D9.5
Dem@Care Video Showcase v1

Dementia Ambient Care: Multi-Sensing Monitoring for Intelligent Remote Management and Decision Support

Dem@Care - FP7-288199

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Abstract (for dissemination)		The aim of this report is to specify the video showcase, illustrating the visual outputs of the Dem@Care project. It presents the identified video components suitable for presentation, a design of the showcase, and a production timeline.

Version Log

Version	Date	Change	Author
V1	20/05/2013	Initial structure	Athina Kokonozi (CERTH)
V2	29/05/2013	Modifications to Initial structure	Ceyhun Burak Akgül (VIV), Athina Kokonozi (CERTH), Ioannis Kompatsiaris (CERTH)
V3	06/06/2013	Description of the video showcase specification. Revision of the document.	Athina Kokonozi (CERTH)
V4	20/06/2013	Revisions after partner comments	Alexia Briassouli (CERTH)
V5	10/07/2013	Final revisions	Ioannis Kompatsiaris (CERTH)
V6	12/07/2013	Review comments and suggested changes. Added 2.1.5 Person with Dementia closed loop theme.	Johan E. Bengtsson (LTU)
V7	15/07/2013	Review comments addressed and final refinements in entire document made.	Alexia Briassouli (CERTH)
V8	15/07/2013	Suggested addition of Fig 2.5	Jenny Benois-Pineau (UB1)
V9	15/07/2013	Review comment addressed and final refinements in entire document made.	Alexia Briassouli (CERTH)

Executive Summary

This deliverable outlines the specifications for the Dem@Care video showcase, which will exhibit the innovative contributions and achievements of the Dem@Care project from a technological standpoint, the support it offers to the medical profession and the numerous benefits it offers to people with dementia and their carers. In particular, it delineates existing and envisioned video components that have been identified as suitable for presentation, a showcase design, and a production timeline.

The video showcase will include an introduction of the Dem@Care project by the coordinator, and also a meet and greet with each of the partners in the project. A short introduction with the motivation, aims, research and development needed to achieve them will comprise its main parts, in parallel with selected demonstrations to highlight wide ranging project results and achievements. The functionalities of the system and services will be illustrated in the three operational scenarios: @Lab, @NursingHome and @ Home. The five target problem areas of Dem@Care will be presented: Sleep, Exercise/Physical Activity, (Instrumental) Activities of Daily Life (ADL/IADL), Social Connectivity and Mood. Significant research results in video-based activity recognition, sensor-based dementia assessment, daily life problem detection and user interaction for persons with dementia will be shown. The showcase will be built around realistic usage scenarios to demonstrate Dem@Care's capabilities and potential in fundamental and oftentimes critical dailly life aspects of People with Dementia (PwD).

We have set up a timeline for the development of the video showcase and identified practical issues that should be attended to.

This deliverable serves as the specification, initial design and material collection working up to the final Deliverable D9.10 Dem@Care Video Showcase v2, due in M45. The Dem@Care Video Showcase v2 will be the final version of the professional video showcasing our project according to the DoW description, however itwill be built incrementally throughout the project, while video components are already being published in the Dem@Care YouTube channel, and will continue to do so as the project progresses.

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1 Introduction

The purpose of the report is to present specifications and plans for the envisioned video showcase of the Dem@Care project, including integration efforts and use cases for the five identified target problem areas (Sleep, Activity/Exercise, ADLs, Social Connectivity, Mood). The video showcase will be made incrementally available through the Dem@Care YouTube channel[1], and a professional production crew will be sub-contracted for the final production. Their task will be to produce a video presenting the project concept, demonstrations of its components, its integrated version, and the partners. This will be the main content of Deliverable D9.10 Dem@Care Video Showcase v2, which is due in M45, but earlier versions of the video and its components will also be made available and disseminated to the appropriate channels.

The objective is to produce a browse-able video collection on the Dem@Care YouTube channel and as a DVD for offline distribution, along with accompanying video samples of sensor recordings and more technical presentations for those interested, so as to give a complete and coherent picture of the project, its goals and achievements. The video showcase will be heavily used at international conferences and other events to create interest in the project and attract external stakeholder for post-project collaboration. Section 2 describes the video specifications and provides characteristic samples of project results, which will be included in the showcase. A staged timeline for producing the video showcase and organisational matters are discussed in Section 3.

2 Scenario and Storyboard

This section provides an initial description of features for the main video and the accompanying, more specialised videos. The key aims of the video showcase will be to present the project, with its achievements and impact in the daily life of PwD's, medical professionals and technology. Interviews of consortium members will be filmed, accompanied by illustrations of their related project contributions, which they will explain and demonstrate in practice, so viewers can easily and better understand how they function, what their role is in Dem@Care and how they can be used in various practical contexts in real life.

The scenario of the Dem@Care video showcase will be based on a storyboard, which will present the overall Concept, the Project, its Results and the Partners. More specialised technical presentations will be interwoven with these presentations in order to vividly present the project achievements, while realistic usage scenarios will form the backbone of the showcase.

2.1 The Concept

The Concept will present the central idea of Dem@Care, why it is needed and how it will achieve its goals, namely better and faster diagnosis, improved problem avoidance and privacy in the home and nursing homes, more precise and personalised interventions for increased autonomy and safety of people with dementia living independently at home. This can be presented in a 5-6 minute interview of the project coordinator, accompanied by visual presentations of related problems and needs, existing solutions and their limitations.

2.2 The Project Results

The Project section of the video showcase will consist of a presentation of Dem@Care that is more detailed than The Concept, adding information about the project approach and timeplan.

The need for a multi-sensor monitoring solution for people with dementia living home alone will be presented, as determined from statistical data of population growth and ageing, EC reports and R&D funding directions, related health costs and existing solutions. Financial difficulties arising from this for governments, healthcare, social care and society in general will be detailed, along with the limitations of current practices, to solidly motivate the need for the Dem@Care solution. The proposed multi-sensor monitoring and intelligent decision support services will then be delineated using the themes described below.

2.2.1 Needs of People with Dementia

Experts from clinical project partners will be interviewed on the need for the Dem@Care solution, in the lab, in nursing homes and in homes. Their input will play a significant role

in demonstrating how and why Dem@Care is needed and how it can help healthcare and care staff as well as People with Dementia (PwD) living independently at home. The clinical partners in Dem@Care identify user needs for describing requirements on functionality, usability and reliability to the technical partners, in order to inform their development of a system that has relevant external qualities[1]. The functionality involves extracting meaningful data and providing useful but discreet feedback to the PwD and their carers (relatives and staff), as well as analysing and presenting trends and patterns to clinicians. The importance of extreme ease-of-use in systems to be used by PwD will be highlighted both within the context of Dem@Care's achievements, but also from previous direct experience of expert project partners in piloting such systems with sensitive populations.

In the video showcase, clinicians will relate to their experiences before and after using the Dem@Care solution, explaining how multi-sensor monitoring and the intelligent analysis of the resulting data can help them in their monitoring, diagnosis and treatment of dementia. They will also present the motivation behind the chosen clinical, functional and cognitive assessment scales, in particular the use of Neuropsychological Inventory (NPI) to detect significant changes in behavioural and psychological symptoms of dementia (BPSD). For example, CHUN partners have already pointed out that video from wearable GoPro cameras can indicate significant changes in the way a person carries out directed activities, like filling out a check, as PwD perform these activities more slowly than healthy controls. Anonymised videos of such activities are already posted on the Dem@Care YouTube channel.

[1] It should be noted that these external qualities of a system are clearly and formally delineated in the ISO 9126-1 quality metrics for evaluating software.

2.2.2 Multi-Sensor Monitoring

The multiple sensors to be used in Dem@Care follow from problem area priorities determined by clinical experts. The sensors themselves will be presented, along with their outputs and correlation with a person's lifestyle, activity/behavioural patterns and changes in them.

The video will show the Dem@Care **life-logging** sensors, how they are used to record a person's daily life in order to support reminiscence therapy and help them remember their day, as well as help their physician discover significant changes in their daily activity patterns. A variety of sensors, the possibilities they offer and their use in appropriate environments will be demonstrated.

Figure 2.1: Life-logging physiological sensors.

Figure 2.2: Life-logging SenseCam.

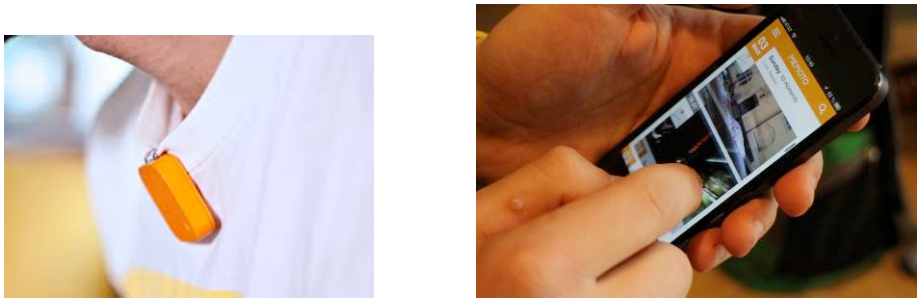

Figure 2.3: Life-logging Memoto camera.

Life-logging sensors used include physiological sensing options, which can record vital signs, as well as solutions to record their daily life (Figure 2.1). Dem@Care makes use of a Wearable Inertial Measurement Unit (WIMU), which includes an accelerometer, a gyroscope and a digital compass, and can be worn on various parts of the body. The Philips DTI-2, worn as a watch, is able to measure skin conductance, body temperature, 3D accelerometry and ambient light. A Sleep Clock (Gear4) is used, showing to be a reliable and discreet tool for measuring a person's quality and duration of sleep. The SenseCam is expected to be useful for life-logging purposes, to support reminiscence therapy and create a visual log of the person's daily life and activities that is helpful in giving access to memories of them. The SenseCam and sample recordings are shown in Figure 2.2, while future developments in the field are being investigated, such as using the smaller and higher resolution Memoto[2] shown in Figure 2.3, which is taking pre-orders and will start free worldwide shipping in the summer of 2013. At this stage of the project, other lifestyle sensing options are also being investigated for use in the pilots, including contact sensors.

Audio-visual sensors, an important innovation in Dem@Care, will be presented to show how both ambient and wearable options can become a part of a person's daily life and routine. Expert partners will show how audio recordings can be related to a person's state of dementia and help determine changes in their condition.

Audio data has been collected from PwD and healthy individuals at the Greek Association for Alzheimer's Disease and Related Disorders [3] (GAADRD) and characteristic videos, with the person performing appropriate vocal exercises, can be seen on the Dem@Care YouTube channel[4], while a few characteristic screenshots are shown in Figure 2.4. Real life deployment of audio sensing in different operational scenarios (lab, nursing home and home) will also be shown, where less structured recordings will be obtained and related to a person's condition via appropriate speech processing techniques.

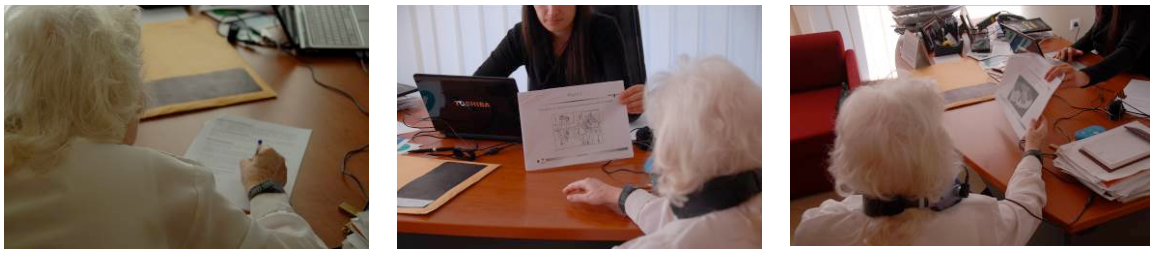

Figure 2.4: Audio recordings at GAADRD.

Visual data will be recorded with both wearable and ambient sensors, the latter recording both RGB video and depth information. The two sensors to be used will be the wearable GoPro camera and an RGB-D camera, both shown in Figure 2.5. In the first image of Figure 2.6, the GoPro worn by the PwD is shown, while the second figure shows how the RGB-D camera can be placed in an unobtrusive location (above the bookcase) to record ADLs.

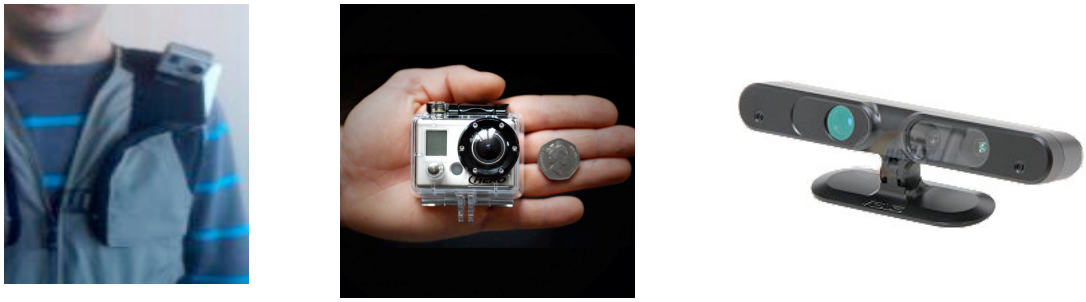

Figure 2.5 Wearable GoPro camera, GoPro camera size comparison, RGB-D camera

Figure 2.6: Video recordings at GAADRD with GoPro, RGB-D camera.

The way **GoPro** cameras are worn will be shown along with their deployment in a person's daily life and characteristic snapshots of a person's day[5], while interesting results, such as object detection and scene saliency, essentially "heat maps" of the relevant parts of a scene, will be exhibited. Examples of scene saliency obtained through the deployment of a GoPro camera can be seen in the Dem@Care YouTube channel[6], while more examples will be available throughout the project.

The role of ambient cameras, namely the **Asus RGB-D** camera, will also be demonstrated. The placement of such cameras in a person's home will be shown, to emphasize their unobtrusiveness and ability to capture crucial aspects of a person's daily life and lifestyle. Analysis results from both RGB and depth data will also be exhibited: activities of daily living (ADLs) can be recognised through the use of this sensor, both for the detection of emergencies, but also for the creation of lifestyle, activity, mobility profiles, which are

essential for personalised monitoring. Several video samples of people performing ADLs recorded from RGB-D cameras are already available on the Dem@Care YouTube channel.

Self-reporting by Persons with Dementia and their carers (relatives and staff) will be supported via on-screen questionnaires (humans-as-sensors).

2.2.3 Medical Ambient Intelligence

Intelligent decisions will be made based on multi-sensor data, in order to arrive at useful and meaningful results and conclusions for the PwD, their condition and its evolution. Within Dem@Care, this will be achieved by defining and developing knowledge structures to represent information necessary for the high-level interpretation of the behaviour and cognitive status of people with dementia. In the video showcase, this will be demonstrated via animated powerpoint presentations of the flow diagrams, structure and role of medical ambient intelligence in the project.

2.2.4 Clinician Closed Loop Interface

The results of Dem@Care monitoring will be transmitted to both the clinicians/caregivers of the PwD in specially designed interfaces, as well as the PwD. Clinicians need continuous monitoring results, with emphasis on unusual or worrisome events and lifestyle changes. The Clinician Interface is a web interface that can easily be deployed in the device used by the clinician, and integrated in the normal clinical workflow.

An example of the clinician interface, showing monitoring results and problems over time can be seen in Figure 2.7 below.

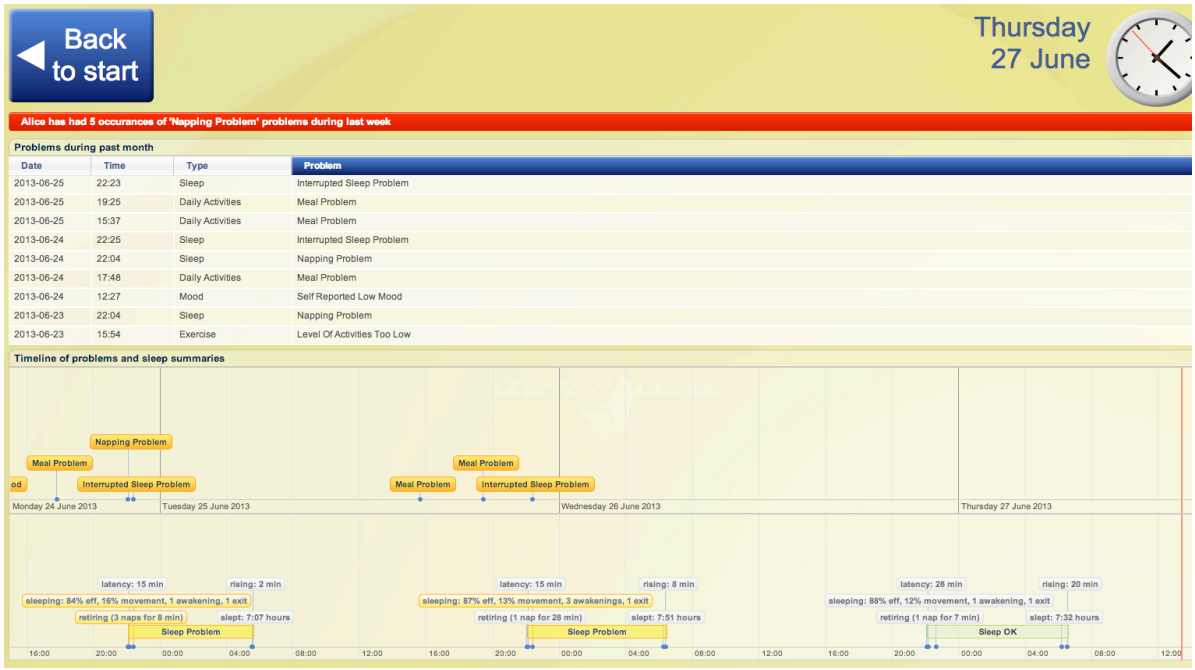

Figure 2.7: Sample Clinician Interface indicating the presence of Eating problems.

2.2.5 Person with Dementia Closed Loop

The Person with Dementia (PwD) will receive feedback from the Dem@Care system, and the carers (relatives and staff) will be able to access summaries of detected problems in daily life, a subset of the clinician closed loop described above. The PwD will also receive direct enabling support for Remembering, Safety and the target problem areas: Sleep, Mood, Eating, Social Contacts and Physical Activity.

The Patient Interface for PwD living independently in their own home provides timely reminders, carefully avoiding to interfere with more important activities such as sleeping or eating, for example. It can also provide periodic feedback of detected problems, prompting the PwD to change daily life patterns that cause them. It will give comfort that the home is safe and secure (in particular that doors and windows are closed and locked). It will also help overcome difficulties in sleeping, contacting others and bad moods, as well as stimulate regular and sufficient eating and physical activity. The services in the Patient Interface will be extremely easy to use (no login, single or zero taps operation, no distracting on-screen elements, wizard-like navigation, and using voice-prompts) and selected on an individual basis. The main device for PwD in the home will be a stationary *family device* in a fixed location, but additional portable devices can also be deployed.

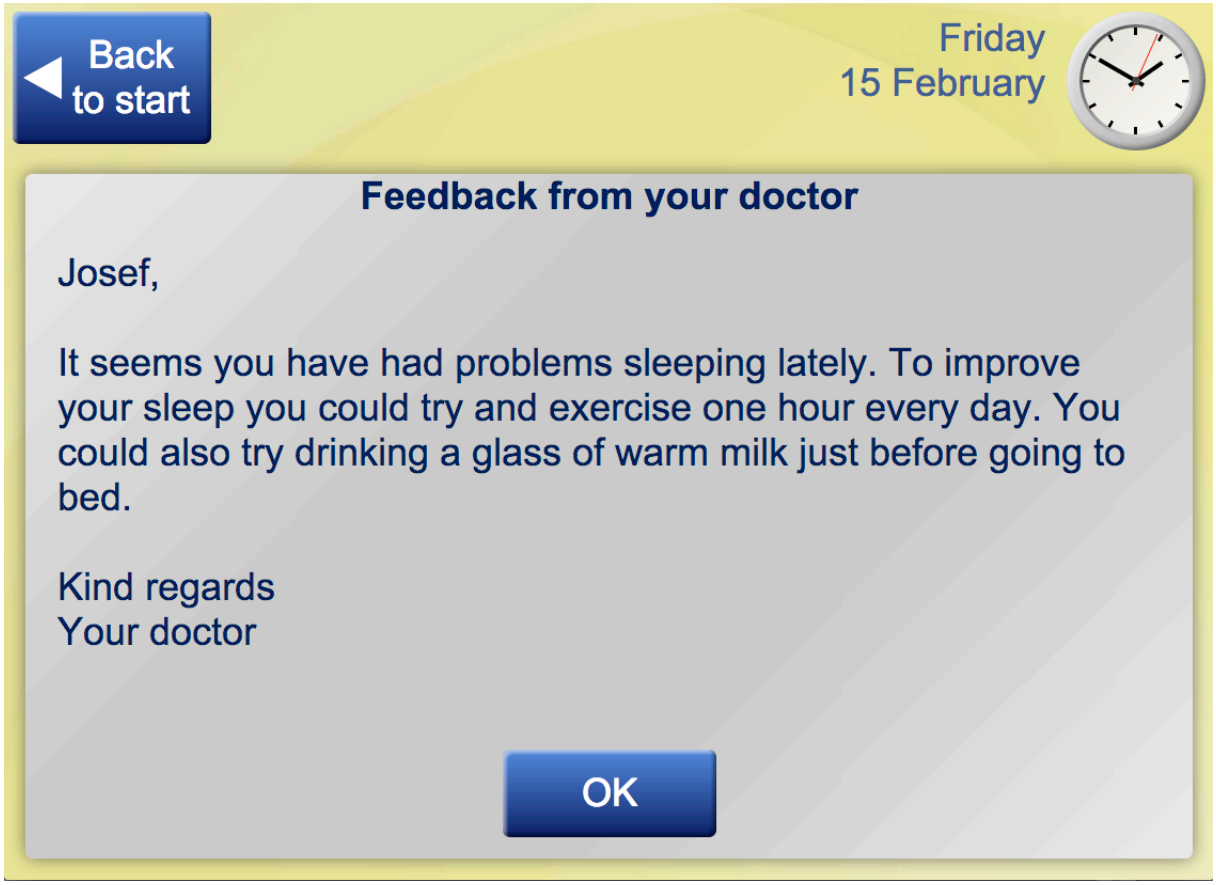

Figure 2.8: Sample Patient Interface with feedback on Sleep problems.

The Carer Interface helps relatives and staff understand and support the PwD, even when they are in a different location. Feedback about the PwD's detected problems can be given automatically or be explored when desired. Reminders for the PwD can be set by the carers. An automatic image diary supports reminiscence therapy and enables to talk about what has happened during the day, or at important previous events in the *life story* of the PwD. The main device for carers will be a portable device, or using the family device with a wireless keyboard.

2.2.6 Prototypes and Usage Scenarios

Dem@Care is to be deployed in three pilots, in the Lab, Home and Nursing Home. Focus will be placed on monitoring and supporting five key problem areas: Sleep, Exercise/Physical Activity, Eating and Activities of Daily Life (ADL/IADL), Mood according to the Dem@Care clinical requirements.

In the Lab scenario, the PwD will be asked to carry out specific tasks for a limited time period, and monitoring results will be provided to both the clinician.

In the Nursing Home scenario, more discreet and unstructured activity monitoring will be used, focusing mainly on detecting problems with Sleep and Mood.Life-logging during external activities (staff carries the camera) supports reminiscing therapy and helps visiting relatives talk about what the PwD has done lately.

Finally, home scenarios demonstrate the capabilities and challenges faced by the Dem@Care system, where ADLs and the other target problem areas will be monitored in an unobtrusive manner, and meaningful feedback will be sent to the carer(s), the clinician and even the PwD themselves. This video component will be driven by an imaginary story in which real (or actor) users will make use of the Dem@Care prototypes for a specific usage scenario. In a longer version, this usage scenario will be interwoven with technical/research presentations described above, depicting the relevant parts of the scenario in which a technological achievement is applied. The execution will pause for technological demonstrations and then resume, as the video narration progresses.

2.3 The Partners

In parallel to the video presentations, project partners and their role in Dem@Care will be presented. Clinical partners will explain the need for the system and how it has helped them in their practice, as well as its expected contributions in the future. Technical partners will present themselves and their role in the project, how their work is connected to that of others and how they have contributed to advances in their field. These presentations can take place in a non-linear manner, to better help the viewer understand their role in the project.

3 Specification of video materials

Video materials will be captured and produced by a team of professionals, based on their expertise and the guidelines sketched below. Some materials will also be expert interviews carried out by individual project partners.

3.1 Capture of supported media

- **On-the-field shootings:** filming of on-the-field trials (during prototype deployments, where and when approved by the corresponding Ethics Committees) at a supported video format: MPEG-1, MPEG-2, MPEG-4, QuickTime MOV, AVI, etc.

- **Display Screens:** video footage that explains the user interfaces (GUI) of the developed applications will be produced by screen capture software. These should be exported into one of the supported video formats: MPEG-1, MPEG-2, MPEG-4, QuickTime MOV, AVI, etc. Additionally, animated power point presentations will be displayed in appropriate video format to demonstrate the system flow.

- **Still images:** layout diagrams, result charts, etc., will be demonstrated by still images. These will be saved in one of the supported image-file formats: Bitmap (BMP, RLE), JPEG (JPG, JPE), TIFF, Portable Network Graphics (PNG), EPS, Pict (PCT, PICT), etc.

- **Narration audio:** A narrator will be explaining the video on view. The narration should be recorded in a recording studio and captured in a supported audio file format: AIFF, MP3, AVI and WAV, etc.

3.2 Video distribution

Video distribution of the Dem@Care video showcase will be possible both online and offline.

Online distribution will take place through the Dem@Care YouTube channel:
http://www.youtube.com/user/DemCareVideoChannel
YouTube has the advantages of flexibility and quality: it allows for providing a playlist, uploading HD videos for streaming, and automatically delivering lower bandwidth encodings to mobiles or in the face of bandwidth limitations. YouTube is also better geared towards evolving the showcase over time. The YouTube videos can be modified to be public, or only available to those with the link. The showcase playlist(s) at the YouTube channel will be incrementally improved and enriched as the project and the pilots advance. Ethics and privacy concerns will be respected throughout this process. Online video distribution through Dem@Care's Youtube channel will make the video showcase

available to a wider audience, taking into account imposed constrains that may affect the viewing quality. For offline distribution, a professional DVD will be produced in month 45. The video showcase, both in DVD format and as YouTube videos, will be used as advertising material to stakeholders for piloting, interested professionals or companies for sustainable collaboration, while the videos in DVD format and the corresponding evolving YouTube link will be distributed at trade fairs, technology exhibitions, etc.

3.3 Video quality, audience and versions

The decided video resolution is dependent of the selected distribution method. For YouTube, the current default video stream is encoded in H.264/MPEG-4 AVC format with stereo AAC audio. Appropriate modifications will be made for YouTube Mobile, where videos can now be streamed on mobile phones as apps [7], while touchscreen controls can also be used on them [8]. With the adoption of H.264/MPEG-4 AVC, YouTube streams at a widescreen aspect ratio of 16:9, with up to 1080p HD support (as of 2009). Currently (as of 2012), YouTube video can stream up to 2049 × 1536. Numerous encoding options exist for YouTube videos, while higher quality 1080p encodings are becoming more and more popular [9].

DVD Video uses the H.262/MPEG-2 format with resolution up to 720×576 pixels at 25 fps (interlaced), while older formats (MPEG-1) support up to 352×288 pixel resolution at 25 fps, progressively scanned. Widescreen (anamorphic) video is supported in DVD only for D-1 resolutions [10], while an aspect ratio of 4:3 is supported in all video modes.

Apart from different version adapted to different devices and networks, there will be various versions and adaptations of the content addressing different audiences:

1. Full version for general public (~15')
2. Shorter version for general public (~5'-7')
3. Video-clip (teaser) for general public (2'-3')
4. Full version for experts audience (~15')

For example, while the versions for the general public will mostly emphasize the results and benefits, the version addressing clinicians and technical experts will also emphasize on the approach, methodology followed and formal evaluation.

4 Timeline and Organisational Matters

The timeline for the production of Dem@Care showcase video can be seen in Table 1. It should be noted that the YouTube channel[1] is already up and running, while it will be constantly updated and improved as the project progresses and more project results become available.

The involved actions aim towards the delivery of the final video (Month 45) but intermediate versions will also be available in the YouTube channel and project website. In the timeline table the responsible partner is highlighted in bold.

Table 4.1 Timeline for the production of the Dem@Care video showcase

Date	Action
Month 19 - 45	**CERTH:** sets up YouTube channel to upload videos from the project. The YouTube channel will be continually updated until M45 when the final professionally produced showcase video will be uploaded.
Month 22-23	**Technical partners** make first video recordings of key research results, especially video-based activity recognition, speech-based assessment and bracelet-based detection.
Month 23-24	**Test site partners** make first video recordings of their installed system using a simple script illustrating their operational scenario.
Month 26	**CERTH**: contract a video/production company.
Month 28	**Video production company**: Provide video scenario, ideas for supporting material and detailed instructions for producing high quality screen captures of the demonstrated (research) prototypes
Month 30	**Video production company and ALL**: Collect screen captures and videos of the demos, interviews, inspect quality.
Month 34	**Video production company:** 1st version available to YouTube
Month 40	**Video production company and ALL:** Different demos, interviews will be updated through individual contacts and visits and during project meetings.
Month 45	**CERTH, Video production company:** Dissemination of the Dem@Care video on various resolutions and versions on YouTube as well as the video showcase DVD.

[1] http://www.youtube.com/user/DemCareVideoChannel

[1] http://www.youtube.com/channel/UC_AIoavPy5hEG0wRK5WXxdA
[2] http://memoto.com/
[3] http://www.alzheimer-hellas.gr/english.php
[4] http://www.youtube.com/watch?v=jkhSCE4bMdY
[5] http://www.youtube.com/watch?v=jkhSCE4bMdY
[6] http://www.youtube.com/watch?v=TZO95LUojaA
[7] http://www.guardian.co.uk/technology/appsblog/2012/sep/11/youtube-iphone-app
[8]www.geek.com/articles/mobile/goodbye-flash-youtube-mobile-goes-html5-on-iphone-and-android-2010079/
[9] http://www.streamingmedia.com/Articles/Editorial/Featured-Articles/Encoding-for-YouTube-How-to-Get-the-Best-Results-83876.aspx
[10] https://en.wikipedia.org/wiki/Anamorphic_DVD#DVD_Video