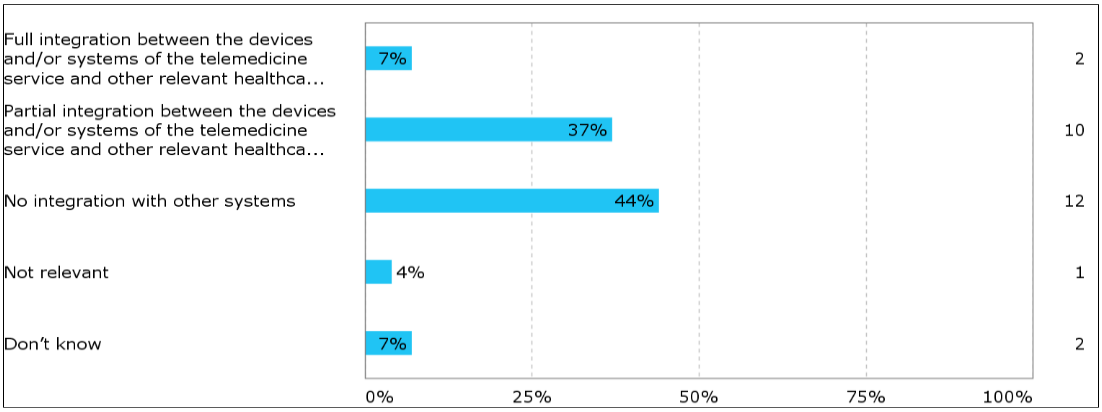

Figure 1: Responses to question 34.1 "Integration of technologies."

The majority of current systems have "no integration with other systems". However, the need for "integration" becomes step-by-step more relevant. In ten cases, the telemedicine service has a form of partial integration. Full integration means that both the request for information and the information returned are digitally transmitted. Integration occurs, and is fully achieved, when data is integrated in e.g., the "local patient electronic health record" or any other information system in the health care service provision.

Q34.2 Is the integration of your telemedicine system achieved using standards?

This question was only answered by 12 respondents. Ten respondents confirmed the use of standards whereas two did not. Most of the respondents use Health Level Seven HL7 and Clinical Document Architecture (CDA). Others reported the use of terminology for their catalogues – ICD9, CPT4, and the International Classification of Functioning (ICF) of the WHO; and in communications the use of the standards H.232 and TCP IP.

Both low level of full integration between devices and/or systems of telemedicine services with electronic health records (7% of cases) and the level of responses in the use of standards (10 out of 26 cases) suggest a need that it is not being fulfilled by telemedicine vendors. Likely, it can be explained either by the absence of integration requirements from public or private health IT systems or the incipient standard telemedicine market.

Q34.3 Were relevant identity (ID) verifications technically and legally interoperable (i.e. were the IDs valid across organisation borders)?"

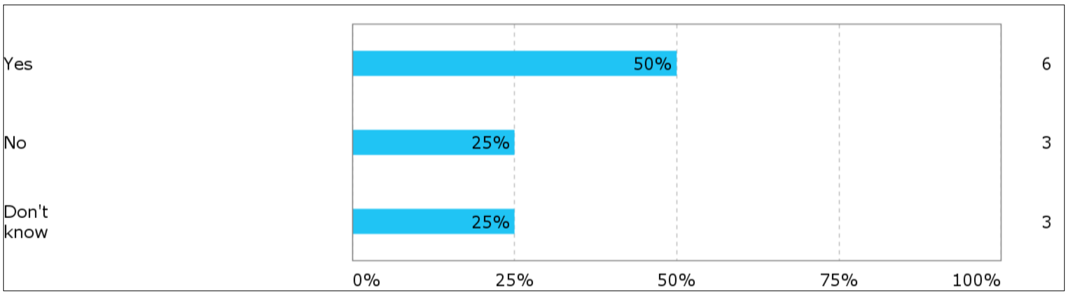

Figure 2: Responses to question 34.3 "Interoperability of IDs."

This question was also only answered by 12 respondents. It is a very relevant question that would indicate whether there is any guarantee of interoperability of data between the individuals or processes. Its answers would indicate whether if it is possible for different organisations (i.e., across organisational borders) to use the same identifier. This is a relevant issue for "integrated care", and is one of the critical issues in the current Europe 2020 Agenda.

This core question must be followed up further in subsequent analysis of the Momentum survey as it is indicating a critical interoperability pitfall and a lack of efficient market provision and/or public regulation.

Q34.4 Did you used only certified systems? (ISO 13473, EU 93/42/EEC ...)

This Momentum survey question was answered by the 27 participants in the first wave of analysis undertaken in December 2012. Summarising the situation at the end of 2012 concerning standards and interoperability, only half of the respondents' cases appear to know whether certified systems are used.

Certain reservations apply. The situation with regard to the responses appears to be twofold. Maybe the respondents were not the appropriate persons to respond to the survey; for example, nine respondents did not know the right answer to the question.

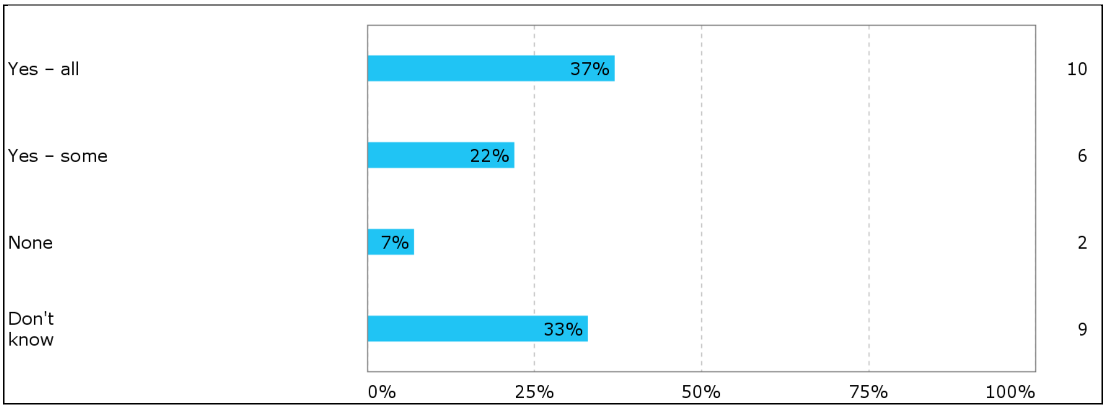

Figure 3: Responses to question 34.4 "Use of certified systems."

Q34.5 Did all the necessary sensor devices used in the telemedicine service automatically interact with the controlling devices?

Since almost half of the Momentum survey responses reported telemedicine services are teleconsulting-oriented (which occurs among practitioners using videoconferencing), in these services there are no monitoring devices involved on the patient side. Therefore, the 13 answers to this question with "none" are equivalent to an answer which would represent "none, because it is not applicable".

Q34.6 Could the data be seamlessly transferred between home and other locations for monitoring and the receiving part e.g. telemedicine service centre, hospital, etc.?

For all of the 16 cases/services doing telemonitoring, their answer was "yes". Nine services were not telemonitoring services, and therefore this question is not applicable.

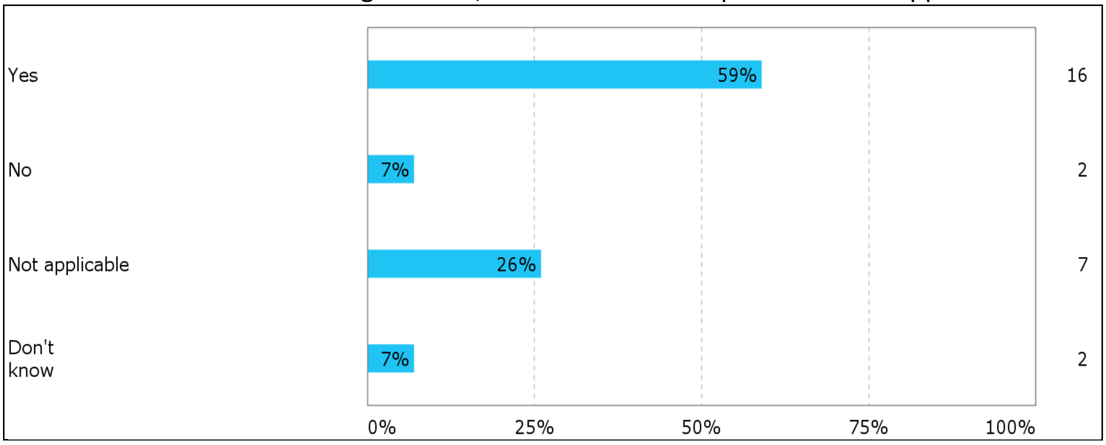

Figure 4: Responses to question 34.6 "Seamless transfer of data."

Q.34.7 Could the data be seamlessly transferred between the receiving part (e.g. the telemedicine service centre) and other actors in health and social care?

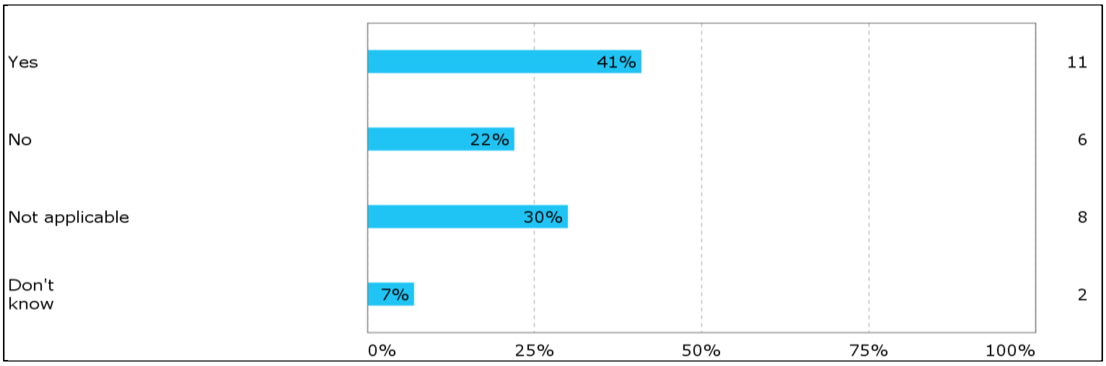

Figure 5: Responses to question 34.7 "Data transfer to other actors."

This question is only applicable to telemonitoring services. Therefore the ratio of answers follows the same trend as in the previous question, because it does not apply to teleconsulting and the interpretation services. In the near future, identity mechanisms (eIDs) should be seamlessly transferred between healthcare centres and social care institutions. If telemedicine services want to embrace interoperability this must extend throughout the continuum of care.

Q34.8 Are any of the devices you use as part of the set-up of the telemedicine service certified in regard to their interoperability with other devices (i.e. Continua Health Alliance?

Certification and standards are nowadays not fully consolidated through the telemedicine domain. Five respondents reported that they are certified either fully or partially. Only half of the Momentum reported service cases are telemonitoring services, and thus only those can use Continua Health Alliance certified devices.

Q34.9 Name the family of standards used for interoperability in the context of the plug-and-play interoperability of your telemedicine system.

With respect to this question, some respondents named a series of standards as certified services, e.g., Digital Imaging and Communication in Medicine (DICOM), HL7, Java, J2EE Spring[11], and SSL.[12]

The findings from this question do not, at this point in the evaluation, impact the study findings significantly.

Q34.10 Does your public authority have any instrument or procedure for the accreditation / certification of providers?

It seems that the potentially powerful instrument of having public authorities promote standards and interoperability is still not widely applied. It is found only in four countries. Examples of institutions that undertake accreditation/certification of providers are Medcom (Denmark), NHS24 (Scotland), the Standard Office at TICSALUT (Catalonia/Spain), and the State Office of Medicines (in Estonia).

[11] J2EE Spring is the most popular application development framework for enterprise Java™.

[12] Secure Sockets Layer (SSL) is a cryptographic protocol that provides communication security over the Internet.

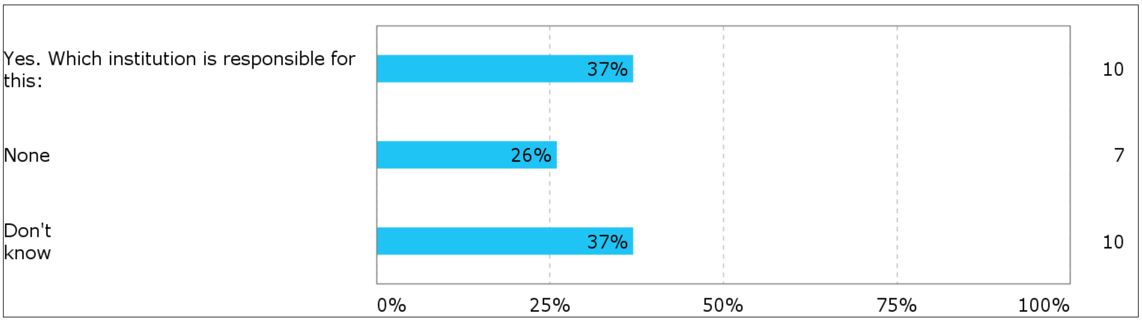

Figure 6: Responses to question 34.10 "Public authorities responsibility for accreditation/certification of providers."

4.2 Synthesis of the stakeholder feedback process

Stakeholders during the meetings in Brussels (February 2013) and in Berlin (April 2013) commented that "integration" is not needed in stand-alone services. This is the case when the service occurs on a single platform that is part of one (intramural) health information system.

This means that each service must be seen within the prism of its "reach", namely either at the level of a whole region or, for example, a single, specific hospital.

Clearly, the integration of subsystems and interoperability among systems is the core issue for scalability and to create real extramural services (i.e., communications between different or separate institutions).

4.3 Synthesis of the literature review

The main guidelines for the most suitable standards for interoperability in cross-border institutions that apply to cross-regional or cross-institutional interoperability are included in European Commission directives and by epSOS, the large-scale interoperability pilot project.

The following three Directives have application for telemedicine services:

- Directive 2001/83/EC, and Regulation (EC) No 1223/2009 on medical devices.
- Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data.
- Directive 1999/93/EC on a community framework for electronic signatures and certification-services in order to ensure the proper functioning of the internal market.

The main standards used in epSOS, the large-scale pilot, are HL7 code system; UCUM (Unified Code for Units of Measures); EDQM[13] – Standard Terms of European Directorate of Quality in Medicine; LOINC – Logical Observation Identifiers names and codes; ATC – Anatomical Therapeutic Chemical classification system; ICD – International Statistical Classification of Diseases and Related Health Problems; and SNOMED CT[14].

[13] These standard terms cover dosage forms, routes and/or methods of administration, and containers, closures and delivery devices used for medicines for human and for veterinary use.

[14] SNOMED CT (Systematized Nomenclature Of Medicine Clinical Terms) is a systematically organised computer processable collection of medical terms providing codes, terms, synonyms and definitions covering diseases, findings, procedures, microorganisms, substances, etc. It allows a consistent way to index, store, retrieve, and aggregate clinical data across specialties and sites of care.

HIMSS, together with Integrating the Healthcare Enterprise (IHE), provides important tools for achieving interoperability and implementing data standards amongst all facets of Health information technology (IT) integration.[15]

Generally, it can be said that laboratory data have been relatively easy to exchange because good standards exist that are widely accepted, such as Logical Observation Identifiers Names and Codes (LOINC). However, important information such as problem lists and medication lists are not easily transmitted or understood by the receiving health IT product because existing standards have not yet been uniformly adopted. Interoperability must therefore extend throughout the continuum of care. Not surprisingly, it can be asserted, as does the Association for the Advancement of Medical Instrumentation (2012) that "Poor user-interface design, poor workflow, and complex data interfaces are examples of poor interoperability."[16]

[15] HIMSS Resource Library on Interoperability and Standards
http://www.himss.org/ASP/topics_interoperability.asp

[16] AAMI Summit report: medical device interoperability
http://www.aami.org/interoperability/Interoperability_Summit_publication.pdf

5 Risk management [Question 35]

This section of the Momentum questionnaire dealt with issues related to risk management. The question was:

Q35.1 Do you have methods in place for the risk management of the devices and/or systems of the telemedicine service (e.g. to ensure effectiveness, security and safety)? If yes, which one(s)?

5.1 Synthesis of the answers to the questionnaire

From the Momentum survey, it emerges that there is a risk management policy in place almost everywhere. Risk management is in place in 18 of the services that responded to the Momentum survey. However, there was no detailed information on which tools are in use to manage properly the security risks associated with their information technology assets. From the responses, one can assume that the services are prepared – at a top organisational level – to mitigate these risks and respond appropriately, if any risky event occurs.

Four different methods/activities exist in relation to risk management (i.e., Protective and mitigation measures, recovery activities, and contingency plans). All the respondents referred to protective measures only; Denmark cited “recovery measures”; only Estonia named “risk management protocols”.

- Denmark: risk management is based on back-up of the data.
- Estonia: has risk management protocols, and a Risk Manager is appointed, while in the Telescot service (UK) regular checking by clinical team is in place.
- Norway: risk assessment methods are in line with ISO 27005. In the COPD service, Norway relies on a service training and control by the specialist staff.
- Spain/Catalonia: does not make explicit the risk management method used. In two Catalonian services, they rely on the risk management methods of the owner of the platform (i.e., owned by the government).
- Sweden: uses only software that is certified to be used in most EU countries. A system error reporting service is in place if the service fails.
- Austria, Netherlands, Slovenia: all three countries did not report the use of any risk management method.

Four respondents answered “I don’t know”.

The coverage of responses with regard to risk management systems seems quite limited. We can consider several factors contributing to these statements in the respondent’s survey. In some cases this may be a field that is relatively new and consequently with little development in the telemedicine domain or, more simply put, the survey respondents may themselves be unaware of the precise risk management methods in place. Some hospitals are now starting to consider risk management issues when implementing telemedicine solutions outside the hospital (i.e. Germany started to consider Risk Management issues since 2012).

5.2 Synthesis of the stakeholder feedback process

The various stakeholder workshops that took place in 2012-2013 focused on the issue of risk management in relation to risks associated with the policy context of the specific territory.

These have an impact on the financing needed when an initiative moves from an identified "good practice" to either small-scale or large-scale deployment. Stakeholders commented that the perceived overall risk could seem to be relatively low from the decision-makers' side. Therefore the risk assessment reported by all the respondents to the survey is limited to the technological aspect. This points to methods that block clinical risks by assessing pre- and post-treatment comparisons (e.g., in Spain/Catalonia and in Sweden) and having a data security plan and back-ups to ensure effectiveness.

5.3 Synthesis of the literature review

In the literature, risk management at an operational level is defined as a line management function. It is difficult to find a risk management assessment occurring either at the healthcare delivery level or at ministerial level. One good reference is literature provided by the Health Service Executive in Ireland[17]. Detailed reaction measures are described for all the elements in the risk management process in health care delivery.[18] At a more concrete level, referring to telemedicine specifically, the Australian document, "Risk Management for Telemedicine Providers"[19] provides background to the practice. It offers some salient points for practitioners to consider (as part of reducing their exposure to adverse outcomes that may be associated with the delivery of a medical service via telemedicine).

The following principles form a basis for sound clinical practice where there is some element of telemedicine service delivery:

- Introduce ethical and clinical standards,
- Ensure that the practice of telemedicine should be the subject of rigorous on-going assessment and evaluation of clinical effectiveness and patient satisfaction,
- Define duty of care and clinical responsibility clearly where there are consultations with third parties,
- Ensure that the patient has a right to fully informed consent including the benefits and limitations of the telemedicine service delivery model and alternate methods of service delivery,
- Choose the technology that most suits the clinical requirements (not vice versa),
- Use file addition and deletion security,
- Ensure that the mode of technical transmission has appropriate security,
- Ensure videoconferencing and teleconferencing facilities used for patient consultations are adequately soundproofed.

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[17] http://www.hse.ie/eng/, accessed 11 July 2013.

[18] http://www.hse.ie/eng/About/Who/OQR011_20081210_v4_Risk_Management_in_the_HSE;_An_Information_Handbook_.pdf, accessed 11 July 2013.

[19] "Risk Management for Telemedicine Providers" BMJ http://www.mdanational.com.au/media/144805/telemedicine_providers.pdf, accessed 11 July 2013.

6 Purchase and procurement strategy [Question 36]

This section of the Momentum questionnaire dealt with issues related to purchase and procurement strategies.

6.1 Synthesis from the answers to the questionnaire

This sub-section describes a number of different aspects related to the purchasing of telemedicine equipment:

- Type of equipment purchased (Q.36.1),
- Means of procurement (Q 36.2),
- Possible agreements (Q 36.3),
- Collaboration with other providers (Q.36.4),
- Equipment from one or from several vendors and how it was integrated (Q 36.5),
- Bespoke solution or vendor product (Q36.6 and Q.36.7).

Q36.1. What was the purchase about? Characteristics of the purchase: platform/system or an end-to-end service.

The respondents remarked that, in the majority, they acquired platforms and not services. The platforms that were procured are usually either a part of an initial/previous contract or the commissioned development either conformed to or was guided by the form of a tender in a public procurement.

The telemedicine services commissioned are mainly platforms or systems (in five cases). In only two cases was an end-to-end service purchased.

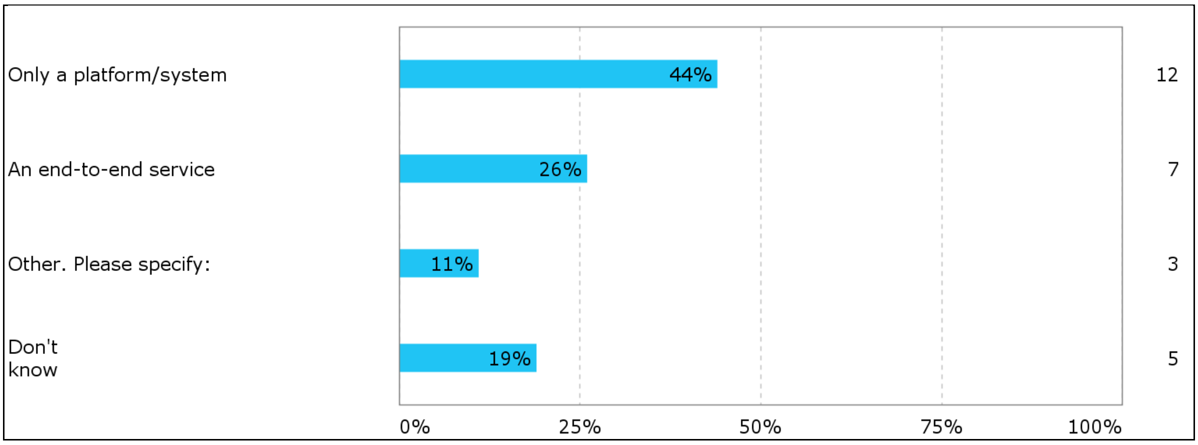

Figure 7: Responses to question 36.1 “What was the purchase about?”

Q36.2 How was the service purchased/procured? (Multiple choice)

The characteristics of how the system or service was purchased are listed below in numeric order of popularity. The highest figure related to the diversity of forms of purchasing (“other“):

- 8: Other (Spain/Catalonia, developed by the own organisation; Leasing from MediSat, Denmark; Spain/Catalonia a Pre-commercial Procurement (PCP) and /or a

Public Procurement for Innovation (PPI)[20] where current maintenance is done by another company, or done via collaborative contracts),

- 7: Direct from vendor,
- 5: Regional or national tender,
- 4: Part of existing contract.

In those cases where the purchase was made direct from a vendor, it was usually part of an already existing contract.

Q36.3 Were appropriate service agreements established in connection with the purchase?

The answers were: Yes (16); I don't know (5); No (1).

Indeed, appropriate agreements were established in all 16 cases. It is impossible to say anything about those cases in which the respondent was unaware of the agreement made (5).

Only Catalonia/Spain reported that the system was developed under regional or local funding. CATSALUT, the public insurer, made a contribution, the hospitals bought the equipment, and TICSALUT (the innovation unit in the public health system) then paid for the maintenance.

Q36.4 Did you co-operate with another telemedicine service provider in relation to the purchase/procurement?

There was usually no cooperation with another telemedicine service provider. This occurred only in the case of Catalonia/Spain (for two services), in Slovenia for the Home Care of Chronic Pulmonary patients' service, and in one service in the Scotland/the UK (the Teledialysis service).

The fact that procurers cooperated with different telemedicine providers could imply that they were perhaps well positioned to facilitate a better deal with the vendor. However, this was not the case in the services reported in the Momentum survey.

Q36.5 Does your telemedicine infrastructure include devices or systems from different vendors?

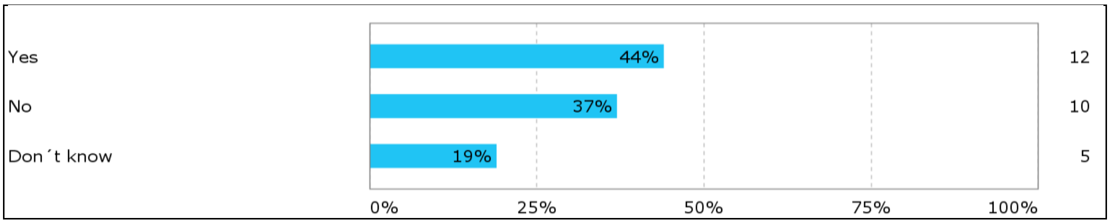

Figure 8: Responses to question 36.5: "Infrastructure includes different vendors."

Possibly half of the telemedicine services include devices from different vendors. However, the share of respondents' answering with a "Don't know" response is too high (5) to assume this. Given the fact that commissioning authorities are nowadays aware of the relevance of interoperability, this situation may be improved by the use of standards to design open, plug-and-play, interoperable devices and systems.

[20] PPI is when a public organisation places an order for the fulfilment of certain functions that could probably be fulfilled within a reasonable period of time through a new product.

In this question, respondents were asked how they integrated the different devices. The responses were evenly distributed among integration done by internal staff and by other self-contracted integrators. A wide variety of proprietary products (whether systems or platforms) are being used.

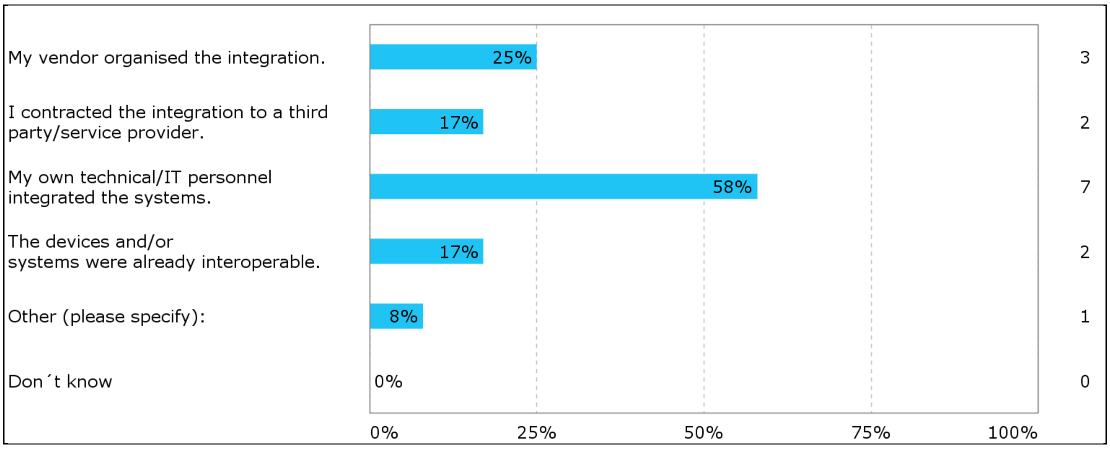

Figure 9: Responses to question 36.5: "How did you integrate the devices?"

One shortcut to the integration process is obviously to buy devices that are already interoperable. If procured platforms and devices are not interoperable, the integration may be done by the respondent's own staff (this happened in seven cases) or it was done by the vendor (in three cases). In other cases, external integrators are contracted to make the platform components interoperable. Only in two cases were devices and/or systems already interoperable.

Public procurers define the specific requirements needed for the telemedicine service when they decide on a purchase. Therefore, it is not surprising to see that either the commissioning authorities buy a proprietary product that fits their requirements or they acquire a bespoke solution. This fits accurately with the answers of the financial conditions shaping the procurement. (See Q. 36.6.)

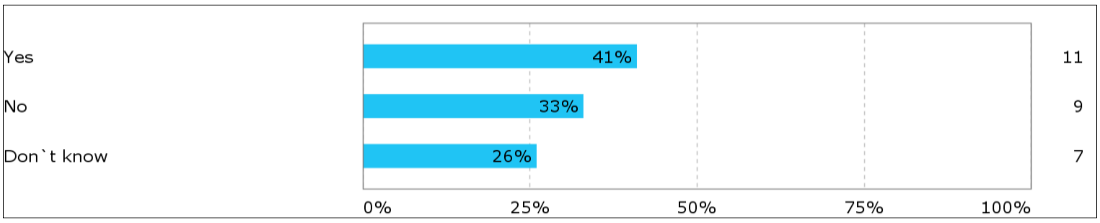

Figure 10: Responses to question 36.6: "Are you using a bespoke platform?"

Forty-one per cent of the services are using a bespoke solution. The specific products bought in both cases (whether a bespoke or a vendor product) are the following:

Table 1: List of specific products bought either bespoke or generic vendor products

Products in BESPOKE solution	Products in NON_BESPOKE solution
• Avia, • Card-Guard platform a web-based PHR (PMP4), • Intel health guide, • Metdting, Crestron - steering system • Polycom doc@HOME service, • RichFaces Java Server Faces (JSF), • Telemedicine EHR “GLAROS”.	• Application Server: Tomcat, • Database Manager: Potgresql, • Docobo handheld device, • HP - vital data monitor, • IEM stabilograph, • Measuring Devices: Sending Data:GPRS Gateway, • MIO LT; Vendor is C2C, • Sony - Roof mounted camera, • Tandberg – Codec, • Tandberg Edge, • Wireless network**.**

The financial conditions underpinning the development process of the bespoke solution are fairly evenly distributed among six different alternatives listed below. The most popular option seems to be that the system was “developed in a university research project”:

- Developed in a university-based research project (4)
- Developed inside an EU programme (3)
- Developed under a national programme (2)
- Developed under a regional or local programme (2)
- Funded by an industry partner (3)Funded by the healthcare organisation (2)
- Other (2).

Of the 27 cases reported in response to Q36.6, 11 telemedicine services were a bespoke solution.

In both the cases (of a bespoke solution and a vendor product), the clinical personnel at the hospital and/or the local IT department were involved in the commissioning process. In those platforms which had arisen from a university spin-off product the original creators were strongly involved (7). Industry also has a strong presence (in nine cases).

Q36.7 In both cases of a bespoke solution or a vendor product, please indicate who was directly involved in the development.

The different parties that can be involved in the development of either a bespoke solution or a vendor product are presented in the next figure:

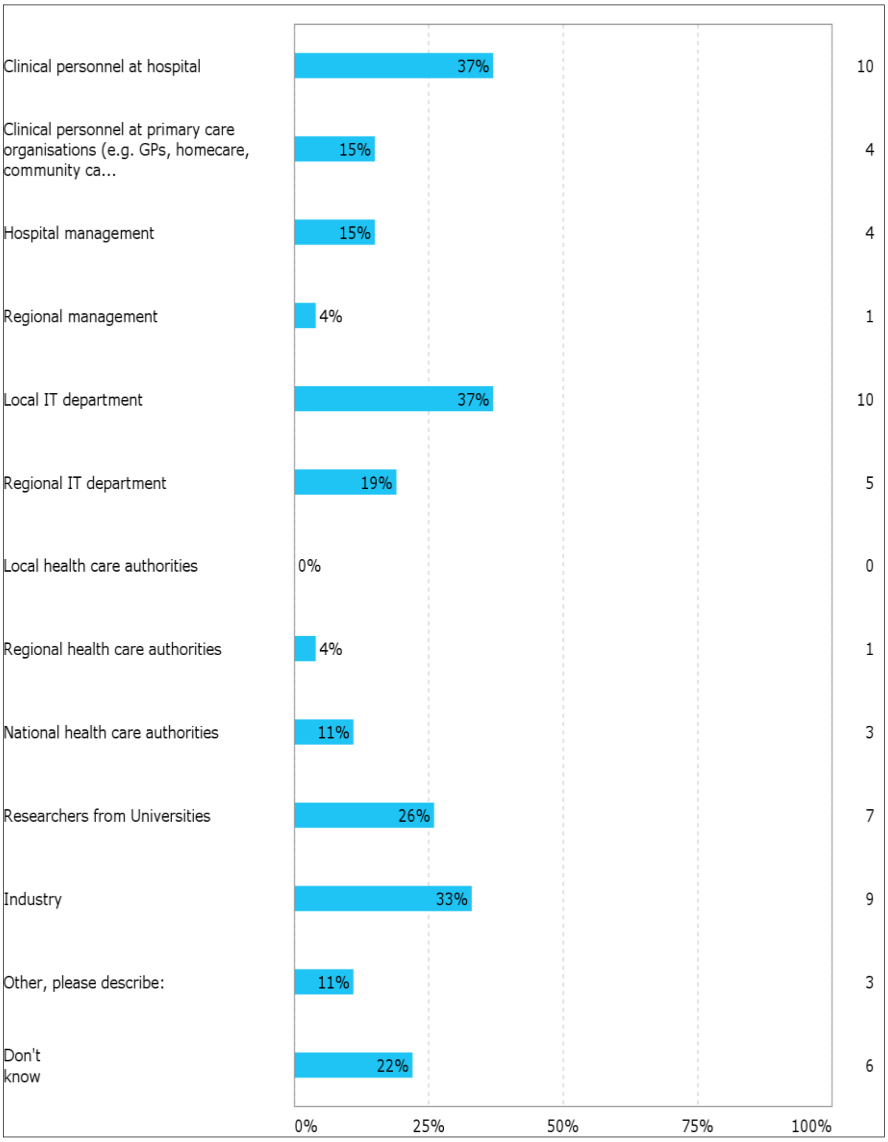

Figure 11: Responses to question 36.7: "Who was involved in the development?"

6.2 Synthesis of the literature review

In an empirica study[21] (a late 2012 study about eHealth procurement), there are details about one of the reported cases in Momentum, the "Telehealth Service of the Municipality of Trikala". The study description argues that the lack of initial market response temporarily hindered the procurement process of this telemedicine solution. In Trikala, it was discovered that the market was limited by Greek underuse of telemonitoring and by the difficulties of a non-Latin alphabet posed by the Greek language.

Success or barriers associated to bridging the gap between pilots and regular service deployment is directly associated with the two processes of pre-commercial procurement and innovative procurement (PPI). Pre-commercial procurement focuses on products and

[21] ProeHealth. Enhancing Procurement of ICT solutions for Healthcare. http://pro-ehealth.eu/downloads/documents/ProeHealth_D5-4_Publishable_Article.pdf, accessed 11 July 2013.

services that are not yet available on the market (and therefore for which a certain amount of development and/or research work is still needed).[22]

[22] European Commission, Precommercial procurement around Europe http://cordis.europa.eu/fp7/ict/pcp/msinitiatives_en.html, accessed 11 July 2013.

7 Alternative equipment [Question 37]

This section of the Momentum questionnaire dealt with issues related to the alternative availability of technology or equipment.

7.1 Synthesis from the answers to the questionnaire

The questions posed in Q37 about telemedicine alternative solutions available at two separate points of time provide an excellent indicator about how technology is in constant evolution.

Q37.1 At the time you purchased, was there alternative equipment, systems or services to your telemedicine service available on the market?

Q37.2 Do you know of similar alternative telemedicine systems/solutions now running in other territories in your country or in other countries?

It is very interesting to see that, at that time when the services were implemented, only 14 respondents considered that there were alternatives on the market. Today, 11 services are aware that other alternative technologies are available on the market. Some are alternatives from well-known operators, while others are simply known to be deployed. These alternatives were cited by respondents from e.g. Scotland or in reports from Australia[23].

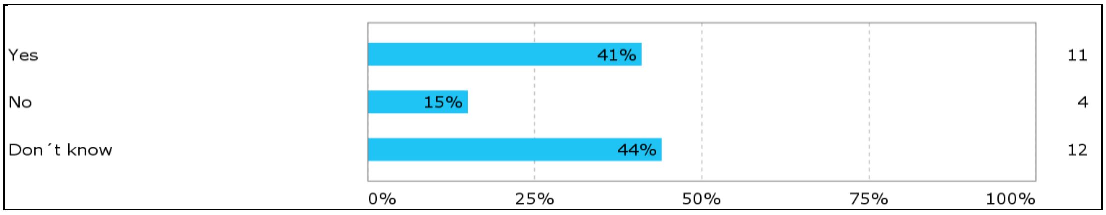

Figure 12: Responses to question 37.1: "Was there alternative equipment?"

In a nutshell, technology can become obsolete within a very short time cycle.

Table 2: Question 37.1 detailed analysis

Alternatives available at that time	Alternatives now
Several (2 respondents) Only a few alternatives (14 respondents)	Alternatives already running (11 respondents) No (4 respondents) I don't know (12 respondents)

[23] NICTA, *Telemedicine in the context of the National Broadband Network*, Report by National ICT Australia (NICTA) Limited for Department of Broadband, Communications and the Digital Economy, Canberra, 2010. (http://www.dbcde.gov.au/__data/assets/pdf_file/0016/130714/NICTA-Telemedicine_Report_cr_-pdf.pdf), accessed 11 July 2013.

7.2 Synthesis from the stakeholder feedback process and synthesis of the literature review

Stakeholders, the editors and reviewers of SIG4 discussed the appropriateness of Momentum's "theoretical model" (the project's current working hypothesis) with regard to how telemedicine services move from pilot to routine care.

In this context, the responses to Q37 on "alternative equipment" offer clear indications that technology changes quickly or upgrades can occur very rapidly. Pilots cannot easily keep pace with these changes. In the majority of cases, it requires the procurement of new solutions or services that, in turn, demand an investment that not always is affordable.

Technology is just an enabler. As such, the evidence of the impact (when telemedicine moves from pilot to regular service) is strongly bound to the fact that technology changes very rapidly, offering new technological alternatives. These technologies solve the same problems while providing new functionalities, and soon make the previous generation of technology out-of-date.

A number of relevant observations are that:

- Pilots often result from research programmes that use and create their own dedicated technology solutions.
- A niche solution is often an evolution of the initial technical solution developed by the same providers, or a combination of new tools embedded in the initial bespoke platform.
- A regular service provision is based on new procurement of market solutions that cover the requested functionality of an initial pilot platform.

8 Integration and documentation of the telemedicine treatment [Question 38]

This section of the Momentum survey related to the integration and documentation of the telemedicine treatment.

8.1 Synthesis from the answers to the questionnaire

Q38 is one of the most relevant in this part of the Momentum survey on technical infrastructure and market relations.

Up until now, telemedicine has been a technology that – because of its innovative character – was not integrated into the standard service process of ordinary patient care. Now, the next step is for telemedicine to be integrated into the whole continuum of care from wellness, prevention to elderly care.

In this long journey on the part of telemedicine, the next steps are that telemedicine data needs to be integrated:

- In a separate system for patient information.
- In the hospital information systems (HIS) and in the ordinary information systems accessed by doctors working in primary care and by nurses (i.e., integrated care in healthcare tier).
- With social care interventions undertaken by social carers taking responsibilities of chronic disease management, or rehabilitation tasks.

Q38.1. Are the telemedicine service events integrated with an Electronic Health Record?

The question was answered affirmatively by 37% of the respondents (10). Therefore, there is still a considerable distance to cover the remaining 63% (17) of the cases that are either not integrated in the ordinary electronic health record of the patient or which do not know whether the service events are integrated in the electronic health record.

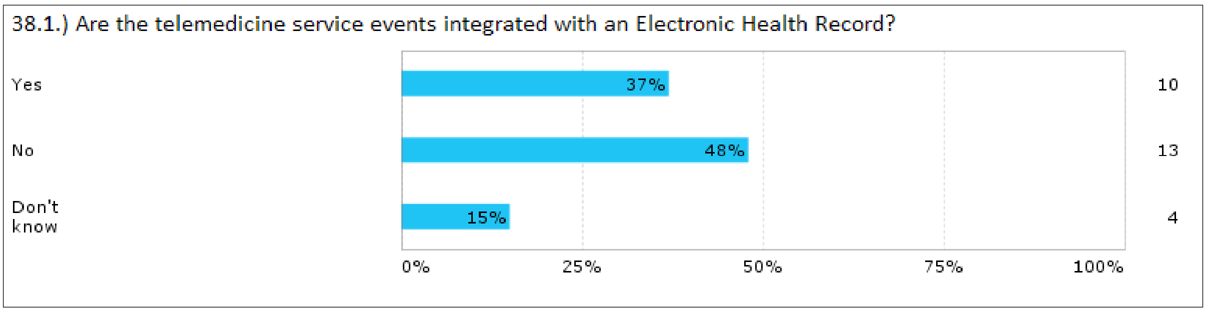

Figure 13: Responses to question 38.1:
"Integration of telemedicine service events with electronic health record?"

Services integrated in the electronic health record are the following:

- Estonia: Doc@home,
- Greece: Telehealth service of Trikala, and Sismanoglio service,
- Israel: Chronic Disease Management,
- Norway: ePlatform for integrated care of long lasting and chronic ulcer,
- Spain/Catalonia: TeleIctus service, ITHACA service for chronic hypertensive patients, and

the Guttman neuropersonal trainer service,

- Sweden: Electronic Healthcare and RxEye Remote Reading.

The responses to Q38.1 are expanded on by answers to the following question:

Q38.1 If No, is there a separate documentation system for medical treatment including clinical data delivered and collected via the telemedicine solution?

Out of the ten cases stating that the patient's data were integrated, six of them were not integrated in the regional or national electronic health record. Whereas three were part of a separate system, three were a messaging system. See the figure below.

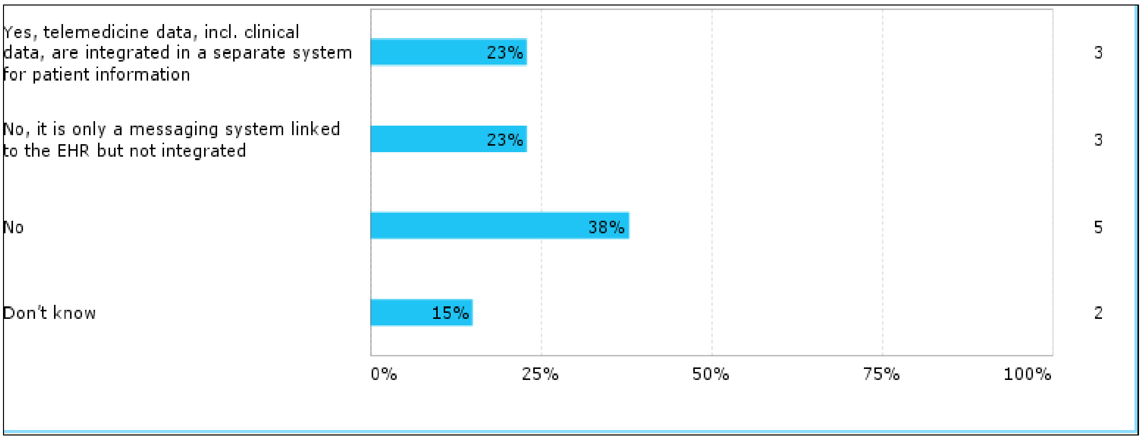

Figure 14: Responses to question 38.1: "if no integration, is there separate documentation?"

8.2 Synthesis and literature review from the stakeholder feedback process

The synthesis and literature review from the stakeholder feedback process are currently pending.

9 Observations or concerns

The results of this analysis do not focus particularly on the differences between infrastructures; rather, they take for granted the transition to strong infrastructures.

As is the case with the other SIGs' reports in their various areas of concern, it might be difficult to be conclusive about analyses in all the technical and procurement areas covered by the Momentum questionnaire. This is mainly due to the fact that several responses to the same questions were, on occasions, lacking in coherence (for example, respondents from the same country responded differently to specific questions, with only one respondent giving a factually "correct" answer). This discrepancy in results may be explained by the fact that the various respondents to the questionnaire are not experts in all the survey's aspects.

Some respondents had difficulties in sorting out whether they should describe the project or the routine service as it is today. One example of this is the Sismanoglio General Hospital case. As the project phase of the initiative was terminated some years ago, the service has changed in several ways over the years since it was set up even though the main idea of it has been retained. Some of the changes came about as a consequence of the pilot (since that is what pilots are for: they reveal the potential for improvement).

Further work definitely needs to be done on various comments made by the Momentum community in terms of observations and suggested sets of actions. At the present time, these observations have not yet been developed into more meaningful insights or compared to the actual findings from the Momentum questionnaire.

For example, in the following table, two lists of preliminary observations underpin the technological requirements. The first list of items contains a number of basic criteria that are needed to support the technological requirements of an initiative. The second contains the organisational basics.

Table 3: Two lists of "basics" that underpin the technological requirements

Technological basics	Organisational basics to support technologies
Reliability of preserving confidentiality	**Ensure the uninterrupted operation of the telemedicine network**
Reliable transfer of data and information	**Use proper technology, and establish operational rules and a service framework**
Effective manipulation of the systems	**Ensure a legal framework**
Recognition of the need for home care - telecare	**Ensure a cost-benefit analysis**
Security standards of data communications system	**Ensure data accuracy**
Configuration – definition assessment criteria (quality, cost)	**Ensure support by all the available modern technical means**
Search for new technical and other capabilities for effective cooperation of patients	**Have service level agreements for the ICT equipment**
	Ensure the functioning of the existing contracted service, if for some reason it does not work
	Reduce the potential risk to the therapeutic intervention to a minimum.

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