



PROJECT COMPLETION REPORT



Data Capture and Auto-Identification Reference Project [DACAR]



COMMERCIAL RESTRICTED

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Project Officer
Monitoring Liaison Officer
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Part 1: Questions for the consortium as a whole

Project contact details

Actual project start date: 1 September 2009
Actual project completion date: 30. September 2011

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Project Manager's name: Prof. Christoph Thuemmler

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1 The Project's Achievements.

1.1 What were the original goals of the project and to extent were these achieved? How big an impact has the project had on the issues it tried to address?

Develop, implement, validate, disseminate and commercialize a novel safe and secure and robust generic platform for smart device system integration across several domains in health care in real time based on dynamic ad hoc networking and remote service provision

- Public Cloud platform implemented in 2010.
- Private Cloud Platform implemented in 2010.
- Care Magic product line developed by Kodit.
- New security architecture created: Single Point of Contact (SPoC) Architecture presented at IEEE Washington, July 2011, and IEEE CloudCom, Dec 2011.
- Integration across several domains in real-time in the cloud since Spring 2011.

After initial implementation of the model at a major London teaching hospital we intend to study the risks of such a novel approach and to develop a suitable risk assessment strategy which will be able to support a novel pervasive adaptation feature to increase security

- Experimental validation successfully completed.
- Temporary implementation in NHS facility.
- Clinical validation not completed but will probably be redundant due to technology moving straight into decentralized and distributed formal and informal (health) care sector.
- Risk assessment and risk management well covered.
- Digital trust and pervasive adaptation know how gained under DACAR could be successfully transferred into a TSB projected (Trusted Services).

The novel approach might lead to a general proposal of an alternative strategy for real time data integration in health care which currently is thought to be exclusively provided by the "spine" in the future

- The "Spine" has been officially abandoned on 22/09/11 as anticipated by the consortium.
- The DACAR project has kick-started the discussion around cloud computing in the UK and elsewhere.
- The DACAR project has been the first E-health cloud prototype in Europe.
- Cloud computing will play a huge role in the future of distributed patient centric care.
- Cloud principles will be applied to medical data networks in the future. Members of the DACAR consortium are already involved in this research.

One of the objectives of this work is to bring researchers from the US together with researchers from the UK in order to join forces and to exchange knowledge

- DACAR became a member in the CERP knowledge cluster run by the European Commission – Highest level of research run in the EU.
- Visit to Kaiser Permanente in 2009, 2010 and 2011 in Denver, Colorado and San Francisco, Meetings with Research Director Dr. Yan Chow.
- Visit by Dr. Ted Palen, MD, PhD from Kaiser Permanente, Denver, Colorado at London DACAR workshop 2010
- Invitation by Scottish Government to join Trade mission to ATA 2011, Florida, USA.
- Meeting with "Partners" (Harvard University Medical School) July 2011.
- Talk at IEEE Washington in July 2011.
- Talk at IEEE CloudCom in Dec 2011.
- Talk at a Princeton University Event July 2011.
- Hosting of the Future of e-Health, 2011.

Implementation of a smart device based data capture strategy (RFID based patient and object tracking) at Chelsea and Westminster Hospital

- Not yet achieved but we will continue to work with C+W and there is a reasonable prospective that implementation might happen earlier than in other NHS Trusts in England.

Implementation of a web based service to enable safe and secure real time system integration

- Achieved under lab conditions and partly in a different project with a European partner

Implementation of a WLAN based information infrastructure backed up by 3G and GPRS to improve resilience

- The trend has changed, away from 3G and WLAN supported systems towards Network virtualization and Load Balancing in Network environments. Pursuing our original change would have led to redundant results. We preferred to focus

on Cloud Computing and Network Virtualization.

Integrate existing international standards including GS1 RFID standards

- Work has continued with the integration of GS1 standards into health care with Kodit.
- Plans to continue work on this after DACAR with CipherLab, GS1 and other partners in order to create a commercial repository on the international market for generic pharmaceuticals

Develop a generic risk assessment strategy for smart device system integration networks

- Work under way at Edinburgh Napier University with new research project.
- Risk Matrix built by a Napier Researcher in 2010.
- Publications regarding Risk assessment strategy by PhD student in 2011.
- PhD under way.

Disseminate and commercialize

- Care Magic products and other products developed by Kodit.
- SPoC software and syntax developed by Edinburgh Napier University.
- 30 Talks, presentations and Keynote Speeches in the UK, Europe and the US delivered by Professor William Buchanan and Professor Christoph Thuemmler.
- Several follow-up research grant applications to the EPSRC, the TSB, the EU and the National Institute of Health Research, most of them pending.
- Around 10 publications including one IEEE paper and a section in an EC book publication.
- Partnership is two times finalists in major UK industry awards awaiting final decision 9/10.November (BCS 2011 UK Industry Awards and IET 2011 Awards).
- Two talks at BCS Health Symposium.
- Invited talk at Innovation in Health Care event.

Further unplanned achievements:

- Professorship Dr. Thuemmler.
- Professor Thuemmler has been appointed Rapporteur at the EU/China round table for E-Health.
- Level 2 Professorship Professor Buchanan.
- Extension employment Dr. Lu Fan and promotion to Research Fellow on the back of his success on the project.
- Spin-out company: Celestor Ltd.
- Further business ideas being followed up.
- Collaboration Kodit with NHS Wales.

1.2 What additional outcomes did the project achieve? How valuable do you feel these are?

(Include any negative outcomes that you feel have value.)

- Professorship Dr. Thuemmler
- L2 Professorship Professor Buchanan.
- Extension employment Dr. Lu Fan and promotion to Research Fellow.
- Spin-out company, Celestor Ltd.
- Further business ideas being followed up.
- Collaboration Kodit with NHS Wales.
- Two new PhD studentships in related areas.

1.3 What barriers to exploitation remain, and what follow on work is required? Is the consortium planning to address these? If so, how?

In the UK there are still barriers for innovative technologies to enter the NHS. Persistence and a stronger more decisive political approach is required to drive change in the NHS. The consortium can only provide data and information to decision makers but does not have any influence otherwise in political decision making. However, DACAR has never been aiming at the UK health care market as the primary market and there are opportunities to apply DACAR outcomes on foreign markets, which will be driven by the commercial DACAR partners in the first instance. On the other hand the academic outcomes have already been presented to the international community and where accepted with great interest. The paper presented at IEEE in Washington DC in July 2011 was had nominations for the best paper.

At present Cloud Computing is not quite understood by the general public, and the term "Cloud" is often viewed as data existing on a generally available data infrastructure, whereas the architecture has been created to actually use Cloud Computing within a private, and secure, infrastructure. There is thus a debate to be had about the integration of cloud infrastructures into health care, and this needs to be resolved in order for new dynamic and robust infrastructures to be created.

1.4 How will the Consortium exploit the project's results?

(If you have an exploitation plan, please attach it to the survey return)

DACAR outcomes have been transferred into another TSB projected on Trusted Services where they could be integrated in the development of future strategies to improve human/machine trust. **Edinburgh Napier University** already have been already scaling the new architecture into new application domains, including into Assisted Living.

Kodit Ltd has used the outcomes to develop novel technology which is now available on a commercial level and CipherLab and GS1 have been using the data from DACAR for market analysis and the placement of their core technology.

CipherLab is planning a commercial product to support supply chain management in the pharmaceutical industry and in health care. Know-how will be presented as online tutorials. Technologies such as the SPOC will enable Edinburgh Napier University to find participations and collaborations in further grant proposals and will put the commercial partners in a far better position on their markets.

1.5 How will the Consortium disseminate the results?

We have written around 10 publications, which related to DACAR and Professor Buchanan and Professor Thuemmler have delivered around 25 talks, presentations and key-note speeches on the subject. Along with this there was a successful Future of e-Health Symposium that was held at the end of the grant.

We also held Workshops at Chelsea and Westminster Hospital in London, which were attended by Industry and representatives from healthcare providers in the US.

For the rest of 2011, there are still outstanding workshops and talks on a national and international level which will have to be delivered. Professor Thuemmler will continue his role as a rapporteur at the EU/Chinese round table.

DACAR outcomes have also been transferred into another TSB project on Trusted Services where they could be integrated in the development of future strategies to improve human/machine trust. New presentations are planned which apply into Assisted Living (such as a paper accepted for IEEE CloudCom 2011), and in Information Sharing.

1.6 Did the consortium benefit from collaborating with others? If so, how? If not, why not? Will the consortium continue to work together?

The consortium did collaborate with SMEs such as Flexiant Ltd, who provided cloud storage space and cloud computing facility to support the theoretical work on the public cloud.

Academic institutions such as the University of Edinburgh, University of Surrey, Princeton University and TU-Munich invited us to conferences and gave us opportunity to have our proposals undergoing a rigorous critical assessment by peers which helped us to develop our ideas further.

Large health care providers such as Partners and Kaiser Permanente in the US, Technical University Munich in Germany, Clinique Pasteur, a private health care provider in France are interested in future collaboration.

The Consortium did also benefit from collaborating with CERP the European Research Cluster on RFID in terms of distribution and dissemination. The DACAR Project has been described in the annual publication of the cluster published by the European Commission.

New collaborations are now in-place with Microsoft plc and HoIP on assisted living work, especially in scaling the novel architecture into assisted living, in order to create a completed integrated environment for health care.

Part 2: Questions to be answered individually by each consortium member about their own involvement

Please copy the pages of section 2 as many times as needed.

2 Contact data

- 2.1 Your company or organisation Name: GS1 UK
- 2.2 Primary contact: Laura Waters
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WC1V 7QH
- 2.4 Telephone number: 0207 092 3500
- 2.5 Email address: Laura.waters@gs1uk.org

In the following questions, we would like to identify the impact of the project on your organisation’s performance, both now, and in the future. Wherever possible, answers to financial questions should relate to the full financial year closest to the end of the project (or its anniversary). Please answer, wherever possible, on behalf of the business unit, division, group or company which was involved in the consortium. If this is not possible (as a result of merger or acquisition, for example), please specify the organisation to which your answers refer.

Do not disclose anything would breach any financial statute or regulation.

3 The wider picture

3.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

Implementation of the technology is underpinned by data standards. Use of GS1 standards illustrated the benefit of using global standards. GS1 UK provided up to date advice and guidance on the use of RFID and use of EPC standards.

3.2 Were you involved in the project as an academic or industrial collaborator?

(If you were involved as an Academic, please go to question 3.9)

3.3 What is your organisation’s turnover in the UK (please specify which fiscal year this applies to):

£7m

What do you expect this to be in 3 years:

£8m

3.4 How many staff do you employ in the UK?:

50

3.5 What are your organisation’s total annual sales **in the technology area of the project** ?

We do not sell technology

What additional sales do you expect in 3 years as a result the project?:

None

3.6 What is your average gross margin on these current sales, and how is this defined?

3.7 How much of your current sales in the technology area are from export sales outside the UK?:

3.8 How many staff do you employ (excluding researchers) in the UK **in the technology area of the project?**:

3 staff have knowledge in this area

What do you expect this to be in 3 years:

3.9 What is your annual UK R&D spend in the technology area of the project?:

3.10 How many researchers do you expect to have working in the UK **in the technology area of the project?**:

4 The impact of the project

*We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but **not** the other members of your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.*

4.1 Number of new or improved products or services launched;

Accreditation of Solution Partners.
Ratification of GS1 standards by NHS ISB

4.2 Number of patent or other IP applications filed worldwide related to the project's technology;

4.3 New markets or research areas entered, or changed market share in existing markets;

4.4 Number of new UK jobs created or existing jobs safeguarded:

4.5 Improved Time-to-market or changed manufacturing or service efficiency

4.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

4.7 Number of relevant academic papers or trade articles published:

GS1 referenced in articles by other Consortium members,

4.8 New or improved workforce skills or qualifications for UK staff:

4.9 Knowledge transferred, or understanding or capability gained:

Transfer of knowledge between GS1 SDO and Solution Partners

4.10 Long term collaborations or partnerships entered into:

Solution Partner Programme being developed

4.11 Any other tangible or intangible benefit or change;

5 About the process

5.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

As a Standards Development Organisation we welcome the chance to work with industry and academia.

5.2 How do you feel about the competition process that led to the grant? How could it be improved?

5.3 How do you feel about the project monitoring? How could it be improved?

5.4 How was your relationship with the Technology Strategy Board? How could it be improved?

6 Is there anything else that you would like to raise with us?

Thank you. Your assistance is much appreciated.

7 Contact data

7.1 Your company or organisation Name: Cipherlab

7.2 Primary contact: Altaf Sadique

7.3 Address:

7.4 Telephone number:

7.5 Email address: altaf@cipherlab.co.uk

In the following questions, we would like to identify the impact of the project on your organisation's performance, both now, and in the future. Wherever possible, answers to financial questions should relate to the full financial year closest to the end of the project (or its anniversary). Please answer, wherever possible, on behalf of the business unit, division, group or company which was involved in the consortium. If this is not possible (as a result of merger or acquisition, for example), please specify the organisation to which your answers refer.

Do not disclose anything would breach any financial statute or regulation.

8 The wider picture

8.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

We have achieved a great deal, and have managed to build an innovative e-Health Platform. The key deliveries have been:

- New application areas defined.
- Integration of devices into the platform.

8.2 Were you involved in the project as an academic or industrial collaborator? Academic
(If you were involved as an Academic, please go to question 3.9)

8.3 What is your organisation's turnover in the UK (please specify which fiscal year this applies to):

£384,758 in 2010

What do you expect this to be in 3 years:

£620,000

8.4 How many staff do you employ in the UK?:

1.5

8.5 What are your organisation's total annual sales in the technology area of the project ?

£44,000

What additional sales do you expect in 3 years as a result the project?:

£260,000

8.6 What is your average gross margin on these current sales, and how is this defined?

26%

8.7 How much of your current sales in the technology area are from export sales outside the UK?:

3%

8.8 How many staff do you employ (excluding researchers) in the UK **in the technology area of the project?**:

1

What do you expect this to be in 3 years:

3

8.9 What is your annual UK R&D spend in the technology area of the project?:

£86,000

8.10 How many researchers do you expect to have working in the UK **in the technology area of the project?**:

2

9 The impact of the project

We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but not the other members of your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.

9.1 Number of new or improved products or services launched;

New Healthcare range, 3 key products

9.2 Number of patent or other IP applications filed worldwide related to the project's technology;

No new patents, entered new strategic partnerships in the project area

9.3 New markets or research areas entered, or changed market share in existing markets;

New healthcare offering partnership with other providers and software vendors.

9.4 Number of new UK jobs created or existing jobs safeguarded:

2 new jobs in 2012

9.5 Improved Time-to-market or changed manufacturing or service efficiency

New healthcare product range, reduced time to market by 6 months, product developed with users input. Improved hygiene and antimicrobial housing as a direct result of project.

9.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

Improved battery management, extension to product operational life a direct result of participation.

9.7 Number of relevant academic papers or trade articles published:

7 trade articles

9.8 New or improved workforce skills or qualifications for UK staff:

Android product range and associated cloud knowledge a direct result of project participation.

9.9 Knowledge transferred, or understanding or capability gained:

- New innovative Health Care Platform.
- Extensive knowledge developed in Cloud-based Systems.
- New security models developed, for formal and informal care.
- New MSc in Advanced Security and Digital Forensics Created.
- New module in Advanced Cloud Systems at MSc level.

9.10 Long term collaborations or partnerships entered into:

The work has developed a wide range of continuing collaborations including Kodit, Microsoft, HoIP, Flexiant, and the Amor Group.

9.11 Any other tangible or intangible benefit or change;

Leadership in the UK with Cloud-based e-Health Platforms.

10 About the process

10.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

Yes. Very much. This funding has allowed us to develop the infrastructure to be able to lead on an international basic, and built up a range of collaborations.

10.2 How do you feel about the competition process that led to the grant? How could it be improved?

This was a fair and open process, where we got useful feedback at every stage.

10.3 How do you feel about the project monitoring? How could it be improved?

The Monitoring Officer was considerate at every point in the grant, and was helpful throughout.

10.4 How was your relationship with the Technology Strategy Board? How could it be improved?

The TSB has provided a good foundation for the future exploitation of the project.

11 Is there anything else that you would like to raise with us?

The project has allowed the research team to expand their knowledge in a wide range of areas, and now are in a position to make significant impact within health care and a number of related domains.

Thank you. Your assistance is much appreciated.

12 Contact data

12.1 Your company or organisation Name: Chelsea and Westminster Hospital Foundation Trust

12.2 Primary contact: Tajumal Malik

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12.4 Telephone number: 02033155966

12.5 Email address: Tajumal.malik@chelwest.nhs.uk

In the following questions, we would like to identify the impact of the project on your organisation's performance, both now, and in the future. Wherever possible, answers to financial questions should relate to the full financial year closest to the end of the project (or its anniversary). Please answer, wherever possible, on behalf of the business unit, division, group or company which was involved in the consortium. If this is not possible (as a result of merger or acquisition, for example), please specify the organisation to which your answers refer.

Do not disclose anything would breach any financial statute or regulation.

13 The wider picture

13.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

From the project we managed to develop our capabilities to handle the cloud infrastructure and to develop this further in conjunction with Imperial College and the rest of the DACAR consortium.

We have learnt of the business benefits of housing applications on the new platform and will look to develop this further for the improvement of patient care and quality of service to be provided.

Realisation has been gained of the collaboration that can be achieved working 3rd party industry suppliers as well as academic partners to produce the end project.

Academic journal and conference papers published/presented:

- Fan, L., Buchanan, W., Thuemmler, C., Lo, O., Khedim, A., Uthmani, O., Lawson, A., Bell, D. (2011). DACAR Platform for eHealth Services Cloud. IEEE Cloud 2011. One-in-five acceptance rate.
- Mason, A., Dingle, N., Knottenbelt, W., Bell, D., Buchanan, W., Thuemmler, C. (2010). Modelling infection spread using location tracking. Int. J. Healthcare Technology and Management, 11(6), 442-461.

Other:

- A number of new submissions for grants based on the developed architecture and in health care related areas.
- A two year IT/ R&D role in collaboration with CLARHC for NWL

13.2 Were you involved in the project as an academic or industrial collaborator?

(If you were involved as an Academic, please go to question 3.9)

13.3 What is your organisation's turnover in the UK (please specify which fiscal year this applies to):

What do you expect this to be in 3 years:

13.4 How many staff do you employ in the UK?:

13.5 What are your organisation's total annual sales **in the technology area of the project** ?

What additional sales do you expect in 3 years as a result the project?:

13.6 What is your average gross margin on these current sales, and how is this defined?

13.7 How much of your current sales in the technology area are from export sales outside the UK?:

13.8 How many staff do you employ (excluding researchers) in the UK **in the technology area of the project**?:

What do you expect this to be in 3 years:

13.9 What is your annual UK R&D spend in the technology area of the project?:

13.10 How many researchers do you expect to have working in the UK **in the technology area of the project**?:

14 The impact of the project

*We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but **not** the other members of your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would*

like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.

14.1 Number of new or improved products or services launched;

14.2 Number of patent or other IP applications filed worldwide related to the project's technology;

14.3 New markets or research areas entered, or changed market share in existing markets;

14.4 Number of new UK jobs created or existing jobs safeguarded:

14.5 Improved Time-to-market or changed manufacturing or service efficiency

14.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

14.7 Number of relevant academic papers or trade articles published:

14.8 New or improved workforce skills or qualifications for UK staff:

14.9 Knowledge transferred, or understanding or capability gained:

Clinicians have become more aware of the new technologies available and the benefits they can bring in providing systems in a more efficient manner.
Learning has been gained on how patients perceive new technologies, it is has given us an insight into the challenges facing developing a multi faceted application which can be used by all aspects of the hospital and the patients alike

14.10 Long term collaborations or partnerships entered into:

Kainos, Imperial College London, Cipherlabs, Edinburgh Napier University, Dell, HP

14.11 Any other tangible or intangible benefit or change;

15 About the process

15.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

After a few initial teething problems due to working relationship in the NHS, we have found the programme extremely beneficial.
Advice I would give any participant to pursue the goals and the outcomes will provide the benefits you require

15.2 How do you feel about the competition process that led to the grant? How could it be improved?

I thought the process was fair and true

15.3 How do you feel about the project monitoring? How could it be improved?

The Monitoring officer, was always on hand to provide guidance and resolve issues

15.4 How was your relationship with the Technology Strategy Board? How could it be improved?

The relationship was very open and it was a delight to work with them. Hopefully opening the door to many more collaborative opportunities

16 Is there anything else that you would like to raise with us?

Thank you. Your assistance is much appreciated.

17 Contact data

17.1 Your company or organisation Name: Imperial College London

17.2 Primary contact: Professor Derek Bell

17.3 Address: Imperial College
CLARHC office
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17.4 Telephone number:

02033155966

17.5 Email address:

d.bell@imperial.ac.uk

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Do not disclose anything would breach any financial statute or regulation.

18 The wider picture

18.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

The project has been a great success it has enabled us to achieve a great deal.

Academic journal and conference papers published/presented:

- Fan, L., Buchanan, W., Thuemmler, C., Lo, O., Khedim, A., Uthmani, O., Lawson, A., Bell, D. (2011). DACAR Platform for eHealth Services Cloud. IEEE Cloud 2011. One-in-five acceptance rate.
- Mason, A., Dingle, N., Knottenbelt, W., Bell, D., Buchanan, W., Thuemmler, C. (2010). Modelling infection spread using location tracking. Int. J. Healthcare Technology and Management, 11(6), 442-461.

Artefacts produced:

- New e-Health Platform for Primary and Secondary Care with new security models.
- New Patient Simulator.
- New Early Warning Score service.
- Clinical Evaluation lab for future testing of technologies

Other:

- A number of new submissions for grants based on the developed architecture and in health care related areas.
- A two year IT/ R&D role in collaboration with CLARHC for NWL

18.2 Were you involved in the project as an academic or industrial collaborator?

(If you were involved as an Academic, please go to question 3.9)

18.3 What is your organisation's turnover in the UK (please specify which fiscal year this applies to):

What do you expect this to be in 3 years:

18.4 How many staff do you employ in the UK?:

18.5 What are your organisation's total annual sales **in the technology area of the project** ?

What additional sales do you expect in 3 years as a result the project?:

18.6 What is your average gross margin on these current sales, and how is this defined?

18.7 How much of your current sales in the technology area are from export sales outside the UK?:

18.8 How many staff do you employ (excluding researchers) in the UK **in the technology area of the project**?:

What do you expect this to be in 3 years:

18.9 What is your annual UK R&D spend in the technology area of the project?:

18.10 How many researchers do you expect to have working in the UK **in the technology area of the project**?:

19 The impact of the project

We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but not the other members of

your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.

19.1 Number of new or improved products or services launched;

19.2 Number of patent or other IP applications filed worldwide related to the project's technology;

19.3 New markets or research areas entered, or changed market share in existing markets;

19.4 Number of new UK jobs created or existing jobs safeguarded:

19.5 Improved Time-to-market or changed manufacturing or service efficiency

19.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

19.7 Number of relevant academic papers or trade articles published:

19.8 New or improved workforce skills or qualifications for UK staff:

19.9 Knowledge transferred, or understanding or capability gained:

- Clinical staff involved have gained valuable knowledge about the use of and potential for applied technology in healthcare, as well as a better understanding of the complexity of the digital medical interface.
- Groundwork has been laid for further programmes using the knowledge, understanding and infrastructure gained via DACAR.
- Has established the university as leader in innovative healthcare technologies.
- Collaboration with clinicians working in a hospital environment has increased awareness of difficulties arising from introducing new technologies in critical clinical environment

19.10 Long term collaborations or partnerships entered into:

Have developed close links with many partner organisations via project. Chelsea and Westminster Hospital Foundation trust, Kodit, Cipherlabs, CSAM

19.11 Any other tangible or intangible benefit or change;

Creation of a Clinical / IT evaluation lab kitted out to full medical capacity for the functionality testing of further projects

20 About the process

20.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

Yes very much so. Knowledge gained is invaluable and has opened up many doors to collaborate on future projects

20.2 How do you feel about the competition process that led to the grant? How could it be improved?

Process was fair and feedback received was always constructive

20.3 How do you feel about the project monitoring? How could it be improved?

Project monitoring officer was always available to resolve issues and provide guidance

20.4 How was your relationship with the Technology Strategy Board? How could it be improved?
TSB were forthcoming in resolving any issues.

21 Is there anything else that you would like to raise with us?

I would like to thank all the participants and TSB in the effort that has gone into making this project. It has given us the framework to push further and explore new technologies in clinical environment.

Thank you. Your assistance is much appreciated.

22 Contact data

- 22.1 Your company or organisation Name: Edinburgh Napier University
22.2 Primary contact: Prof Bill Buchanan
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- 22.4 Telephone number: 0131 455 2759
22.5 Email address: w.buchanan@napier.ac.uk

In the following questions, we would like to identify the impact of the project on your organisation's performance, both now, and in the future. Wherever possible, answers to financial questions should relate to the full financial year closest to the end of the project (or its anniversary). Please answer, wherever possible, on behalf of the business unit, division, group or company which was involved in the consortium. If this is not possible (as a result of merger or acquisition, for example), please specify the organisation to which your answers refer.

Do not disclose anything would breach any financial statute or regulation.

23 The wider picture

23.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

We have achieved a great deal, and have managed to build an innovative e-Health Platform. The key deliveries have been:

Awards:

- Finalist, BCS/Computing Technology Excellence Award (to be awarded in November 2011).
- Finalist, IET Innovation Award (to be awarded in November 2011).

Conference organisation and presentations:

- Symposium for Future Health, Edinburgh, Sept 2011.

Special issues:

- Buchanan, W., Thuemmler, C. (Eds.) (2009). International Journal of Healthcare Technology and Management: Special Issue on Patient-Centric Modelling and Enhanced Security in Distributed Healthcare Systems, 10 (1/2). Inderscience.

Academic journal and conference papers published/presented:

- Fan, L., Buchanan, W., Thuemmler, C., Lo, O., Khedim, A., Uthmani, O., Lawson, A., Bell, D. (2011). DACAR Platform for eHealth Services Cloud. IEEE Cloud 2011. One-in-five acceptance rate.
- SPoC: Protecting Patient Privacy for e-Health Services in the Cloud, Lu Fan, William Buchanan, Owen Lo, Thuemmler, Alistair Lawson, Omair Uthmani, Elias Ekonomou, Abou Sofyane Khedim, e-TeleMed 2012 (submitted).
- An Integrated Cloud-based Healthcare Infrastructure, Elias Ekonomou, William Buchanan, Lu Fan, Owen Lo, Christoph Thuemmler, Alistair Lawson, Omair Uthmani, Abou Sofyane Khedim, IEEE CloudCom 2012.

- Buchanan, W. (2011, May). A next generation Cloud-based health care platform. Paper presented at Innovation in Healthcare, London.
- Buchanan, W., Fan, L., Thuemmler, C., Lo, O., Ekonomou, E., Khedim, A. (2011, Sept). Cloud-based e-Health System. Paper presented at BCS Health Informatics, Edinburgh.
- Buchanan, W., Thuemmler, C., Fan, L., Lo, O., Khedim, A. (2010, September). An e-Health Cloud. Paper presented at Cloud Computing for the Public Sector, Edinburgh.
- Buchanan, W., Thuemmler, C., Fan, L., Lo, O., Khedim, A. (2010, August). Information sharing framework: Next Generation e-Health Cloud. Paper presented at BCS Health Informatics Scotland, Glasgow.
- Buchanan, W., Thuemmler, C. (2010). Modelling Infection Spread Using Location Tracking. International Journal of Healthcare Technology and Management (IJHTM), 11(6).
- Mason, A., Dingle, N., Knottenbelt, W., Bell, D., Buchanan, W., Thuemmler, C. (2010). Modelling infection spread using location tracking. Int. J. Healthcare Technology and Management, 11(6), 442-461.
- Thuemmler, C., Buchanan, W. (2010). Review of coding for success implementation.
- Thuemmler, C., Buchanan, W., Lawson, A. (2009). Radio frequency identification (RFID) in pervasive healthcare. International Journal of Healthcare Technology and Management (IJHTM), 119-131.

Artefacts produced:

- New e-Health Platform for Primary and Secondary Care with new security models.
- New Patient Simulator.
- New Early Warning Score service.

Other:

- Creation of a Centre for Applied e-Health.
- Research Fellow promotion for Dr Lu Fan, and contract extension.
- New contract extension for Dr Elias Ekonomou.
- New related PhD project looking at Patient Simulation (Owen Lo).
- Professorial Appointment for Christoph Thuemmler.
- Level 2 Professorship promotion for Bill Buchanan.
- A number of new grants based on the developed architecture and in health care related areas.
- New MSc programme in Advanced Security and new modules created.
- Wide range of publications and dissemination events.
- Large-scale interest from a range of companies in future collaboration.

23.2 Were you involved in the project as an academic or industrial collaborator? Academic
(If you were involved as an Academic, please go to question 3.9)

23.3 What is your organisation's turnover in the UK (please specify which fiscal year this applies to):

What do you expect this to be in 3 years:

23.4 How many staff do you employ in the UK?:

23.5 What are your organisation's total annual sales **in the technology area of the project** ?

What additional sales do you expect in 3 years as a result the project?:

23.6 What is your average gross margin on these current sales, and how is this defined?

23.7 How much of your current sales in the technology area are from export sales outside the UK?:

23.8 How many staff do you employ (excluding researchers) in the UK **in the technology area of the project**?:

What do you expect this to be in 3 years:

23.9 What is your annual UK R&D spend in the technology area of the project?:

23.10 How many researchers do you expect to have working in the UK **in the technology area of the project**?:

24 The impact of the project

We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but not the other members of your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.

24.1 Number of new or improved products or services launched;

24.2 Number of patent or other IP applications filed worldwide related to the project's technology;

24.3 New markets or research areas entered, or changed market share in existing markets;

24.4 Number of new UK jobs created or existing jobs safeguarded:

24.5 Improved Time-to-market or changed manufacturing or service efficiency

24.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

24.7 Number of relevant academic papers or trade articles published:

24.8 New or improved workforce skills or qualifications for UK staff:

24.9 Knowledge transferred, or understanding or capability gained:

- New innovative Health Care Platform.
- Extensive knowledge developed in Cloud-based Systems.
- New security models developed, for formal and informal care.
- New MSc in Advanced Security and Digital Forensics Created.
- New module in Advanced Cloud Systems at MSc level.

24.10 Long term collaborations or partnerships entered into:

The work has developed a wide range of continuing collaborations including Kodit, Microsoft, HoIP, Flexiant, and the Amor Group.

24.11 Any other tangible or intangible benefit or change;
Leadership in the UK with Cloud-based e-Health Platforms.

25 About the process

25.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

Yes. Very much. This funding has allowed us to develop the infrastructure to be able to lead on an international basic, and built up a range of collaborations.

25.2 How do you feel about the competition process that led to the grant? How could it be improved?

This was a fair and open process, where we got useful feedback at every stage.

25.3 How do you feel about the project monitoring? How could it be improved?

The Monitoring Officer was considerate at every point in the grant, and was helpful throughout.

25.4 How was your relationship with the Technology Strategy Board? How could it be improved?

The TSB has provided a good foundation for the future exploitation of the project.

26 Is there anything else that you would like to raise with us?

The project has allowed the research team to expand their knowledge in a wide range of areas, and now are in a position to make significant impact within health care and a number of related domains.

Thank you. Your assistance is much appreciated.

27 Contact data

- 27.1 Your company or organisation Name: Kodit Database Limited
- 27.2 Primary contact: Craig Story
- 27.3 Address: Sandlow Green Farm, Holmes Chapel,
Cheshire.
- 27.4 Telephone number: 01477 537744
- 27.5 Email address: cstory@kodit.com

In the following questions, we would like to identify the impact of the project on your organisation's performance, both now, and in the future. Wherever possible, answers to financial questions should relate to the full financial year closest to the end of the project (or its anniversary). Please answer, wherever possible, on behalf of the business unit, division, group or company which was involved in the consortium. If this is not possible (as a result of merger or acquisition, for example), please specify the organisation to which your answers refer.

Do not disclose anything would breach any financial statute or regulation.

28 The wider picture

28.1 Was your involvement in the project worthwhile? Did your organisation achieve what it set out to achieve?

Extremely. We have created a platform for the deployment of mobile applications in a health care environment that will deliver measurable improvements to patient care – at the point of care. The key deliveries have been:

Product

- GS1 certified solution status.
- Motorola Certified Solution Status
- CareMagic Suite

Other:

Creation of combined application to monitor:

- Early Warning Score
- 1000 Lives Project
- SEPSIS alert and Screening
- LaserBand Print
- ADT Service
- European collaborations (France, Germany)

Academic journal and conference papers published/presented:

- Fan, L., Buchanan, W., Thuemmler, C., Lo, O., Khedim, A., Uthmani, O., Lawson, A., Bell, D. (2011). DACAR Platform for eHealth Services Cloud. IEEE Cloud 2011. One-in-five acceptance rate.
- SPoC: Protecting Patient Privacy for e-Health Services in the Cloud, Lu Fan, William Buchanan, Owen Lo, Thuemmler, Alistair Lawson, Omair Uthmani, Elias Ekonomou, Abou Sofyane Khedim, e-TeleMed 2012 (submitted).
- An Integrated Cloud-based Healthcare Infrastructure, Elias Ekonomou, William Buchanan, Lu Fan, Owen Lo, Christoph Thuemmler, Alistair Lawson, Omair Uthmani, Abou Sofyane Khedim, IEEE CloudCom 2012 (submitted).
- Buchanan, W., Fan, L., Thuemmler, C., Lo, O., Ekonomou, E., Khedim, A.

(2011, Sept). Cloud-based e-Health System. Paper presented at BCS Health Informatics, Edinburgh.

- Buchanan, W., Thuemmler, C., Fan, L., Lo, O., Khedim, A. (2010, September). An e-Health Cloud. Paper presented at Cloud Computing for the Public Sector, Edinburgh.
- Buchanan, W., Thuemmler, C., Fan, L., Lo, O., Khedim, A. (2010, August). Information sharing framework: Next Generation e-Health Cloud. Paper presented at BCS Health Informatics Scotland, Glasgow.

28.2 Were you involved in the project as an academic or industrial collaborator? Industrial
(If you were involved as an Academic, please go to question 3.9)

28.3 What is your organisation's turnover in the UK (please specify which fiscal year this applies to):

£763,000 for Year ending March 31st 2011

What do you expect this to be in 3 years:

£1.73m

28.4 How many staff do you employ in the UK?:

9

28.5 What are your organisation's total annual sales in the technology area of the project ?

£0.00

What additional sales do you expect in 3 years as a result the project?:

£1.0M

28.6 What is your average gross margin on these current sales, and how is this defined?

80% Sale Price minus direct cost of sale excluding overheads.

28.7 How much of your current sales in the technology area are from export sales outside the UK?:

5%

28.8 How many staff do you employ (excluding researchers) in the UK in the technology area of the project?:

6

What do you expect this to be in 3 years:

20

28.9 What is your annual UK R&D spend in the technology area of the project?:

£342,000

28.10 How many researchers do you expect to have working in the UK **in the technology area of the project?**:

1

29 The impact of the project

We would like to understand the direct and indirect benefits that you have gained from involvement in the project. Please answer on behalf of your whole organisation, but not the other members of your consortium. We are principally interested in benefits felt by, or accruing to, the UK; but would like to know about benefits felt elsewhere where these may have an indirect impact – for example, UK jobs being protected because of improved global performance. Feel free to include brief details where these help to explain how the benefits are achieved.

29.1 Number of new or improved products or services launched;

2

29.2 Number of patent or other IP applications filed worldwide related to the project's technology;

None

29.3 New markets or research areas entered, or changed market share in existing markets;

We have secured partnership agreements for the new products that cover United Kingdom and France. We are currently in late stage negotiations to add USA, Italy, Spain and Germany. We have also received interest from the Middle East and Africa.

29.4 Number of new UK jobs created or existing jobs safeguarded:

9

29.5 Improved Time-to-market or changed manufacturing or service efficiency

The project has enabled us to incorporate the very latest code that has already had a measurable benefit in our Time to Market and furthermore meets strategic view of our partners, including Motorola Global Solutions.

29.6 Sustainability benefits (e.g. reduced waste, energy consumption etc) achieved;

Does not Apply

29.7 Number of relevant academic papers or trade articles published:

None

29.8 New or improved workforce skills or qualifications for UK staff:

Our entire programming team has enhanced their skills to meet the improved Kodit Framework.

29.9 Knowledge transferred, or understanding or capability gained:

- Strategic vision of Motorola for Healthcare
- GS1 rules and requirements
- Requirements for Cloud-based deployment
- Requirements for cross platform capability

29.10 Long term collaborations or partnerships entered into:

The work has developed a wide range of continuing collaborations including LaserBand, ENS Nursecall, Motorola Healthcare and Defence, General Dynamics, Zebra and Brightpoint.

29.11 Any other tangible or intangible benefit or change;

Recognition at senior level within both Government and Large corporate of the technology we have created and the benefits it can deliver, both in efficiency and cost reduction.

30 About the process

30.1 Did you find involvement in the Programme beneficial? What advice or comments would you give to a prospective participant?

Yes. Very much. The programme provide both funding and, more importantly, meaningful collaborations, that are leading to measurable increase in sales opportunities both in the UK and overseas.

30.2 How do you feel about the competition process that led to the grant? How could it be improved?

This was a fair and easy process for an SME to be involved in.

30.3 How do you feel about the project monitoring? How could it be improved?

The Monitoring Officer was considerate at every point in the grant, and was helpful throughout. An observation would be to put more defined timescales so that all members have a responsibility to produce required documentation within a reasonable time.

30.4 How was your relationship with the Technology Strategy Board? How could it be improved?

Very good indeed. The new online filing system works extremely well.

31 Is there anything else that you would like to raise with us?

The project has allowed us expand our knowledge in a wide range of areas, and now we are in a position to exploit this commercially.

Thank you. Your assistance is much appreciated.

Part 3: For completion by the Project Monitoring Officer

We would like your view of how our projects could be better run in the future, based on any lessons learned from this one. In answering, please keep your replies factual. Avoid comments on personalities and technical matters unlikely to be repeated elsewhere.

32 What lessons can be learned from this project:

- (a) In terms of the Technology Strategy Board's processes, and
- (b) In terms of the project's management and methods?

Monitoring Officer Name:

Monitoring Officer email: