Final Report
P4 Digital Healthcare Scoping Study

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### Glossary

<table>
<thead>
<tr>
<th>Term or acronym</th>
<th>Description / definition</th>
</tr>
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<tbody>
<tr>
<td><strong>CHP</strong></td>
<td>Community Health Partnerships – soon to be replaced by Health and Social Care Partnerships - co-ordinate health, local authority and third sector services at a local level within an NHS Board or Local Authority area in Scotland.</td>
</tr>
<tr>
<td><strong>DALLAS</strong></td>
<td>Delivering Assisted Living Lifestyles at Scale (DALLAS) is a programme/competition that will establish three to five sites across the UK (one site with 5 locations is expected to be located in Scotland) with a minimum of 10,000 users per site that will &quot;show how assisted living technologies and services can be used to promote wellbeing, and provide top quality health and care, enabling people to live independently - including a preventative approach.&quot; It also aims to &quot;unlock new markets in social innovation, service innovation and wellness, enabled by technology...[and] will help to grow the sector and position UK companies to take advantage of increasing global demand&quot;. Successful projects will attract 100% public funding and last up to 36 months. There will be a total investment over four years of £23 million. The Technology Strategy Board will invest £18 million in the UK-wide programme while the Scottish Government has agreed to invest a further £5 million, to establish one of the sites in Scotland. HIE has in principle committed to co-invest £800k.</td>
</tr>
<tr>
<td><strong>eHealth</strong></td>
<td>Information and Communications Technology products and services deployed in the healthcare sector – see also <a href="http://www.ehealth.scot.nhs.uk/">http://www.ehealth.scot.nhs.uk/</a></td>
</tr>
<tr>
<td><strong>Health Board</strong></td>
<td>The NHS organisation responsible for provision, planning and co-ordination of NHS services typically for a defined population living within a geographical footprint. Within Highlands and Islands Region, Boards include NHS Grampian (for Moray), NHS Highland (also responsible for services in Argyll), NHS Orkney, NHS Shetland and NHS Western Isles. NHS Boards in Scotland are responsible for funding and commissioning of services as well as for</td>
</tr>
</tbody>
</table>
 provision of hospital, GP and other services. In addition to geographical Boards, there are a number of Special Health Boards, and notably NHS 24.

| **HIE** | Highlands and Islands Enterprise – Scottish Government’s economic development agency. |
| **NHS** | National Health Service – in most contexts this will be NHS Scotland, responsible to the Scottish Parliament. In other parts of UK, the NHS is completely separate organisation with different accountabilities. |
| **NHS24** | NHS24 provides Health Information and Self Care Advice for Scotland through phone services and online. It manages the Scottish Centre for Telehealth and Telecare. |
| **P4 Digital Healthcare** | The intersection between digital technology spanning information and communications technologies, medical equipment and devices on the one hand and on the other hand, the practice of predictive, preventative, personalised and participatory (P4) medicine. |
| **RCT** | Randomised Controlled Trial – the ‘gold standard’ when measuring clinical effectiveness of therapeutic interventions, but very expensive to implement |
| **SCT** | The Scottish Centre for Telehealth (SCT) now part of NHS 24 was established in 2006 to support and guide the development of telehealth for clinical, managerial and educational purposes across Scotland. This involves working across boundaries with industry, academia, local authorities and NHS Boards to develop recognised models for redesigning care. |
| **The Scottish Life Science Advisory Board (LiSAB),** | A joint industry, enterprise and government strategy team set up to develop, drive and deliver Scotland’s Life Sciences strategy. HIE is represented on this Board |
| **Self Directed Care** | The Self-directed Support (Scotland) Bill is proceeding into legislation. Self-directed support empowers people to direct their care - to have informed choice and control about how their support is provided. There are several ways for people to take more control. One way is taking a direct payment. This is when a local authority makes a payment direct to the citizen in place of services that otherwise would have been arranged by the authority. As an alternative, people can direct the available resources. They can take and |
manage a direct payment as part of this but they do not have to. This is sometimes called an individual budget or individual service fund. For more information go to [www.selfdirectedsupportscotland.org.uk](http://www.selfdirectedsupportscotland.org.uk)

| **Whole System Demonstrator Project** | The Whole System Demonstrator (WSD) programme is a two year research project funded by the Department of Health in England to find out how technology can help people manage their own health while maintaining their independence. The WSD programme is believed to be the largest randomised control trial of telecare and telehealth in the world to date. Results are just starting to be published. See also [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_100946](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_100946) |
1. Executive summary

Highlands and Islands Enterprise (HIE) commissioned this scoping study to explore the evolving role of digital technology in health and social care and to establish what is required in order to capitalise on emerging opportunities. P4 Digital Healthcare – a term coined within the Region - is positioned at the intersect between digital technology spanning information and communications, medical equipment and pharmaceutical technologies and the practice of predictive, preventative, personalised and participatory (P4) medicine.

Digital healthcare therefore has a clear footprint within with three well understood markets: medical devices and equipment, information and communications technology (deployed in the health sector (also known as eHealth) and pharmaceuticals. The most developed markets for medical devices and equipment, information and communications technologies (in healthcare), are to be found in the USA and developed countries. Whilst pharmaceutical markets in these regions are also very large, growth is occurring faster in other geographies. Cumulative annual growth rates (CAGR) for some digital healthcare segments are predicted to exceed 10% - higher than the Life Sciences sector average. Overall, since the current economic downturn (with associated public spending constraints) will impact relatively harder on developed countries and USA, some of the highest growth rates across the world are expected in East and South Asia. However it is also expected that as traditional approaches in developed countries to delivering health and social care services appear less affordable (due for instance to the demand from the elderly population), large scale digital healthcare deployments will emerge as a favoured way to ‘square the circle’. Significant investments and policy initiatives are underway in countries including Australia, Brazil, Canada, Denmark, Finland, India, Japan, Korea, Netherlands and US.

Many Digital Healthcare services – electronic record systems for instance - are widely used in UK and elsewhere. Other digital services including telehealth and telecare services have not yet been rolled out at scale across UK or indeed in almost all other parts of the world, and a number of deep-rooted challenges remain. So whilst large scale telehealth and telecare deployment is being advocated as a way forward in UK, US as well as in other parts of the
world, with an associated promise of significant growth for the businesses involved, the full potential of large scale deployment has not yet been realized anywhere.

In Scotland, the health and economic development policy frameworks are clearly supportive of digital healthcare. It is also clear that Scotland (and within Scotland, the Highlands and Islands) is positioned amongst international leaders in early stage telehealthcare deployments.

For these and other reasons, this study finds that Highlands and Islands does have the potential to become a world leading location for P4 Digital Healthcare products and services for specific – not all – customer groups. The Region should focus on those digital healthcare solutions which play to its strengths. This implies a focus on digital healthcare solutions which deliver value to public primary care services and social services organisations (especially in remote and rural settings) as well as to research based pharmaceutical organisations. It is realistic to aim to attract inward investors interested in working in such a world leading location.

Market segments of interest to these target customers can be expected to evolve over time but currently include (for public primary care services and social services): Appointment booking and scheduling services, systems which enable patient related information to be reliably exchanged across differing settings, systems which support new models of clinical service delivery, call centres which monitor outputs from medical equipment or social alarms, portable medical devices for self-monitoring, diagnostic tests, health and social care related social networking, TV related to health, telecare, mobile health, telehealth, and business intelligence services for health.

HIE has an important role in making this happen. It will however need to foster more effective engagement with leading local public sector organisations, professionals and managers from primary care services and social services for whom organisational innovation and system redesign are the critical challenges. HIE should be seeking to build commitment to implementation of innovative services supported by business which are capable of delivering superior outcomes such as reductions in emergency and elective admissions to
hospital or reduction in bed days (and as for instance achieved within the Whole System Demonstrator project in England). For these customer groups in the Region, this aspect is more important than either clinical or technological innovation. For research based pharmaceutical companies however, clinical innovation of course remains however a top priority. Some key public sector stakeholders clearly do not yet fully understand or are not yet committed to a common view of how the Region can best support economic development for digital healthcare. It is also not yet obvious to potential inward business investors how successful implementations within the Region could lead to a Scotland or UK wide roll-out or business opportunity. A further critical success factor will be the extent to which initiatives can be ‘joined up’ across the Region. These aspects must be addressed quickly if the Region wishes to become a world leading location.

If progress can be made on these aspects, it does seem possible that a critical mass of support for more widespread and system-wide deployment of digital healthcare solutions could be created within the Region. This would certainly be significant within Scotland, but also internationally. It would also translate into business opportunity for a supplier base of businesses operating ‘at the cutting edge’.

A 3 year roadmap has been developed with associated recommendations on:

- Prioritising primary and social care and research based pharmaceutical customer groups
- Building a shared commitment amongst local, business and public sector stakeholders to implement services to deliver organisational innovation and system redesign;
- The support services HIE should consider to foster the emergence of a digital healthcare cluster of international significance in the Region.
- The approach to be taken to ensure that investment in supporting digital healthcare is leveraged to produce outcomes of economic significance.
1. Introduction: rationale and objectives for this study

Highlands and Islands Enterprise (HIE) commissioned this scoping study to explore the evolving role of digital technology in healthcare, with a view to understanding where the greatest market opportunities may lie and establishing what is required in order to capitalise on these opportunities.

2.1. Digital Healthcare’s potential in overcoming challenges facing health and social care worldwide

Health and care sectors across the world are confronting similar challenges. These include:

- Increasing proportion of elderly people within the population
- Rise in unhealthy lifestyles
- Rise in incidence of long term conditions (related to age and lifestyle)
- Increasing power of the “grey pound”
- Increasing influence of the consumer in healthcare
- Increasing constraints on healthcare budgets
- Global population growth (of particular note in developing countries)
- Increasing energy costs
- Requirement to reduce carbon footprint
- Advances in digital technology and infrastructure

These challenges come at a time of increasing budgetary constraints. It is therefore inevitable that new approaches to health and care provision will be implemented.

Digital technology offers the potential to overcome geographical barriers, supports a “one to many” approach and also offers the potential to reduce costs and deliver a ‘personalised’ approach to healthcare delivery. As digital technology advances and healthcare needs increase, it is anticipated that digital healthcare will become embedded in service provision and self management. This is turn will lead to the emergence of new opportunities across the world to benefit the health and well being of the population and to support new business growth.
2.2. The opportunity in the Highlands and Islands and HIE’s approach

The Highlands and Islands Region of Scotland, with its geographical diversity and population dispersal stands to benefit greatly from healthcare innovation and is well-placed to act as a test-bed for delivering and implementing new approaches to dispersed healthcare delivery. The Life Sciences sector is recognised by both the UK and Scottish Governments as having high growth potential and the capacity to contribute significantly to the nation’s productivity as well as to its social wellbeing. Highlands and Islands Region therefore appears well positioned in an emerging market, where Scotland already has a significant competitive advantage on which there is substantial scope to build.

Based on the strength of comparative advantage and the growth potential of the sector, HIE has therefore identified digital healthcare as a priority area for development and investment. HIE’s approach draws on the Scottish Life Science Strategy, and the complementary Highlands & Islands’ sectoral strategy. HIE’s approach has been informed by the shared vision of telehealthcare (2020), which was developed with key stakeholders from the Highlands and Islands and beyond at the Aldourie Castle sessions (2010). HIE is also active within a number of structures which are co-ordinating developments in the field, such as;

- **The Scottish Life Science Advisory Board** (LiSAB), the joint industry, enterprise and government strategy team set up to develop, drive and deliver Scotland’s Life Sciences strategy, which identified telehealthcare as being of strategic importance.

- **The Scottish Assisted Living Programme Board** (SALPB), which includes representatives from the enterprise agencies, Government and the public healthcare sector. The Board has been established to provide leadership and co-ordination in developing telehealthcare in Scotland.
### 2.3. The key objectives of this scoping study

Against this background, HIE commissioned this scoping study with the following objectives:

1. Provide an overview of the scope and breadth of global P4 Digital activity looking at both healthcare practice (service delivery) and commercial activity. This should include the identification of leading geographic locations in service delivery and commerce detailing novel initiatives that could be useful for the development of the sector in the Highlands and Islands.

   *See especially Section 3 and the Annex to this report*

2. Detail key companies involved in P4 Digital activity with a brief overview of their involvement and where possible, details on Research and Development activity. This should also include some degree of segmentation of market sub-sectors within digital health, with particular emphasis on the consumer market. Segmentation should include:

   - Nature of the sector, illustrated with examples;
   - Dominant Business Models;
   - Key players;
   - Current Value;
   - Potential for and nature of future growth;
   - Barriers to growth.

   *Full details are included within separate Market Segment and Customer Analysis reports prepared by Consard for Highlands and Islands Enterprise. However the main conclusions from these reports are contained within Section 3 and the Annex to this Report.*

3. Provide a high level illustration of the likely development of the digital health market in the mid term (next three years) and longer term (next 5 – 10 years). This should include an illustration of the current status of the consumer market and areas of
anticipated growth, with particular reference to market geography and some insight into what support is required to achieve this growth. This should include an assessment of where the greatest market opportunities lie as well as consideration of how industry (both businesses and social enterprises) can support service delivery in P4 Digital.

Predictions for market development and growth are discussed in Section 3 of this report. Sections 5 and 6 consider how best industry (with a focus on Highlands and Islands) can best address the opportunities.

4. Map P4 Digital activity at Highlands and Islands and Scotland-wide level, identifying lead players and roles and highlighting regional strengths before relating to national and global opportunities.

Policy dimensions are addressed within Section 4. Section 5 considers the current position in Highlands and Islands and Section 6 proposes a Roadmap. Supporting information is provided as follows: the Annex contains information about global opportunities, and full information about major players is contained within separate Market Segment and Customer Analysis reports prepared by Consard for Highlands and Islands Enterprise.

5. Articulate the strengths and opportunities associated with P4 Digital activity within the Highlands and Islands and within Scotland, along with current constraints and barriers to growth.

This is directly addressed within Section 5, with the supporting analysis contained within separate reports on Market Segment and Customer Analysis and on Interviews and Consultation prepared by Consard for Highlands and Islands Enterprise.

6. Identify exemplars and novel P4 Digital-based business models and cutting edge practice at either regional or global level.

P4 Digital-based cutting edge practice at a global level is described in Section 3, with a fuller picture presented in the Annex to this report. At a regional level, discussion is contained within Section 5. In both
cases further information on cutting edge practice and a fuller discussion of business models is contained within separate reports on Market Segment and Customer Analysis and on Interviews and Consultation prepared by Consard for Highlands and Islands Enterprise.

7. Make recommendations as to priority areas for growth and development within the P4 Digital sector, including potential business models to support service delivery. This should include specific recommendations on measures to promote the growth of the regional sector.

Recommendations are included within Section 7, and these have been framed to support implementation of the Roadmap presented within Section 6.
3. Digital Healthcare in a global context

P4 Digital Healthcare uses a range of technologies, drawn from the fields of information and communications technology, medical equipment and pharmaceutical devices to deliver predictive, preventative, personalised and participatory (P4) medicine. Top customer groups for Digital Healthcare products and services are public hospitals, primary care services, social services, research based pharmaceutical companies, national authorities (e.g. NHS Scotland bodies), private care homes / companies, pharmaceutical contract research organizations, retail pharmacy, private hospital and private diagnostic companies.

Amounts spent on digital healthcare differ across the world. This is a function not only of how much is spent per head on health and social care, but also of the percentage of total spend on products relevant to P4 Digital Healthcare: Information and Communications Technologies, Medical Devices and Equipment and Pharmaceuticals. The best existing geographical markets for Information and Communications Technologies and Medical Devices and Equipment are the USA and developed countries. Whilst pharmaceutical markets in these regions are very large, growth is occurring faster in other geographies. Higher growth rates are predicted for Brazil, Russia, India and China as well as other geographies since the current economic downturn (with associated public spending constraints) will impact harder on developed countries and USA.

Customers for digital healthcare - the public sector, the patient/ consumer and businesses - have different perspectives. Research and development challenges remain, but substantial R & D programmes are being implemented. It is clear that cumulative annual growth rates (CAGR) for some digital healthcare segments will exceed Life Sciences (typically reported in the range 3-7%), with some segments predicted to experience growth at > 10%. A range of recent announcements and market developments underpin these predictions.

Key market segments for digital healthcare products and services have been identified with reference to the overall value of the segment (UK revenues > £100M per annum, high growth rates or significant R & D programmes under way). These key segments include: National Infrastructure services, Local Infrastructure, Local applications, Consumer, Customer Relationship Management, Therapy Areas, Medical Devices and Imaging, Teleservices, Enterprise
resource planning / Performance Management, Health or care related record systems.

Many Digital Healthcare services – electronic record systems for instance - are widely used in UK and elsewhere. Other digital services including telehealth and telecare services have not yet been rolled out at scale across UK or indeed in almost all other parts of the world. So whilst large scale telehealth and telecare deployment is being advocated as a way forward in UK, US as well as in other parts of the world, with an associated promise of significant growth for the businesses involved, the full potential of large scale deployment has not yet been fully realized anywhere. A number of deep-rooted challenges remain including:

- Long timescales to reach a level when benefit realised exceeds costs of installation;
- Problems with technology adoption within key target groups, such as older people with long term health conditions;
- Disinvestment in hospitals and service reconfiguration as new services come into being to replace them;
- Models for profitable product and service delivery, especially when most purchasing needs to conform to public procurement best practice.

Significant investments and policy initiatives are underway worldwide. These offer learning opportunities for stakeholders in the Highlands and Islands and also possible opportunities for direct collaboration. Leading countries include Australia, Brazil, Canada, Denmark, Finland, India, Japan, Korea, Netherlands and USA.

Objective 1 of this study is to provide an overview of the scope and breadth of global P4 Digital activity. This has been addressed by explaining what is meant by P4 Digital Healthcare, analyzing Digital Healthcare customers and analyzing how their buying behavior differs across the world. Some examples of cutting edge Digital Healthcare deployments are provided. The benefits sought from Digital Healthcare deployments and outcomes targeted by major customer groups are identified. Finally the structure of the market is described with an assessment of expected growth. This Section also summarises the main findings of relevance to Objective 2 of this report, an overview of P4 market segments and the companies active within them. Finally, this Section also discusses market development and growth projections within the market.
a. **P4 Digital Healthcare markets**

i. *What is meant by P4 Digital Healthcare?*

![P4 Digital Healthcare positioning diagram](image)

As illustrated above, P4 Digital Healthcare lies at the intersect between digital technology spanning information and communications technologies, medical equipment and devices and pharmaceuticals on the one hand and on the other the practice of predictive, preventative, personalised and participatory (P4) medicine. It is important to note that this definition includes a critical qualitative dimension: there is a focus on the changes in health provision which has been enabled by digital technology.

ii. *Customer segmentation*

Across the world, customers for P4 Digital products and services fall into three main categories:

A. Providers of Health and Care Services  
B. Purchasers of Health and Care Services  
C. Pharmaceuticals & Life Sciences

However, it is recognised that in Scotland the purchasing and provider function is united within Health Boards and Community Health Partnerships bring together provision of Social Services and Primary Healthcare Services.

Table 1 below shows the major customer groupings within these broad categories.
Table 1: major customer groupings for P4 Digital Healthcare

A. Providers of Health and Care Services

   I. Public organisations providing Health Services

      i. Central or nationally funded organisations (Providers)
      ii. Hospitals - NHS Boards, Trusts
      iii. Primary Care (GPs)

   II. Public organisations providing care services

      i. Local Authority provided Social Services
      ii. Other Public Sector Provided Services

   III. Private organisations providing Health Services

      i. Private or not for profit providers of secondary care services
      ii. Private or not for profit providers of diagnostic services
      iii. Private providers of primary care services
      iv. Private providers of complementary / alternative health services
      v. Retail pharmacy and other High Street Health outlets
      vi. Occupational health service providers
      vii. Health and Fitness organisations

   IV. Private organisations providing care services

      i. Private companies / Social Enterprises / Nursing homes
      ii. Carers

B. Purchasers of Health and Care Services

   I. Public organisations purchasing health services

      i. NHS Boards or Commissioners
      ii. Public Organisations purchasing care services - Local Authorities
iii. Who are the most important customers for P4 Digital Healthcare?

There is a correlation between historic expenditure by health and social care customers on products and services related to P4 Digital Healthcare, what they can be expected to spend in the future and hence the best and biggest P4 Digital opportunities in UK and globally. In Table 2 below, the most important customers for P4 Digital Healthcare are identified with reference to what they spend on P4 related products and services. Products and services of relevance to P4 Digital Healthcare are classified as Information and Communications Technologies, Medical Devices and Equipment and Pharmaceuticals. Top customer groupings for P4 Digital Healthcare in UK can be identified by comparing the total spend by the customer groups described at Section 3.a.ii. above, and correlated this with the absolute value of spend on P4 related products and services, and the % of total spend represented by P4 Digital Healthcare products and services:
Table 2: Top 10 customer groups for P4 Digital Healthcare in UK (in no priority)

<table>
<thead>
<tr>
<th>Top 10 Customer Groups for P4 Digital Healthcare</th>
<th>Total UK Spend Estimate (£ Billion)</th>
<th>Est. spend on areas relevant to P4 (Pharma, ICT and Med. Equipment) (£ Billion)</th>
<th>% Total Spend on P4 (Pharma, ICT and Med. Equipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Hospitals</td>
<td>62</td>
<td>15.7</td>
<td>25%</td>
</tr>
<tr>
<td>Public Primary Care</td>
<td>25</td>
<td>11</td>
<td>44%</td>
</tr>
<tr>
<td>Social Services</td>
<td>20</td>
<td>0.4</td>
<td>2%</td>
</tr>
<tr>
<td>Research Based Pharmas</td>
<td>18</td>
<td>2.7</td>
<td>15%</td>
</tr>
<tr>
<td>National NHS</td>
<td>13</td>
<td>0.8</td>
<td>7%</td>
</tr>
<tr>
<td>Private Care Cos/ Homes</td>
<td>8.5</td>
<td>0.3</td>
<td>4%</td>
</tr>
<tr>
<td>Contract Research</td>
<td>2</td>
<td>0.04</td>
<td>2%</td>
</tr>
<tr>
<td>Retail Pharmacy</td>
<td>2</td>
<td>0.5</td>
<td>2%</td>
</tr>
<tr>
<td>Private Hospitals</td>
<td>0.7</td>
<td>0.14</td>
<td>20%</td>
</tr>
<tr>
<td>Private Diagnostics</td>
<td>1</td>
<td>0.25</td>
<td>25%</td>
</tr>
</tbody>
</table>

Source: P4 Digital Healthcare Customer Analysis (Appendix 1)

iv. Are there differences across the world?

The short answer is yes - not only in terms of how much is spent per head on health and social care in total, but also in terms of the amounts spent on products relevant to P4 Digital Healthcare: information and communications technologies, medical devices and equipment and pharmaceuticals. These differences are highlighted in the pie charts which follow.

These pie Charts show what is being spent on the major technological groupings of relevance to P4 Digital Healthcare (information and communications technologies, medical equipment pharmaceuticals) within the major Regions of the world: USA; other developed countries; Russia, Brazil, India and China; and the Rest of the World.
The charts have been prepared using information from the following sources:


- **Pharmaceutical expenditure as % of Health expenditure**: For OECD countries estimates broadly aligned to values published in OECD 2009, BRIC valuations published by Espicom, otherwise estimated in line with these reference points

- **ICT expenditure as % of Health Expenditure**: derived from estimates within the 2007 Wanless Report, where English ICT spend was estimated at 1.5% of overall health expenditure, and is now assumed to have risen in UK to 3% by 2011. Otherwise estimates, based on this reference point have been made by Consard.

- Medical Device expenditure as % of Health Expenditure: UK figures derived from an article published in by [www.medicaldevice-network.com](http://www.medicaldevice-network.com), US valuation is based on estimates prepared by Gerald Donahoe and Guy King, and the BRIC Market valuations were published by Espicom.

**Figure 2:** *Pie Chart: total world healthcare spend by major Region*

![Pie Chart: total world healthcare spend by major Region](chart.png)

*Source: P4 Digital Healthcare Customer Analysis (Appendix 1)*
Figure 3: *Pie Chart: total world healthcare pharmaceutical spend by major Region*

Total Estimated World Healthcare Pharmaceutical Spend:
$1087 Billion
Split by Region

- USA, 269, 22%
- Other Developed, 275, 22%
- Brazil, Russia, India, China, 127, 10%
- Rest of World, 552, 46%

Source: P4 Digital Healthcare Customer Analysis (Appendix 1)

Figure 4: *Pie Chart: total world medical device / equipment spend by major Region*

Total Estimated World Healthcare Medical Device / Equipment Spend:
$263 Billion
Split by Region

- USA, $134.64, 51%
- Other Developed, $102.57, 39%
- Brazil, Russia, India, China, $20.90, 8%
- Rest of World, $4.53, 2%

Source: P4 Digital Healthcare Customer Analysis (Appendix 1)
Figure 5: *Pie Chart: total world information and communications technology spend by major Region*

It will be observed that three major factors in these charts are interacting:

- **The size of the population in a Region**: Brazil, Russia, India and China and the rest of the world have relatively larger populations than other regions considered.
- **Per capita spend on healthcare**: This favours USA and other developed countries.
- **% of total expenditure spent on areas relevant to P4 Digital**: This favours USA and other developed countries for ICT and Medical equipment and BRIC / ROW for Pharmaceuticals.

From this analysis, it is concluded that for existing markets, the best geographies for P4 Digital Healthcare will be USA and developed countries. However this does not take account of growth rates. If it did, Brazil, Russia, India and China and the Rest of the World would emerge as the geographies with the biggest potential. This will occur if as is widely predicted, the current economic downturn (with associated public spending constraints) impacts the hardest on USA and other Developed Countries.
v. Approaches by leading countries / regions to development of Digital Healthcare Solutions

In the Table which follows, examples are provided of P4 Digital Healthcare solutions being implemented across the world, and which are recognised as being at the ‘cutting edge.’

*Table 3: Approaches to development of Digital Healthcare Solutions in leading countries*
*(Sources: As shown under ‘Find out More’ column. See also further examples in the Annex to this report)*

<table>
<thead>
<tr>
<th>Location</th>
<th>Activity</th>
<th>Focus areas</th>
<th>Relevance to H &amp; I</th>
<th>Find out more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Scoping of a common service that allows clinicians to securely and easily connect using online videoconferencing and desktop sharing and involving. • NT Department of Health, • WA Country Health, and • Aboriginal Services Alliance of the NT (AMSANT) Members</td>
<td>Telehealth</td>
<td>Telecommunications and IT infrastructure required for Digital Health</td>
<td>See report in Annex</td>
</tr>
<tr>
<td>Location</td>
<td>Activity</td>
<td>Focus areas</td>
<td>Relevance to H &amp; I</td>
<td>Find out more</td>
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<td>-------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Brazil</td>
<td>The BHTelehealth Project implemented systems in 148 basic health units in the city of Belo Horizonte, providing tools for the medical assistance model as well as strengthening the quality of primary healthcare. It served as a model for implementing the National Telehealth Program, across Brazil, involving 900 cities.</td>
<td>Telehealth and primary care</td>
<td>Contribution of telehealth to improved healthcare and financial model for service roll-out</td>
<td><a href="http://www.epractice.eu/files/ICT's%20Role%20in%20Healthcare%20Transformation.pdf">www.epractice.eu/files/ICT's%20Role%20in%20Healthcare%20Transformation.pdf</a> then go to Page 19</td>
</tr>
<tr>
<td>Ontario, Canada</td>
<td>Consumer digital health companies require legislative support and public investment in health IT infrastructure, particularly for electronic health records. Businesses in this sector also value: • clinician validation of their solution • use of a consumer-centric product design • digital-health leadership from within health-care institutions and from health practitioners • strong local health-care IT companies and a local talent pool • clear legal policies for privacy issues related to the storage and use of health information</td>
<td></td>
<td>Benefits sought by / the nature of support needed by consumer health businesses</td>
<td><a href="http://www.marsdd.com/dmsassets/reports/MARS_consumerdigitalhealth_2010.pdf">www.marsdd.com/dmsassets/reports/MARS_consumerdigitalhealth_2010.pdf</a></td>
</tr>
<tr>
<td>Location</td>
<td>Activity</td>
<td>Focus areas</td>
<td>Relevance to H &amp; I</td>
<td>Find out more</td>
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<tr>
<td>----------</td>
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<tr>
<td><strong>• mechanisms that enhance the credibility of online health information in this increasingly crowded market.</strong></td>
<td></td>
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</tr>
<tr>
<td>Denmark, MedCom</td>
<td>MedCom is a co-operative venture between authorities, organisations and private firms linked to the Danish healthcare sector, with the following objective: &quot;MedCom will contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector with a view to supporting good patient progression&quot;.</td>
<td>e-records, the local authority projects, the common medication card, telemedicine and surgery and laboratory medicine</td>
<td>Cross Public Sector collaboration with private sector partners</td>
<td><a href="http://www.medcom.dk">www.medcom.dk</a></td>
</tr>
<tr>
<td>Finland</td>
<td>The Ministry of Social Affairs and Health has a strong role in steering eHealth Activities in close cooperation with other national authorities such as the Social Insurance Institution (KELA) and the National Authority for Medico-legal Affairs and the National Research and Development Centre for Adoption of digital patient and client records in all levels of healthcare and social services, combined with nationwide interoperability between distributed legacy systems;</td>
<td>Model for joined up collaboration on eHealth between different</td>
<td></td>
<td><a href="http://www.ehealth-era.org/database/documents/ERA_Report/FINLAND%20country%20report%20sep07_FINAL.pdf">www.ehealth-era.org/database/documents/ERA_Report/FINLAND%20country%20report%20sep07_FINAL.pdf</a></td>
</tr>
<tr>
<td>Location</td>
<td>Activity</td>
<td>Focus areas</td>
<td>Relevance to H &amp; I</td>
<td>Find out more</td>
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</tr>
<tr>
<td>Welfare and Health (STAKES). The members of that board, representing different interest groups are nominated by the Government (23).</td>
<td>support of high level security and privacy protection, allowing citizens access to their patient records via the internet, as well as maintenance of a personal digital health and welfare record and improved management of service chains.</td>
<td>government bodies at a local and national level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>Case studies from Indonesia, South Africa and India</td>
<td>mHealth applications in developing countries</td>
<td><a href="ehealth-connection.org/files/conf-materials/mHealth_20A%20Developing%20Country%20Perspective_0.pdf">ehealth-connection.org/files/conf-materials/mHealth_20A%20Developing%20Country%20Perspective_0.pdf</a></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Hasegawa &amp; Murase (2007) found that Japan has implemented over 1 000 telemedicine projects. These projects have principally focused on Home telecare, Telemedicine, Robotics and Medical Informatics</td>
<td></td>
<td><a href="www.vinnova.se/upload/EPIStorePDF/eHealthPatientCentered">www.vinnova.se/upload/EPIStorePDF/eHealthPatientCentered</a></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Activity</td>
<td>Focus areas</td>
<td>Relevance to H &amp; I</td>
<td>Find out more</td>
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<tr>
<td></td>
<td>teleradiology (37 %) and home telecare (33 %). Most telecare initiatives</td>
<td>Relevance to H &amp; I: R &amp; I Find out more</td>
<td></td>
<td>CareProcessJapan.pdf</td>
</tr>
<tr>
<td></td>
<td>(70 %) have been implemented in rural areas where benefits are most clear.</td>
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<tr>
<td></td>
<td>Researchers point out that home telecare projects provide an important</td>
<td></td>
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<tr>
<td></td>
<td>alternative to hospital-based care for Japan’s ageing population.</td>
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<tr>
<td>Korea:</td>
<td></td>
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<tr>
<td>ubiquitous Life Care</td>
<td>Established in 2006 with funding from Ministry of Knowledge Economy of</td>
<td>Developing human lifecare technologies based on the principles of east-west</td>
<td>Model for academic</td>
<td><a href="http://ulcrc.khu.ac.kr/eng/index.php">http://ulcrc.khu.ac.kr/eng/index.php</a></td>
</tr>
<tr>
<td>Research Center</td>
<td>Korea, is a unique Information Technology Research Center dedicated to</td>
<td>neo medicine</td>
<td>and industrial</td>
<td></td>
</tr>
<tr>
<td>(uLCRC), Kyung Hee</td>
<td>developing human lifecare technologies. The centre is an interdisciplinary</td>
<td></td>
<td>sector collaboration</td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>organized research unit for technology development and education which</td>
<td></td>
<td>on development of</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>is located at Global campus of Kyung Hee University in Korea</td>
<td></td>
<td>‘human lifecare</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>technologies’</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>The IT &amp; Innovation Steering Group, consisting of a selection of</td>
<td>Political engagement</td>
<td></td>
<td><a href="http://www.ehealth-era.org/database/documents/ERA_Report">www.ehealth-era.org/database/documents/ERA_Report</a></td>
</tr>
<tr>
<td></td>
<td>representatives of the umbrella organizations (Ministry of Health,</td>
<td></td>
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<td></td>
<td>Welfare and Sport, NICTIZ, health care providers, patients and insurers)</td>
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<tr>
<td></td>
<td>meets once every six weeks under ministerial</td>
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<tr>
<td>Location</td>
<td>Activity</td>
<td>Focus areas</td>
<td>Relevance to H &amp; I</td>
<td>Find out more</td>
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<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>California State, Rural Health Association, USA</td>
<td>leadership to take decisions on and monitor the progress of such IT and innovation projects.</td>
<td>Relevance to H &amp; I</td>
<td>s/eHealth-ERA_Report_Netherlands_03-10-07_final.pdf</td>
<td></td>
</tr>
<tr>
<td>The Indus Entrepreneurs, Silicon Valley USA</td>
<td>The Association has recently published a report on the eHealth environment in California of relevance to California rural health providers and those that use the rural health care delivery system. The report shows how another Region with a significant rural population (as in H &amp; I) is identifying and organising to address barriers and challenges for rural health providers adopting eHealth. It also discusses of the policy implications associated with these opportunities.</td>
<td>Approach of another Region with a large rural population: a potential partner?</td>
<td><a href="http://www.csrha.org/advocacy/alerts/">www.csrha.org/advocacy/alerts/</a> csrha_eHealthreport.pdf</td>
<td></td>
</tr>
<tr>
<td>The Indus Entrepreneurs, Silicon Valley USA</td>
<td>The mission of TiE Life Sciences SIG is to foster entrepreneurship in its major segments and to support entrepreneurs, building businesses in the traditional and emerging Life Sciences technologies. The goal is to promote the synergy of diverse technologies with Life Sciences and to provide educational resources to entrepreneurs who create innovative products. Regular events are held.</td>
<td>Biotechnology, Medical Technologies (Devices, Equipment and Supplies) and Pharmaceuticals</td>
<td>Model for developing entrepreneurs</td>
<td>sv.tie.org/page/tie-lifescience-sig</td>
</tr>
</tbody>
</table>

Status: Final
b. **Customer expectations from digital healthcare**

The Top 10 customers for Digital Healthcare were identified in Section 3.a.iii (Table 2) above. This Section goes into more detail:

- In Table 4, a top level overview of why these customers are investing in Digital Healthcare is provided.
- This is followed by a more detailed review of what results or outcomes are being sought by major stakeholder groups such as the Public Sector, the consumer or patient, businesses (pharmaceuticals, private hospitals / healthcare organisations).

The Section concludes with a review of what sort of Digital Healthcare R & D initiatives are being funded by the European Commission. This is proposed as a proxy illustration of the hottest R & D topics worldwide.

**Table 4: Customer wants and needs**

<table>
<thead>
<tr>
<th>Top 10 Customers</th>
<th>Affiliation</th>
<th>Needs / Wants</th>
</tr>
</thead>
<tbody>
<tr>
<td>National NHS</td>
<td>Public Sector</td>
<td>Value for money</td>
</tr>
<tr>
<td>Public Hospitals</td>
<td></td>
<td>Effective</td>
</tr>
<tr>
<td>Public Primary Care</td>
<td></td>
<td>Public accountability</td>
</tr>
<tr>
<td>Social Services</td>
<td></td>
<td>Improved patient outcomes</td>
</tr>
<tr>
<td>Research Based Pharmaceuticals</td>
<td>Pharmaceutical</td>
<td>Speed to market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Innovative drugs</td>
</tr>
<tr>
<td>Contract Research Organisations</td>
<td></td>
<td>Protection of IPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access to rich information</td>
</tr>
<tr>
<td>Retail Pharmacy</td>
<td>Retail</td>
<td>Customer service</td>
</tr>
<tr>
<td>Private Care Companies / Homes</td>
<td>Private health and care</td>
<td>Profitable service delivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer service</td>
</tr>
<tr>
<td>Private Hospitals</td>
<td></td>
<td>Differentiation</td>
</tr>
<tr>
<td>Private Diagnostics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Separate market segment and customer analysis reports prepared by Consard for Highlands and Islands Enterprise (Appendices 1 and 2).*
In the Annex to this report, major global companies and some smaller businesses go into more
detail about how their P4 Digital Healthcare solutions are meeting the needs of these customers
groups across the world.

i. Public Sector perspective

A good summary of significant results from Digital Healthcare from the perspective of public
sector customer groups, is provided by an article by Kevin Doughty published in the Telecare
Services Association Review. These have been updated and are presented in the table below.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source</th>
<th>Study</th>
<th>Results / Evidence</th>
</tr>
</thead>
</table>
| Randomised clinical trial | England: Evaluations of Whole System Demonstrator Projects | Various telehealth interventions in Kent, LB Newham and Cornwall | Full publication is still awaited. So far, the English Department of Health has announced the following headline results:
  • 15% reduction in A&E visits;
  • 20% reduction in emergency admissions;
  • 14% reduction in elective admissions;
  • 14% reduction in bed days;
  • 8% reduction in tariff costs.
  • Potential for correctly deployed telehealth to reduce mortality by 45% . |
<p>| Review                    | National Institute for Clinical Excellence | Telemonitoring of Heart Failure         | 8 RCT’s showed reduction in rates of mortality and hospitalisation                  |
| Review/ meta analysis     | Cochrane                            | Telemonitoring of Heart Failure           | 11 RCT’s showed cost savings of 35-86%                                              |
| Large evaluation          | University of Kent                  | Telemonitoring of COPD, CHD and Diabetes  | Average savings over a 6 month period of £1878 per patient                          |
| Local evaluation          | University of Aberdeen              | Various telehealth interventions in      | Number of bed days reduced from 72 to 8 over a 9 month period for patients with      |</p>
<table>
<thead>
<tr>
<th>Large Evaluation</th>
<th>Argyll and Bute</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newhaven Research / Joint improvement Team</td>
<td>An Assessment of the Development of Telecare in Scotland 2006-10</td>
<td>c. 1,500 hospital discharges were expedited due to Telecare Development Programme 2006-10</td>
</tr>
</tbody>
</table>

Source: Kevin Doughty, Telecare Services Association Review, updated with Whole Systems Demonstrator results

Other significant sources of evidence on global best practice (see also Annex) include:

- Telehealth Infrastructure Services, NICTA Report, Northern Territory, Australia July 2011
- ‘eHealth priorities and strategies in European countries’ prepared by Empirica for the European Commission includes country by country eHealth benchmarking analysis
- The conclusions of the Council of the European Union on safe and efficient healthcare through eHealth 1/12/09
- Telehealth Framework report published by 2020 Health. This was designed to influence the Coalition’s policy for the NHS in England (see the recent announcement by Prime Minister Cameron referenced at 2.3.b. Hot Topics above). The following aspects are of particular significance or interest to P4 Digital Healthcare in the Highlands and Islands:
  - Segmentation of Telehealth impact
  - Classification of benefits achievable by private and public sector bodies
  - Service segmentation and definitions for Telehealth, Telecare and Teleconsultations
  - Outline and analysis of the Telehealth service delivery model.
The following developments are considered indicative of the likely future direction of travel in consumer driven P4 Digital Healthcare:

- NHS Direct in England and NHS 24 have pioneered P4 Digital services for consumers. It is relevant to note that for instance in the first month of release, 240,000 apps. were downloaded to phones in the first month of release. NHS Direct Apps now represent 50% of online usage for NHS Direct.
- NHS Direct has 10 syndication partners for spreading health information.
- NHS 24 Symptom Checker and other digital services
- Glasgow School of Art / Moray Telewear Project involving users in design of telecare devices won a Scottish Social Services Council Care Accolades Award in 2011.

**iii. Business perspectives**

- Pharmaceuticals: Fiscal austerity and increasing healthcare costs from an ageing population are leading to fundamental changes in how therapeutics are valued and ultimately priced. For many years commercial organisations set price and healthcare systems made decisions on patient access and uptake of new products. In the emerging pricing and reimbursement environment companies will be required to demonstrate the value of their products in real clinical settings and price is set by the healthcare system based on evidence of value. Healthcare companies and systems need to capture, interrogate and report on the value of interventions in real-world clinical settings which is opening up opportunities for P4 companies and products. For the Pharmaceutical Industry in Scotland:
  - Chronic disease management accounts for c. 80 % NHS costs, so has the most to gain from P4 interventions.
  - With value based pricing for pharmaceuticals, patient reported outcome measures (PROMS) are central to valuing medicines in the future.
  - Patient Safety –emphasis on screening, monitoring, process and clinician decision support –potentially deliverable though P4.
Preventative – screening for certain conditions through electronic questionnaires to identify patients but also to assess feasibility for clinical trials. E.g. Health Checks in England.

The Patent Cliff and NHS Reform: companies may lose £270 million revenue from Scotland alone when some key medicines go off patent. Many are looking at new revenue streams. Health and technology is a prime target, involving partnerships with small firms.

- Private Hospitals and diagnostic services in Scotland are currently relatively small business operations – especially by comparison with parts of England and other countries. This seems unlikely to change without a significant change in government policy.

- Private sector nursing homes and housing providers are significant actors within the Scottish Care sector with close relationships with Social Services and Community Health Partners. Their active involvement in policy initiatives to better integrate services and collaborate across organisational boundaries is a critical success factor.

iv. Research and Development Challenges

European Union Funded Research and Development: the health theme has been allocated €6.1 billion for 2007 to 2013. It represents one of the largest research programmes worldwide and is to that extent representative the direction of travel of other similar programmes worldwide. Total 2012 budget allocation for health is €656 million with the following areas of relevance to P4 Digital Healthcare being funded:

<table>
<thead>
<tr>
<th>Table 6: European Commission: prioritised areas for health related research and development</th>
</tr>
</thead>
</table>
| Health Conditions | Cancer, respiratory diseases and cardiovascular disease 
Personalised medicine, -omics, HIV/AIDS, Malaria and TB 
Ageing-related medical technologies |
<p>| Medical | For artificial organs, diagnostics for infectious diseases, management of |</p>
<table>
<thead>
<tr>
<th>technologies</th>
<th>diabetes, sensory impairment, chronic inflammatory disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patient Guidance Services (PGS)</td>
</tr>
<tr>
<td></td>
<td>Virtual Physiological Human (VPH)</td>
</tr>
<tr>
<td>Patient guidance</td>
<td>Personalised health status for Neurodegenerative diseases, Rehabilitation of stroke and neurological conditions, Liver failure:</td>
</tr>
<tr>
<td>“Ageing Well”</td>
<td>Smart and self-adaptive environments prolonging independent living:</td>
</tr>
<tr>
<td></td>
<td>Service and social robotics systems</td>
</tr>
<tr>
<td>mHealth</td>
<td>mHealth solutions for lifestyle and disease management.</td>
</tr>
<tr>
<td>Competitiveness and Innovation</td>
<td>Empowering patients via secure online access to medical records</td>
</tr>
<tr>
<td>Programme</td>
<td>Support for widespread deployment of telemedicine services</td>
</tr>
<tr>
<td></td>
<td>Thematic networks</td>
</tr>
</tbody>
</table>

Source: Derived from information published on Cordis European Commission Research and Development Information Service.

Go to: http://cordis.europa.eu/home_en.html
c. Growth in the market

This Section reviews published evidence on market growth of products and services of relevance to Digital Healthcare, and compares this with growth projections for other Sectors. Since Digital Healthcare is an emerging market, and growth predictions have often proved optimistic in practice or for some segments do not yet exist, the Section also identifies in Table 7 some of the major initiatives will drive growth in the market, or which can be taken as indicators of strategic intent by some major global companies.

Life Sciences

The cumulative annual growth rate (CAGR) for Life Sciences is typically reported as being in the range 3-7%. For instance Datamonitor’s 2011 Global Pharmaceutical Industry Guide reports that the global pharmaceuticals, biotechnology, and life sciences industry group generated total revenues of $1,071.7 billion in 2009, representing a compound annual growth rate (CAGR) of 6.7% for the period spanning 2005-2009. In more detail:

- The global biotechnology market had total revenue of $200 billion in 2009, representing a compound annual growth rate (CAGR) of 10.2% for the period spanning 2005-2009.
- The global generics market had total revenue of $149.7 billion in 2009, representing a compound annual growth rate (CAGR) of 11% for the period spanning 2005-2009.
- The global life sciences tools and services market generated total revenues of $18.1 billion in 2009, representing a compound annual growth rate (CAGR) of 10.5% for the period spanning 2005-2009.
- The global OTC pharmaceuticals market generated total revenues of $110.7 billion in 2009, representing a compound annual growth rate (CAGR) of 3.9% for the period spanning 2005-2009.
- The global pharmaceuticals market is expected to have total revenue of $693 billion in 2010, representing a compound annual growth rate (CAGR) of 4.8% for the period spanning 2006-2010.
P4 Digital Healthcare including Pharmaceuticals

Authoritative reports have not been identified which predict growth in all the market segments which are relevant to P4 Digital Healthcare. In other words, reports which analyse one interconnected market for medical equipment, and the health and social care markets for information and communications technology have not been identified. The approach taken therefore has been to use growth estimates published in authoritative reports on sub segments whenever these have been identified. These include the following:

- Teleradiology CAGR (2012-17) globally reported at 14.5% (eHealth Insider).
- CAGR estimates for telehealth, telecare and mHealth predict very widely and in some cases do not originate from trusted sources. Estimates in the range 15-55% have been identified. On 21st September: inMedica, a Division of IMS research predicts the global market for telehealth technology will reach $1 billion by 2015 and grow to about $6 Billion by 2020. Current global market is worth $163 Million and driven by shipments of 'telehealth gateways' and peripheral devices for remote patient monitoring (wireless).
- Global market for elder care technologies expected to grow $2.6B today to $4B by 2015 (8.7% CAGR) (Scottish Enterprise / BBC Research)

This report has used estimates which are informed by the authors' knowledge of overall developments in the market and announcements about initiatives which will generate growth in the segments considered. Recent announcements about initiatives which will generate growth are summarized in the box below.

Overall, it is noted that until 2009, the UK was commonly identified as one of the faster growing markets in the world (linked to the now discontinued National Programme for IT in England). More recently the US has emerged as the fastest growing market, due to the Obama health reforms and associated investments in technology.
Table 7: Digest of announcements about initiatives which will drive market growth

**May 2011**: 30% US Doctors using an iPad (Manhattan Research May 2011), a further 30% are planning to get one in next 6 months.

**1st July 2011**: Australia announces incentives for telehealth videoconferencing with patients in rural and outer metropolitan areas to provide more equitable access to health specialists. Incentives include $620 M in Medicare rebates, a $6000 bonus for practitioners when they use technology for first consultation and $20 every time a telehealth service is bulk billed in the first year.

**Summer 2011**: by Summer 2011, > $650M has been paid out in incentives to organisations and health professionals to adopt electronic health records in US.

**21st September 2011**: Australia Government is creating a nationwide electronic health record platform (Personally controlled electronic health record). Suppliers include Telstra (cloud based hosting), Oracle, Orion Health and Accenture. Funding is $467M over 2 years.


**October 2011**: The Economist predicts a 10 fold increase in mobile connected devices (Smartphone, tablet) in use between 2008 and 2020 - from 1 Billion devices to 10 Billion.

**October ’11**: US Veterans Administration reported to be considering purchase of tablets for 100,000 staff

**October 2011**: The Department for Health (in England) has confirmed that the non-emergency 111 service offering patients NHS care and advice over the telephone and online will be introduced across England by April 2013. The new service will combine functions provided by NHS Direct and local out of hours services and allow GPs to link their own booking systems. This will give patients the opportunity to book appointments if they need to see their GP urgently, or if they need to see a nurse or need an urgent home visit in the middle of the night. The DH also said that NHS 111 content will be available online, allowing people to access health information, a directory of local services and check their symptoms as well as being able to connect to a 111 call advisor.

**December 2011**: GE Healthcare and Microsoft have announced the formation of a new
50:50 JV as yet unnamed. It is due to be launched in H1 2012 and will be headquartered near to the Microsoft campus in Redmond with a significant presence in Salt Lake City, Utah.

Additional sites will be established globally as the JV develops. The new company will develop an open platform that will be available to ISVs to develop new clinical applications. In addition, the company will develop its own range of healthcare applications on the platform incorporating existing products including:

- Microsoft’s enterprise health intelligence platform, Amalga
- Microsoft’s single sign-on and context management solutions, Vergence and expreSSO,
- GE Healthcare eHealth, a Health Information Exchange platform
- GE Healthcare Qualibria, a clinical knowledge application environment

Source: Separate market segment and customer analysis reports prepared by Consard for Highlands and Islands Enterprise (Appendices 1 and 2)
d. Segments within the market

This Section breaks down P4 Digital Healthcare into its component parts. It identifies the major segments and the sub segments within them, in a way which is recognizable to for instance the existing major customer and supplier groups within the market (Table 8 below). This is followed by a qualitative analysis in Table 9, which explains how the P4 Digital Healthcare segments with high potential have been identified.

Table 8: Market segmentation – products and services for P4 Digital Healthcare

<table>
<thead>
<tr>
<th>P4 Segments</th>
<th>Sub Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Infrastructure services</td>
<td>National eHealth Applications</td>
</tr>
<tr>
<td></td>
<td>Health Infrastructure enablers</td>
</tr>
<tr>
<td></td>
<td>National Access and triage services</td>
</tr>
<tr>
<td></td>
<td>Screening and Disease Registers</td>
</tr>
<tr>
<td>Local Infrastructure</td>
<td>Information and Communications Technology (ICT) customised for Healthcare</td>
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<td></td>
<td>Inter-operability across care settings</td>
</tr>
<tr>
<td></td>
<td>Security, identification and access solutions for Health</td>
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<td>Portals</td>
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<td></td>
<td>Hosting / Cloud Computing for Healthcare</td>
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<td>Local applications</td>
<td>e-Prescribing</td>
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<td></td>
<td>Clinical Decision-Support &amp; Specialty record systems</td>
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<td>Patient Safety</td>
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<td>Closed Loop Clinical Systems (Call Centre based)</td>
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<td></td>
<td>Managed clinical networks</td>
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<tr>
<td></td>
<td>Clinical trials / test beds for new models of service delivery</td>
</tr>
<tr>
<td></td>
<td>Mobile devices and wireless</td>
</tr>
<tr>
<td>Consumer</td>
<td>Intelligent Medical devices (at home / primary care/ self ) monitoring solutions</td>
</tr>
<tr>
<td></td>
<td>Lab on a chip / point of care / diagnostic testing</td>
</tr>
<tr>
<td></td>
<td>Social networking &amp; TV</td>
</tr>
<tr>
<td></td>
<td>Consumer mHealth</td>
</tr>
<tr>
<td></td>
<td>Personal Health Records</td>
</tr>
<tr>
<td>Customer Relationship Management / Patient accessibility solutions</td>
<td>Self Service kiosks</td>
</tr>
<tr>
<td></td>
<td>Booking Centres &amp; Scheduling</td>
</tr>
<tr>
<td></td>
<td>Web-based information services</td>
</tr>
<tr>
<td></td>
<td>ePharmacy / electronic transfer of prescriptions</td>
</tr>
<tr>
<td>Therapy Areas</td>
<td>Digital solutions for neurological conditions</td>
</tr>
<tr>
<td></td>
<td>Digital solutions for COPD</td>
</tr>
<tr>
<td></td>
<td>Digital solutions for other long term conditions</td>
</tr>
<tr>
<td>Medical Devices and Imaging</td>
<td>Picture Archiving and Imaging Systems (PACS)</td>
</tr>
<tr>
<td></td>
<td>Networks and sensors for medical devices (secondary care)</td>
</tr>
<tr>
<td></td>
<td>Radiotherapy</td>
</tr>
<tr>
<td></td>
<td>Other Imaging</td>
</tr>
<tr>
<td>Teleservices</td>
<td>Telecare</td>
</tr>
<tr>
<td></td>
<td>Telehealth</td>
</tr>
<tr>
<td></td>
<td>Teleconsultations</td>
</tr>
<tr>
<td></td>
<td>mHealth</td>
</tr>
</tbody>
</table>
Enterprise resource planning / Performance Management

| Business Intelligence for Health (performance management and reporting, predictive risk modelling and adjustment) |
| Human Resource (staff rostering) |
| Finance and Billing |

Health or care related record systems

| Integrated clinical record systems - secondary and tertiary care |
| Integrated clinical record systems - primary care |
| Voice recognition / Digital Dictation |
| Document Management |

Source: Separate market segment analysis report prepared by Consard for Highlands and Islands Enterprise (Appendix 2)

In the Annex to this report, examples are provided of the P4 Digital Healthcare products and services which are being marketed by major global companies and some smaller businesses.

Sub segments considered for potential inclusion as part of P4 Digital initiatives within the Highlands and Islands were those where:

- High growth rates were present
- High revenues already exist in the UK Market > £100M p.a.
- Research funding is available or initial commercial deployments are just starting.

This then suggested the following segments with high potential for HIE.

**Table 9:** P4 Digital Healthcare market segments with high potential

**High growth rates (Cumulative Annual Growth Rate (CAGR) > 8%) in UK**

- ICT customised for Healthcare
- Inter-operability across care settings
- Portals
- Hosting / Cloud Computing for Healthcare
- Closed Loop Clinical Systems (Call Centre based)
- Managed clinical networks
- Clinical trials / test beds for new models of service delivery
- Mobile devices and wireless
- Intelligent Medical devices self-management monitoring solutions
- Lab on a chip / point of care / diagnostic testing
- Social networking related to health
- Neurological Conditions
- COPD
- Telehealth
- mHealth
Revenues in UK Market estimated @ > £100M p.a.

National eHealth Applications  
Health Infrastructure enablers  
National Access and triage services  
Hosting / Cloud Computing for Healthcare  
e-Prescribing  
Clinical Decision-Support & Specialty record systems  
Booking Centres & Scheduling  
PACS  
Networks and sensors for medical devices (secondary care)  
Telecare  
Integrated clinical record systems - secondary and tertiary care  
Document Management

Significant Research or development focus

Closed Loop Clinical Systems (Call Centre based)  
Managed clinical networks  
Clinical trials / test beds for new models of service delivery  
Intelligent Medical devices / self-management monitoring solutions  
Lab on a chip / point of care / diagnostic testing  
Social networking related to health  
Consumer mHealth  
Personal Health Records  
Self Service kiosks  
Telehealth  
mHealth

Source: Separate market segment analysis report prepared by Consard for Highlands and Islands Enterprise (Appendix 2)
e. Problems in scaling up telehealth and telecare initiatives

P4 Digital Healthcare (or to be more precise the telehealth and telecare components) is not yet happening at scale in UK or most of the rest of the world. Overcoming ‘pilotitis’ has been an important justification for funding both the Technology Strategy Board’s DALLAS programme and the English Department of Health’s Whole System Demonstrator Project. There are few if any examples of system wide successes, with the possible exception of the Veteran’s Administration, which does however operate as an integrated organization in most respects. Some further examples are provided in the Annex.

**VA sets the telehealth table:** The Veterans Health Administration’s pioneering telehealth program is drawing the attention of health care reformers, but how soon and how much such approaches can help remains to be seen. Alice Lipowicz May 24, 2010

Each day, thousands of retired veterans don an electronic cuff at home that records their pulse and blood pressure and sends the information to care coordinators at the Veterans Health Administration. The patients also punch buttons in an electronic desktop box to indicate whether they feel shortness of breath or have swollen ankles. The care coordinators flag all problems that need immediate attention.

For Dr. Adam Darkins, the top telehealth executive at VHA, the greatest benefit of the Care Coordination/Home Telehealth program is that it allows older patients with chronic conditions to live at home independently for a longer time. And the patients indicate that they like it, too.

“We are getting patient satisfaction scores of 86 percent, which are very high levels,” said Darkins, VHA’s chief consultant of care coordination. “The patients have to do less travel, and they can get problems resolved quickly…. They feel the care coordination system is their lifeline.” The Veterans Affairs Department has taken a lead role in adopting telehealth strategies, and it is expanding those programs as word has spread of its good results, such as reductions in hospital admissions and shorter hospital stays for the telehealth populations, which result in lower costs. “We have seen a sustained growth in telehealth, and it is exciting to be recognized for that,” Darkins said.
The problems involved in scaling up are fully analysed in academic papers analyzing policy, legal and other dimensions, as referenced in Annex. However there is also a commercial perspective - Intellect, a UK Trade body, recently commissioned a view from (Information and Communications Technology) members on commercial models for large scale Telehealth roll-out in England. (See also Report Annex).

Problems highlighted include the following:

- **Funding:** “It takes about four years on average to reach a level of benefits that exceeds the costs” Funding and incentive models need to deal with this – Source – eHealth is Worth it? EU study.
- **Demographics:** Start with the quick wins and build out - younger people and the middle aged are now technology savvy - start with this group and aim to transform key segments of healthcare delivery over a 10-year period.
- **Political / organisational:** As a nation, we need to recognise and deal with the “Elephant in the room”
  - Politics around Hospital closures and service reconfiguration
  - NHS’s poor record in disinvestment and change management
  - Overcome the barriers on Gain sharing
  Clinician led eHealth programmes work – so find ways of stimulating clinician’s creativity and harness their support
- **Commercial**
  Industry already believes it can deliver Telehealth as a service at scale – but this has to be in collaboration with NHS. NHS and Industry must reach agreement on fair pricing and gain sharing formulae….Trust the market
4. **The policy backdrop**

It is clear that digital healthcare offers significant growth opportunities, even if the potential is not yet being fully realized. It has already been noted that in this market, the public sector is a key customer. Regulatory considerations are also important. So when considering what is required to capitalise on digital healthcare opportunities in the Highlands and Islands, it is important to be clear about relevant public policy objectives, and how these impact on delivery of health and social care services, on public services more generally and as well as on economic development initiatives.

For health and care services in Scotland and UK, there is a policy and funding shift away from secondary and tertiary care provision (hospital-based) and towards primary care (care by general practitioners or in the home) and prevention. Other important policy themes which may provide opportunities for digital healthcare services to deliver value to public sector customers include:

- greater integration of health and care services at a local level,
- tackling waste, duplication and inefficiency,
- support for self-directed care (patients choosing which services to fund)
- releasing the potential of digital technology to drive better public service delivery and improving the procurement, management and use of digital technology

Announcements from Prime Minister Cameron about closer links between the health service and the life science sector and a statement of intent to ‘deliver this (telehealth) technology across the country to improve 3 million lives over the next five years’ are clearly positive signals for development of digital healthcare within the UK. It is also clear that Scotland and within Scotland, the Highlands and Islands is a leader in early stage telehealthcare deployments.

The Scottish Government’s Economic Strategy makes extensive reference to the health sector in the context of public sector reform, of the overall health and wellness of the population and of planned changes to public procurement. HIE’s economic development plans emphasise the important existing contribution of the life sciences sector and set the scene for a focus on digital healthcare as a driver for economic development within the Region.
This Section discusses the influence of policy on the development of the market, with a specific focus on UK and Scotland. This is relevant to understanding who the lead players are regionally and globally, and what they are seeking to achieve and why (see objective 4 of this report).

a. Health and social care

i. Health and social care policy

In the UK and many other countries, healthcare provision is funded by public money. So as well as considering the wants and needs of public sector customers (as in Table 4 above), it is also important to consider government policy objectives in health and social care. These objectives often lie at the heart of decisions (by government) to invest in deployment of Digital Healthcare solutions, and are typically predicated on the expectation that deployment will make it possible to implement policy better, more effectively and sometimes more cheaply. An overall illustration of policy direction in health and social care is provided in Figure 6, and this is followed by a review of relevant policy initiatives in UK.

*Figure 6: Illustration of UK policy direction in healthcare*

### Policy Direction

[Diagram showing policy direction]

Source: Consard Limited
A digest of current pubic sector policies in Scotland which impact health and social care follows:

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>John Swinney, Cabinet Secretary for Finance, Employment and Sustainable Growth:</strong> Our approach closely reflects the key themes and aims of the Christie Commission’s report. It is built on four pillars:</td>
</tr>
<tr>
<td>• a decisive shift towards prevention;</td>
</tr>
<tr>
<td>• greater integration of public services at a local level driven by better partnership, collaboration and effective local delivery;</td>
</tr>
<tr>
<td>• …..a sharp focus on improving performance, through greater transparency, innovation and use of digital technology.</td>
</tr>
</tbody>
</table>

**Enhancing Value for Money:** Tackling waste, duplication and inefficiency is now a top priority for all those in public service and we will encourage the swifter adoption of proven strategies for improvement and the rapid roll-out of reforms. In so doing, we will not shirk the difficult decisions and we will be resolute in prioritising the public interest in achieving better outcomes ahead of narrow sectoral concerns. Communities want services that work effectively and efficiently.

As a responsible Government, we believe it vital to the future sustainability of our public services that we take swift action to:

- *accelerate progress in building prevention into the design and delivery of all our public services;*
- *focus support in the first few years of life ....;*
- *unlock resources currently invested in dealing with acute problems;*
- *tackle inter-generational cycles of inequality and pockets of disadvantage …*

As part of our approach, we are introducing *new funds to support preventative spending:*

- a continuation of the Change Fund for older people’s services. The fund currently amounts to £70 million within the NHS budget for 2011-12. This will increase to £80m ...within NHS budgets, supplemented by funding from local partners.
- an Early Years and Early Intervention Change Fund.
**Christie Commission:** Renewing Scotland's Public Services


- **Renewing Adult Health & Social Care:** The Scottish Government is committed to the introduction of an integrated system of health and social care to ensure that older people continue to receive the care, compassion, support and dignity they need and deserve.

  - Strong evidence suggests that better outcomes for people, better use of resources (money and people's time) and better experience of care and support can all flow from services that are planned and delivered in an effectively integrated way.

  - Community is at the heart of our approach and Community Planning Partnerships will continue to play a significant role. Our priorities for improving partnership during this Parliament include:
    - **integrating health and social care across Scotland** to ensure that services are organised around the needs of the individual;
    - **enactment of the Social Care (Self-directed Support) Bill**;
    - continuing closer joint working between GPs, pharmacists and other community services;

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**McClelland Review of ICT Infrastructure in Public Sector in Scotland**

- The public sector, at all levels, can do more to transform how it procures, manages and uses digital technology to drive better public service delivery.

- We need to ensure that services are tailored to meet the needs of individuals and communities – exploiting the full potential of ICT will be critical in achieving this transformation.
ii. From Audit Scotland report on Telehealth 2011:

Note the presence of ‘wide range of telehealth initiatives’ within Highlands and Islands Boards in comparison with almost all other NHS Boards in Scotland.

*Figure 7: Audit Scotland’s mapping of telehealth initiatives within NHS Boards*
b. Economic development

i. The economy of Highlands and Islands and HIE’s role

Figure 8: Map of Highlands and Islands showing fragile areas and areas with employment deficit

Red Highlight: Fragile Area
Green Highlight: Employment Deficit

Source: Highlands and Islands Enterprise

Highlands and Islands Enterprise (HIE) is the Scottish Government's development agency for a diverse region which covers more than half of Scotland and is home to around 450,000 people. Its role is to develop sustainable economic growth across the region. To achieve this it creates infrastructure for future investment, assists large and small businesses with growth aspirations and has a unique role strengthening communities, particularly in fragile areas.

HIE supports the growth ambitions of business and social enterprise clients by creating close working relationships in order to accelerate growth in turnover, profitability, wage levels, exports and therefore gross value added (GVA) in the HIE area.

Life Sciences is an emerging sector which is rapidly growing in importance regionally, nationally and globally. The growing number of life science businesses based in the Highlands and Islands is
confirmation of the region's potential and evidence of Highlands and Islands Enterprise's committed support for the sector. Over 50 organisations employ approximately 1,800 full time-equivalent staff (FTEs) in the region, and provide salaries totalling £49 million. Most businesses in the sector are relatively small, with fewer than 20 employees. LifeScan Scotland is the largest Life Sciences employer in Scotland with around 1,300 employees.

The sector contributed £131 million to the economy (Gross Value Added) in the financial year 2008/09 which was a 23% increase on the figure for 2006/07. The regional sector has a £194 million turnover. It is against this background, that HIE has commissioning this scoping study to explore the evolving role of digital technology in healthcare.

ii. Scottish Government’s economic strategy

The strategy speaks for itself and applies to Highlands and Islands as well as the rest of Scotland. The synopsis below highlights those aspects of the strategy which are of specific relevance to P4 Digital Healthcare such as public sector reform, health and wellness of the population and public procurement.

Table 10: Extracts relevant to Digital Healthcare


<table>
<thead>
<tr>
<th>Strategic Priority</th>
<th>Actions relevant to P4 Digital Healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Targeted) Strategic Objectives and National Outcomes:</td>
<td>The kind of Scotland we want to live in is... HEALTHIER – Help people to sustain and improve their health, especially in disadvantaged communities, ensuring better, local and faster access to health care. Particular actions in our growth sectors include: ….Capturing the significant opportunities for Scotland in Life Sciences, driven by global trends in health care, wellbeing and demographics. In supporting the Life Sciences Scotland Strategy, we are focused on building a sustainable company base; realising the significant economic benefit from areas of world-class research including regenerative and translational medicine; and capitalising on key business opportunities in medical technologies and pharmaceutical services;</td>
</tr>
</tbody>
</table>
## Public Procurement

Our actions in this area include:

- Using public procurement to maximum effect to promote economic growth. Whilst European rules do not allow us to discriminate in favour of Scottish firms, we will help public bodies to design their contracts in a way which gives Scottish firms, particularly SMEs a fair chance to compete;
- Using public procurement to encourage innovation in both the public and private sectors – allowing bidders to come up with new ideas wherever possible;

## Strategic Priority 1: Supportive Business Environment

Focus our efforts on growth companies, growth markets and growth sectors.

Key actions in this area include:

- Advice and support to help SMEs grow, and hire staff
- Promoting Scottish exports with target to deliver a 50% increase in exports by 2017;
- Strengthening innovation and commercialisation, including improving the links between our universities and private sector companies;

## Strategic Priority 4: Infrastructure Development and Place

Setting out plans for a Next Generation Digital Fund to accelerate the delivery of superfast broadband across Scotland;

Key actions in this area include:

- Increasing the public sector’s direct contribution to the economy through smart use of public procurement, in order to promote jobs and growth;
- Encourage innovation...and help Scottish firms, particularly SMEs, compete effectively for contracts;
- Ensuring that Scotland’s public services remain fit for purpose, and affordable, in these challenging times and into the future;
- Commitment to further improve the efficiency of the public sector

## Strategic Priority 5: Effective Government

Focus on preventative spend to tackle social and health problems;

- Delivering with key commitments including prioritising health budgets,
- Supporting the development of an enterprising third sector in Scotland.
5. Highlands and Islands in context

Objective 5 of this report is to ‘Articulate the strengths and opportunities associated with P4 Digital activity within the Highlands and Islands and within Scotland, along with current constraints and barriers to growth.’

It is concluded that Highlands and Islands has the potential to become a world leading location for P4 Digital Healthcare products and services which deliver value to public primary care services and social services organisations (especially in remote and rural settings) as well as to research based pharmaceutical organisations. Customer groups within the Region already have a relevant track record. HIE should focus support activities on these customer groups and the market segments of interest to them. By the same token, HIE should de-prioritise activities which do not address these target groups or market segments of interest, since the same potential does not exist for economic developments. Market segments of interest to these groups can be expected to evolve over time but currently include (for public primary care services and social services): Booking Centres & Scheduling, Inter-operability, Clinical trials / test beds for new models of service delivery, Call Centre based Clinical Systems, Intelligent Medical devices (self-monitoring), Lab on a chip / diagnostic testing, Social networking & TV related to health, Telecare, Consumer mHealth, mHealth, Telehealth, Business Intelligence.

Organisational innovation and system redesign are critical to primary care services and social services organizations. It is therefore critical that HIE frames optimal engagements with leading local organisations, managers and professionals from these customer groups. There also needs to be an explicit economic development objective and a shared commitment to implement innovative services supported by business, capable of delivering superior outcomes. For these customer groups, this aspect will be more important than clinical or technological innovation. For research based pharmaceutical companies however, clinical innovation is the top priority.

The Region has many attractions of relevance to an aspiration to become a world leading location for digital healthcare for primary and social care services and for research based
pharmaceuticals. These include existing and planned implementations (such as DALLAS), the presence of an academic, educational research base, a group of committed stakeholders and some leading businesses already in operation.

However, it is also clear and a matter of concern that some key public sector stakeholders do not yet fully understand or are not yet committed to supporting regional wide economic development initiatives for digital healthcare. Existing plans for use of digital healthcare by the key customer groups do not yet appear likely to lead to the creation of a vibrant local market, and with some exceptions the Region is not yet perceived as a leading location within Scotland for digital healthcare. It is also not clear to potential inward business investors how successful implementations could lead to a Scotland or UK wide roll-out or business opportunity, but this is a problem also faced by business in other locations (within UK and in other countries). In discussing the way forward with stakeholders in the public sector it was clear that differing views existed on the optimal approach to rolling out digital healthcare solutions. Some favoured a local approach; others considered it essential for roll-out to occur within an overarching national framework. No one specifically advocated a regional – H & I wide – approach and the case for economic development case did not appear to carry weight. There was also scant evidence (with the exception of the Western Isles) of Board level commitments to implement digital health or care solutions as part of a broader programme of system transformation.

There is an as yet unrealized opportunity to engage more effectively with key local customer groups on how digital technology could be deployed to foster innovative approaches to solving long standing problems and achieve key business objectives, such as closer integration of health and social care services or self-directed care. A clear potential also exists to attract inward investment through external grant funding.

H & I is not the only UK Region which sees the potential of Digital Healthcare. It will be important that initiatives ‘join up’ across the Region. A critical mass of support for wider deployment of digital healthcare solutions could be created but does not yet exist. Were this to emerge, it could be significant both within Scotland and internationally and would in turn translate into business opportunity for a supplier base operating ‘at the cutting edge’.
a. **Digital Healthcare in the Highlands and Islands**

This Section applies the analytical framework developed earlier in the report to the situation in the Highlands and Islands:

- In Section 3.a. above, the major customer groups for Digital Healthcare were described. The extent to which these major customer groups are present in the Highlands and Islands is explored in Table 11 below.

- In Section 3.d. above, the structure of the Digital Healthcare market was presented, and the sub segments with the highest potential were highlighted. In Table 12 below, the current status of these high potential market segments in the Highlands and Islands is reviewed. In Table 13, further information is provided about the business model for these segments and current status within Highlands and Islands.

Highlands and Islands companies active in the P4 Digital Healthcare market are analysed and their locations mapped.

**Table 11: Presence of top customer groups in Highlands and Islands**

<table>
<thead>
<tr>
<th>P4 Customer Groupings</th>
<th>Assessment</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Hospitals</td>
<td></td>
<td>Lack of teaching or specialist hospital means services offered in H &amp; I geography are limited in comparison with other (Scottish) geographies. This however may present opportunities for novel partnerships with more specialised services out with the Region.</td>
</tr>
<tr>
<td>Public Primary Care</td>
<td></td>
<td>Remote/rural dimension globally significant</td>
</tr>
<tr>
<td>Social Services</td>
<td></td>
<td>Remote/rural dimension globally significant</td>
</tr>
<tr>
<td>Medical Device Company / Research based Pharmaceuticals</td>
<td></td>
<td>LifeScan is a subsidiary of Johnson and Johnson a research based Pharmaceutical company</td>
</tr>
<tr>
<td>National NHS organizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Care Companies / Homes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract Research Organisations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail Pharmacy</td>
<td></td>
<td>Some specific opportunities may exist for expanded roles for retail pharmacy in remote and rural locations</td>
</tr>
<tr>
<td>Private Hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Diagnostics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key:**
- Clearly well represented in H & I: a possible model
- Present but would not be recognised as a model
- Relatively weak compared to other geographies

*Source: P4 Digital Healthcare customer analysis (Appendix 2)*
The most promising sub-segments for Highlands and Islands are those where companies are known to be actively delivering or likely to become involved in delivering against known local needs.

**Table 12: Presence of high potential P4 market segments within Highlands and Islands**

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>Why high potential?</th>
<th>Comments on H &amp; I status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booking Centres &amp; Scheduling</td>
<td>UK Market revenues est. &gt; £100M p.a.</td>
<td>Could be important, but appears not to have yet reached its full potential.</td>
</tr>
<tr>
<td>Inter-operability across care settings</td>
<td>High Growth rates: CAGR &gt; 8% in UK</td>
<td>Integration of health and social care in Highlands could offer potential</td>
</tr>
<tr>
<td>Clinical trials / test beds for new models of service delivery</td>
<td>Significant Research / development focus</td>
<td>Highland Hub; paediatric services in Western Isles</td>
</tr>
<tr>
<td>Closed Loop Clinical Systems (Call Centre based)</td>
<td>Significant Research / development focus</td>
<td>Could be a strong area if it forms part of DALLAS roll-out</td>
</tr>
<tr>
<td>Intelligent Medical devices (home / primary / self monitoring solutions)</td>
<td>Significant Research / development focus</td>
<td>COPD and CHD services in Argyll</td>
</tr>
<tr>
<td>Lab on a chip / point of care / diagnostic testing</td>
<td>Significant Research / development focus</td>
<td>Potential to build on LifeScan and Accunostics presence</td>
</tr>
<tr>
<td>Social networking &amp; TV related to health</td>
<td>Significant Research / development focus</td>
<td>Web services in Moray: could also form part of DALLAS roll-out (especially TV)</td>
</tr>
<tr>
<td>Telecare</td>
<td>UK Market revenues est. &gt; £100M p.a.</td>
<td>H &amp; I is set to be a test bed for national service development in 3 ex 5 DALLAS Scottish sites.</td>
</tr>
<tr>
<td>Consumer mHealth</td>
<td>Significant Research / development focus</td>
<td>Could be a strong area if it forms part of DALLAS roll-out</td>
</tr>
<tr>
<td>Telehealth</td>
<td>Significant Research / development focus</td>
<td>Strong presence already in Scottish telehealth scene (see Figure 3 above)</td>
</tr>
<tr>
<td>mHealth</td>
<td>Significant Research / development focus</td>
<td>Could be a strong area if it forms part of DALLAS roll-out</td>
</tr>
<tr>
<td>Business Intelligence for Health (performance management reporting, predictive risk modelling and adjustment)</td>
<td>Significant Research / development focus High Growth rates: CAGR &gt; 8% in UK</td>
<td>See for example AlbaSoft work on Diabetic research</td>
</tr>
</tbody>
</table>

*Source: P4 Digital Healthcare customer analysis (Appendix 2)*
### Table 13: Business models and position within Highlands and Islands for high potential P4 market segments

<table>
<thead>
<tr>
<th>Market segment</th>
<th>Business / service model</th>
<th>Current initiatives in H &amp; I</th>
<th>Companies known to be active in the segment</th>
</tr>
</thead>
</table>
| Booking Centres & Scheduling          | Predominantly phone based contact management centres providing scheduling / confirmation services for a hospitals or group of providers.  
Typically such centres handle all administrative processes associated with out-patient appointments, in-patient booking, operations and sometimes discharges. Also taken to include GP out of hours scheduling services | Highland Hub, NHS 24, Out of Hours Services, Out-Patient Booking services; Scottish Ambulance Service                                                                                                                   | CSC/iSoft Ultragenda Carefx, Plain, Adatastra;                                                                                                                                               |
| Inter-operability across care settings| Hospitals typically run hundreds of discrete systems, with varying levels of inter-operability. In addition information needs to be shared with other systems outside the hospital - for instance linked community services or with GP’s or Social Services. Information sharing between systems may be implemented on a system by system basis. Alternatively an inter-operability engine (Orion Rhapsody, InterSystems Ensemble are commonly used) is implemented to manage exchange of data between systems, information cannot be readily exchanged between systems. A number of standards based approaches to delivering interoperability exist such as Integrating the Health Enterprise (IHE). They provide a standard based approach with tools for developers to achieve inter-operability between systems using a standard based approach. | The Ensemble Integration Engine from InterSystems has been selected through a framework contract for Scotland wide roll-out, but Boards within H & I have typically tackled integration in house. | Orion Health, InterSystems; SOPRA; ReStart; Sunquest; CACI; Advanced Health and Care; Ascribe |
| Clinical trials / test beds for new models of service delivery | Following research, a new clinical pathway which requires a combination of new drug therapy, different interventions by health professionals may emerge.  
This can be automated and supported by an application which pulls all elements of the redesigned service together. An example would be initial treatment of patients who have suffered a stroke or patients | Some early implementation for instance in relation to bowel disease at Raigmore.                                                                                                                                       | Acunostics, LifeScan, Pfizer, Quintiles, Healthcare at Home |
<table>
<thead>
<tr>
<th>Market segment</th>
<th>Business / service model</th>
<th>Current initiatives in H &amp; I</th>
<th>Companies known to be active in the segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Loop Clinical Systems (Call Centre based)</td>
<td>Typically involves linkage of a clinical system with deployment of sensor or intelligent medical device at the point of care. Data is then sent and analysed at a central point, with alarms, alerts or reminders being generated and passed to a clinician or less qualified person to take the appropriate action.</td>
<td>Some implementations in Argyll for Cardiac Services and COPD.</td>
<td>Pfizer; Medtronic, RGS Technologies and MedMonitoring; Phillips; Bosch; GE Home Health; Copla</td>
</tr>
<tr>
<td>Intelligent Medical devices (home / primary / self monitoring solutions)</td>
<td>Point of care devices which typically involve an integrated sensor with possible connectivity back to a monitoring or support centre.</td>
<td>Some initial commercial deployment, but largely still in development phase</td>
<td>Medtronic, RGS Technologies and MedMonitoring; Phillips; Bosch; GE Home Health; Copla</td>
</tr>
<tr>
<td>Lab on a chip / point of care / diagnostic testing</td>
<td>Increasingly available in the UK at retail outlets, diagnostic solutions which test for the presence of a particular indicator, with possible transfer to a remote interpretation centre.</td>
<td>Accunostics (see Annex)</td>
<td>Accunostics, Medtronic, Phillips, Bosch, GE Home Health;</td>
</tr>
<tr>
<td>Social networking &amp; TV related to health</td>
<td>Use of social media by health professionals and diffusion of information to the public from ‘trusted’ sources. There may also be unmet potential for groups of patients with similar diagnoses / needs to interact and support each other. Web 2.0’s potential for healthcare is being promoted heavily. YouTube may also have potential</td>
<td>NHS Inform from NHS 24 has established channels on Facebook (54,000 views), Twitter (500 followers) and a Blog. Also NHS Scotland has a digital TV channel, which can be downloaded as an app</td>
<td>Sitekit; Dr Koop, Web MD, Revolution Health; Microsoft HealthVault; Maverick TV; Pixic,</td>
</tr>
<tr>
<td>Telecare</td>
<td>2020 Health report Nov ’10 defines Telecare as ‘a range of alarms and sensors in the home to enable independent living linked to a call centre’. Telecare Development Programme (TDP) claims in July 2010 Newhaven Research report that by March 2010, £14M of TDP funding had delivered efficiencies worth £48M (as a result of saved care home bed days, saved hospital bed days, saved home check visits and sleep over night care)</td>
<td>DALLAS related proposals are being developed at 3 sites within H &amp; I: Moray, Western Isles and Highland (hub). Telecare services have been offered by all Local Authorities over recent years, drawing on Scottish Government grant funding</td>
<td>Argyll; Tynstall, Tynetech, Caretech, Cirrus, Phillips, Jontek, Bosch,</td>
</tr>
<tr>
<td>Market segment</td>
<td>Business / service model</td>
<td>Current initiatives in H &amp; I</td>
<td>Companies known to be active in the segment</td>
</tr>
<tr>
<td>------------------------------</td>
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<tr>
<td>Consumer mHealth</td>
<td>NHS Direct in May 2011 launched mobile health and Symptom checker (&gt;240,000 downloads in first month and &gt; 1 M downloads to end October ‘11). Some evidence exists that mHealth offers the key to sustained behaviour change (which is what is needed for management of most Long Term Conditions).</td>
<td>No large scale implementations identified</td>
<td>Intel, Vodafone; O2 / Telefonica; TMobile; Pyxis Mobile; Portable Pixels; Polycom; iPlato; Kelvin Connect, Open Broly</td>
</tr>
<tr>
<td>Telehealth</td>
<td>Remote capture / relay of physiological measurements from the home for clinical review and early intervention.</td>
<td>Video-conferencing based applications are well established – see for instance Figure 3: Audit Scotland’s Mapping of Telehealth Initiatives against NHS Boards</td>
<td>AMD Telemedicine, Honeywell HomMED, Phillips, Alere Connected Health, Intel, Telehealth Solutions ; TBS GB; DanMedical; Healthaware ; Docobo</td>
</tr>
<tr>
<td>mHealth</td>
<td>mHealth supports health professionals in providing point of care services and continuous care across care settings (home, clinic, hospital), hence improving outcomes. PWC Health Research in US study says 40% of physicians believe they can eliminate up to 30% of office visits with information provided by mHealth Technology. Mobile devices can also provide the viewing platform of choice for clinicians.</td>
<td>No large scale implementations identified</td>
<td>Intel, Vodafone; O2 / Telefonica; TMobile; Pyxis Mobile; Portable Pixels; Polycom; iPlato; Kelvin Connect, Open Broly</td>
</tr>
<tr>
<td>Business Intelligence for Health (performance management reporting, predictive risk modelling and adjustment)</td>
<td>The sourcing, analysis and presentation of financial, operational and other business information to support the monitoring of for instance a hospital or an organisation buying health services on behalf of a population. Typically involves supply of a licenced software product, which is then used by information analysts, clinicians and managers.</td>
<td>In house nationally developed systems are available across the SCI platform and National Services Scotland currently provides a wide range of services in this area. However it is also understood that Boards are purchasing commercial solutions.</td>
<td>Albasoft; iSoft; Ardentia; Stalis; CACI; RealTime Health MedeAnalytics; SAP, Cedar Financials</td>
</tr>
</tbody>
</table>

Source: P4 Digital Healthcare customer analysis (Appendix 2)
A project has recently been undertaken by Mairi Macleod, Highlands and Islands Enterprise to map the digital health care sector in the Highlands and Islands region. The map has uncovered a multi-disciplinary cluster of 40 organisations who are actively engaged in developing healthcare solutions that use digital technology promoting Predictive, Preventative, Personalised and Participatory models and services. The cluster is most concentrated along the Inverness/Elgin corridor, although important capabilities lie in the periphery. Each member of the cluster is aware that it is part of a unique cluster of businesses and organisations with an important contribution to make towards the future of healthcare.

*Figure 10: Digital Healthcare organisations in H & I by location (Source Mairi Macleod, HIE)*

Interviews have highlighted a wide range of expertise which the organisations can offer to the sector. Health & Wellbeing Services, ICT, Web Science, research, devices and diagnostics are key sub-sectors in the development of digital healthcare in the future, and as the chart shows, they are very much present in the region.

*Figure 10: Digital Healthcare organisations in H & I by type and expertise (Source Mairi Macleod, HIE)*

This pie chart categorises the types of organisations involved in the region’s digital healthcare cluster: SMEs hold the largest percentage at 44% followed by Academia (18%), and Health Boards (15%).
b. **Highlands & Islands: strengths, weaknesses, opportunities and threats**

The preceding section considered the status quo in the Highlands and Islands. This Section addresses how Highlands & Islands is positioned to seize the opportunities presented by an expanding local and international market for Digital Healthcare.

<table>
<thead>
<tr>
<th>Strengths</th>
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<tbody>
<tr>
<td>3 important and internationally significant customer groups are present: Public Primary Care, Social Services and LifeScan, a medical device company and subsidiary of Johnson &amp; Johnson, a Research Based Pharmaceutical company. The Region has a relevant track record of designing and implementing digitally enabled solutions with positive impacts.</td>
</tr>
<tr>
<td>Organisations in the Highlands and Islands have already implemented, are planning to procure or solutions assessed as high potential in an international context (see Table 6 above). Companies which deliver these solutions are present in the Region, and some major international companies as well as SME’s have already decided to locate or start up within the Region.</td>
</tr>
<tr>
<td>The Region is an attractive location in which to work and live.</td>
</tr>
<tr>
<td>From 2012 one of the largest global deployments of telecare, the DALLAS programme, will base 3 of its 5 Scottish locations in the area, Highland, Western Isles and Grampian.</td>
</tr>
<tr>
<td>The Region has a relevant educational, academic and research base. This includes:</td>
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<tr>
<td>- the University of the Highlands and Islands, Health Faculty offering for instance the UK’s first undergraduate course in web science developed by Moray College UHI in partnership with the Web Science Trust, MIT and the University of Southampton.</td>
</tr>
<tr>
<td>- Aberdeen University’s Academic Primary Care Department. Dept General Practice and the Centre for Rural Health. International research activities such as the Northern Periphery Project and the Dot Rural Project are under way.</td>
</tr>
<tr>
<td>- The Rural Health Educational Alliance (NHS Education for Scotland)</td>
</tr>
<tr>
<td>- Glasgow School of Art’s Centre for Design Innovation with a focus on innovation and healthcare.</td>
</tr>
<tr>
<td>The characteristics of the Region make it suitable as a test-bed. It will be creditable to claim that a solution which works in this Region will work in any developed country with similar characteristics.</td>
</tr>
<tr>
<td>Some organisational mechanisms exist for cross sector dialogue such as North of Scotland Chief Execs. and associated multi-agency planning structures, even if they are not currently focused around releasing the potential for innovation from P4 Digital Healthcare solutions.</td>
</tr>
<tr>
<td>The Region has invested in dedicated life science facilities such as the Moray Life Science Centre in Elgin, and the Centre for Health Science in Inverness.</td>
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</table>
A series of successful P4 events delivered by HIE have engaged a large number of relevant local and global companies. Some key local stakeholders also engaged.

<table>
<thead>
<tr>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Opinion leaders within the NHS at a national level do not yet see H &amp; I as the obvious territory for innovation.</td>
</tr>
<tr>
<td>The weak presence within the Region (in comparison with other part of Scotland) of tertiary and specialist healthcare services limits potential for some potential P4 growth segments.</td>
</tr>
<tr>
<td>Within the Region, economic development priorities and the role of HIE in supporting these may not be fully understood.</td>
</tr>
<tr>
<td>A clear strategy which includes plans for technology enabled service development and openness to business led innovation focus is not yet present within some key NHS Boards and Local Authorities. NHS and Local Authorities are not yet committing to engage with HIE or business to explore how P4 Digital Healthcare solutions delivered by business can help deliver top priority organisational objectives. Some critical opinion leaders are not yet engaged and inter-agency collaboration structures do not yet seem to be creating an environment in which P4 Digital Healthcare solutions will be more easily adopted within this Region than elsewhere.</td>
</tr>
<tr>
<td>Mechanisms do not yet exist which would lead to Scotland wide adoption of P4 Digital Healthcare Solutions, which have been successfully developed and implemented within the Region.</td>
</tr>
<tr>
<td>The NHS is not yet committed to the P4 concept or brand, and seems likely to prefer alternative branding. No co-branding has yet been agreed with NHS 24 for DALLAS sites in the Highlands and Islands.</td>
</tr>
<tr>
<td>Academic and research disciplines in H &amp; I need to link in more effectively to commercial entities</td>
</tr>
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</table>
**Opportunities**

Work with NHS Highland on the planned Planning for Integration” mapping exercise. Deliver practical solutions to support the planned integration of health and social care services which is planned in most part of the Region. Provide enhancements to the ‘shared services agenda’

Support delivery of H & I Healthcare in year 2016. Key attributes are expected to include:

- Less secondary care clinics
- More patient empowerment, more options for Patient Access
- Informed self-care (via video web based info-support)
- Increase reliance on Assistive Technologies to support care delivery
- Anticipatory care plans for all
- Web to link health needs –patient journals, virtual ward, advice

Explore novel models for service linkages powered by technology from H & I locations to specialised services out with geography

Examine potential to make under-used clinical staff time available to telehealth companies via purchase of time from Health Boards

Leverage the opportunities for service innovation which will be created by the introduction of the revised GP contract into the Region (and Scotland).

Mobilise existing public sector multi-agency structures in the Region to legitimise and build support for digital healthcare investments to support service transformation and boost understanding of the associated economic development agenda

Leverage investments in DALLAS and superfast Broadband roll-out within the Region

Develop the case for attracting funds into the Region from the Atos Alliance Innovation fund

Team up with other Regions across Europe to bid for European funding
**Threats**

<table>
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<tr>
<th>Threats</th>
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<tbody>
<tr>
<td>NHS (and LAs) may be tempted to treat economic development funding as if it is core service funding, and not sign up to economic development goals for the Region.</td>
</tr>
<tr>
<td>Competing UK sites active in DALLAS or Whole System Demonstrator initiatives for example, may deliver better models than those within the Region.</td>
</tr>
<tr>
<td>Public Sector organizations may prefer to develop in house products or services to support roll-out of digital healthcare solutions, rather than work with the private sector (especially locally).</td>
</tr>
<tr>
<td>Public procurement rules and practice may not deliver opportunity for local businesses aiming to capitalize on opportunities around P4 Digital Healthcare.</td>
</tr>
<tr>
<td>‘DIY’ Digital Healthcare solutions within Highlands and Islands geography may dilute the potential for leverage of economic development.</td>
</tr>
</tbody>
</table>

**What might stop the potential being realised?**

- **Economic factors**
  - Funding, Capital, Timescale, Low capital but require high volume product,

- **Cultural factors**
  - Resistance to change, lack of compliance, Governance failure, Bureaucracy, Fear/Risk,

- **Business factors**
  - Limited visibility of H & I business, Competition, Dominance of large businesses; administration time and overhead, Credibility, Global Market Factors, Market Visibility, Scale, Product cost

- **Technology factors**

- Pressures on public sector funding may squeeze funding for digital healthcare investments. Existing pioneering activities may be constrained due to cost cutting pressures.
c. **What stakeholders are thinking**

The conclusions reached during this study and especially the SWOT analysis at 5 b above, were informed by a series of interviews held with representatives of key stakeholder groups. These interviews were also critical to the development of the Roadmap (Section 6) as well as the formulation of the recommendations (Section 7). Interviews were held as follows:

- **Senior Civil Servants/Policy Makers** (3 interviews)
- **Professional Clinical Staff/Clinical Managers** (5 interviews)
- **NHS Managers** (3 interviews)
- **Local Authority Managers** (2 interviews)
- **Commercial Organisations** (3 interviews)

_The authors would like to take this opportunity to thank those people who participated in these interviews for their full and open discussion of the issues._ In addition, many of the issues addressed were fully debated at the P4 Convention held in Forres in early November 2011, as reported in the Annex.

A full report on Consultation and Interviews held is included in a separate report from Consard for Highlands and Islands Enterprise (Appendix 3). The main conclusions from these discussions are summarised below:

- **Observations**

In responses from public sector organizations, there is a difference of view on the optimal approach to rolling out digital healthcare solutions. Some favour a very local (parochial) approach; others see it as essential that this happens within an overarching national framework. No one we spoke to advocated a regional – Highlands and Islands wide - approach.

There are significantly differing perspectives amongst the people we spoke to about likely and required timeframes for return on investment.

In public sector responses, there was little evidence of Board level commitments to implement digital health or care solutions as part of a broader programme of system transformation.
Whilst integration of health and social care is clearly a high priority strategic issue, this does not yet translate into plans for system-wide deployment of digital healthcare services. Challenges clearly remain on making digital healthcare more user friendly, capable of supporting a greater variety of uses, supporting multiple conditions, and providing a platform for linking up patients (carers).

➤ **Areas of agreement**

### Why are P4 Digital Services important to the economy of the Highlands and Islands?

**For people** living in the Highlands and Islands, these services will be and are safe, accessible, cost effective and equitable. For patients and staff, there is the potential to overcome problems of rurality and distance from District General Hospital or other centralized services.

**For organizations delivering services,** P4 Digital services are ‘green’ and popular with patients, carers and staff. They offer a more cost effective way to meet people’s needs for health and care services.

**For businesses** offering P4 Digital services, a location within the Highlands and Islands offers the opportunity for practical support and an opportunity to participate and shape a dynamic economic development initiative.

**Senior Civil Servant/Policy Maker:**

‘HIE and partners need to come up with a compelling solution. So first of all identify what is the product and then develop a compelling solution to the problems that they have, therefore, looking at it more from an overview and business perspective.’

**Senior Civil Servant/Policy Maker:**

‘The P4 partnership for integration that Highland and the Local Authorities are doing means they are going to see the need for integrated systems and it will be an obvious reason to purchase things that make them work more effectively and more cheaply together.’

‘The opportunity exists for mining linked and social health and social care data which would be possibly more valuable than that David Cameron is proposing down south where there are going to be partnerships between the NHS and companies.’

**Senior Civil Servant/Policy Maker:**
'Opportunities for a P4 in development in Highlands and Islands need to be focused on unique selling points of that area. For example, other parts of Scotland have got better clinical infrastructure and denser populations with a more developed clinical academic set up so that it might be more attractive for example for P4 to be set up in Glasgow or Edinburgh…. Unique selling points would be the fact that the patients in remote areas will require more self-care and the technologies that will help that the niche therefore is about self-management in a cutting-edge way, and developing remote and rural projects which then are transferrable to other areas. ' 

**Professional Clinical Staff/Clinical Manager:**

'(The most important area for investment would be) ‘Home monitoring for long term conditions in ways that prevent people from having to be seen so frequently by professionals. Behind that, development of broadband and mobile technology that enables the communications of these monitoring and, behind that, development of software applications for standard platforms such as mobile phones etc. The interoperability of various types of communication and support for the deployment and technical management of these technologies will be critical so as that they are reliable and work well.’

**Professional Clinical Staff/Clinical Manager:**

‘A key selling point for inward investors would be Centre of Excellence concept aligning healthcare with social care and offering a platform for citizens-based research and development. With access to clinical intelligence so that they can decide how products work effectively.’

**Professional Clinical Staff/Clinical Manager:**

He believes having travelled widely, that Scotland is a great place because of the infrastructure and existing integration to develop models which become solid and are testable but then are exportable to countries.

**Commercial Organisation (Small Business):**

For a small company cash-flow is king and the NHS budgeting processes, decision making times and attitudes to innovation can make the first couple of years very difficult. The NHS seems to find it impossible to condense the time frames from a clinician identifying the need for a product to procuring and implementing the system. If you have a product which we know solves a problem for a Health Board and that health board was open to a fast-track process for implementing the product then we would be very interested in locating in the area.
More contentious areas / minority views

**Senior Civil Servant/Policy Maker:**

‘If DALLAS becomes a focus for a virtual Centre of Excellence in Moray or wherever in the area, it would be an opportunity for investment to be rewarded. If the investment of £800k that is put in works, it will “beef-up” the existing small and medium sized enterprises and will attract future SMEs to the area which will be providers of increased employment.’

**Senior Civil Servant/Policy Maker:**

He believes that mass market technology will not be the way that HIE will make an impact here but, it’s about research and development and owning intellectual property creating systems that work effectively.

**Senior Civil Servant/Policy Maker:**

‘We need to create trusted platforms and create markets for services on that platform’.

‘We need to work with the Private and third sector to meet the Innovation challenge. We can learn / partner to for instance on better ways to access consumers (end-users) directly.’

**NHS Manager**

‘No major (ICT) procurements are likely within NHS (in Scotland) over the next five years. The NHS in Scotland tends to purchase products but often delivers services in house. Public procurement practice means that larger organisations tend to win the business.’

**Local Authority Manager**

‘We should be engaging with the private sector on broken aspects of (local) service delivery. We do not have the capacity to each handle similar problems in each locality’.

**Local Authority / Social Services Manager:**

She described a (failed) local initiative to get the private sector involved in delivering a ‘Disability Shop’ (outsourcing of joint disability store). She and colleagues put a lot of effort in, but in the end one voluntary group (the only group to attend the day event) ended up taking the agenda forward.

The implications of the self directed care agenda expected to be implemented next year are potentially far reaching. In this island, clients will not have any option other than to take cash or continue to use Council services.
This sort of initiative might be better addressed at a Highlands and Islands level with private sector organizations potentially being introduced to opportunities across the whole geography.’

**Professional Clinical Staff/Clinical Manager:**

‘When DALLAS goes live in the 3 sites that the important thing would be for content development that is for digital requirements, that would feed content to patients and clinicians’.

**Professional Clinical Staff/Clinical Manager:**

‘The most important area in terms for further investment was improving connectivity…connections, broadband the ability to create a highway that people could navigate readily.’

**Commercial Organisation:**

‘The most important investment would be to support the integration of unitary services around the care of the individual so, minimising the separation that occurs between organisations such as local authority, healthcare, police, fire, libraries – anything.’

**Commercial Organisation:**

‘A clear identification of the potential market and a good business case is critical’

**Commercial Organisation:**

‘Speed of implementation and dispersal of innovation is critical.

Be a champion of innovation.

Take a broad definition of value’
6. **P4 Digital Roadmap**

A 3 year roadmap has been developed and falls into three main phases. During 2012, the HIE’s £800k co-investment in the Delivering Assisted Living at Scale (DALLAS) Programme managed by the Technology Strategy Board should result in 3 implementations within Highlands and Islands Region. These can become reference sites, leading to Region and Scotland wide roll-out.

Also during 2012, a second strand of activity concerns the design and delivery of support activity from HIE to foster the emergence of a Digital Healthcare Cluster of international significance.

Finally and as from late 2012, the economic development benefits of a digital healthcare cluster will start to emerge in the form of increased adoption of digital healthcare solutions in the Region and the rest of the UK, inward investment by business, the attraction of grant funding into the Region and new start-up digital healthcare businesses locating in the Region.

**Figure 11:** Roadmap: P4 Digital Healthcare & HIE

- 1 HIE DALLAS Investment
- 2. Scoping Study
- 3 DALLAS Technical Specification
- 4. Business Plan - HIE Services
- 5 DALLAS roll-out
- 6 HIE Supported Services
- 7 Public Sector Leverage
- 8 Inward Investment Leverage
- 9 International Leverage
- 10 Start-up Leverage

Time (months)

-3 Today +6 +12 +24 +36

Source: Consard Limited
a. Leveraging HIE’s investment in DALLAS

1. **HIE DALLAS Investment**
   HIE Invests £800k into DALLAS

2. **Scoping Study**
   HIE identifies most promising market segments for H&I business/economy, plus consultation with key stakeholders.

3. **DALLAS Technical Specification**
   HIE & other DALLAS Stakeholders specify technical solutions to be deployed in H&I sites.

4. **Business Planning**
   HIE business plan for services to support roll-out of digital healthcare in the Region

5. **DALLAS**
   DALLAS sites in H&I and elsewhere deploy solutions branded......supported by HIE

**Discussion**

**Steps 1-3: DALLAS launch:**

HIE has announced an in principle investment of £800k in DALLAS over 3 years. Three of the 5 DALLAS sites announced within the Scottish cluster are located in the Highlands and Islands. The bid to TSB for the Scottish DALLAS cluster has not yet been approved.

HIE has commissioned this study and has an ongoing series of events to promote P4.

HIE does not have any formal input to the process of technical specification in DALLAS sites. It seems probable that the focus within the selected DALLAS will be development of services as opposed to purchase of products. If the services were to be developed internally within the public sector, as opposed to leveraging purchase of externally supplied products or services, there is a risk that there could be a limited opportunity to leverage P4 business opportunities for local or other suppliers.
HIE and NHS 24 / DALLAS and local stakeholders should prioritise reaching an agreement on co-branding for Highlands and Islands sites, and an overall agreed identity for economic development initiatives associated with digital healthcare initiatives in the Region. However it seems probable that this can be negotiated. It is recommended that P4 is only used internally and not with public sector audiences.

**Step 4: Business planning:**

Following this scoping study, HIE should develop a detailed business and investment case to further develop the most promising P4 opportunities for Highlands and Islands, and to maximise leverage from the intended investment in DALLAS. (See also Step 6 below).

**Step 5: Leverage DALLAS sites in H & I**

With agreed branding in place (see Step 3), HIE should be positioned to realize the benefits from its co-investment in DALLAS. The work undertaken at the three Highlands and Islands sites will not only be at the cutting edge in UK. Since UK is probably the most developed telecare / assisted living market in the world (with possible exception of Korea and Japan), it will also be of international significance.

The outcomes from the work at the DALLAS sites in Highlands and Islands should deliver evidence to substantiate a claim that Highlands and Islands can be a world leading location for implementing assisted living services at scale. This evidence is expected to be in the form of improved lifestyles for the elderly people involved, better health and social care services and outcomes and learning about how to scale up assisted living services involving business, the public and the third sector. Highlands and Islands Enterprise does not yet have the basis for long term win-win relationships which it will need to have with the key stakeholders at those sites. The relationship building activity required will also need to embrace the local and extended business and public sector stakeholder communities. From HIE's perspective, it should be an early priority to ensure that a shared economic development agenda is properly articulated and also supported locally.
b. **HIE Supported Services for Digital Healthcare Cluster**

![Diagram](image)

**Discussion**

**Step 6: HIE supported services for P4 Digital Healthcare cluster**

1. **Governance, funding and commercial models for collaboration:**

   At the moment, models are by no means clear or agreed with stakeholders. Careful and full elaboration of a model(s) will be needed with key stakeholders, so that unambiguous commitment can be obtained to deliver against jointly agreed priorities.

   It is also relevant to note that the approach required to develop agreed models will be different from the activities associated with the P4 Digital Conventions. The focus will be more on negotiation about implementation and less on promotion of the concept of P4 Digital Healthcare. In view of the overall momentum and levels of support created by the P4 Conventions, it is reasonable to expect that agreed model(s) could be positioned as a logical development from what has gone before.
It seems probable that a stage has been reached when choices will need to be made about whom to work with and on what terms. Some stakeholders may wish to withdraw, or become less or selectively involved.

2. **Specifying the services to support P4:**

Six dimensions have been identified within a possible service specification to support a globally significant business and public sector partnership for P4 Digital Healthcare in the Region.

a. **Nurturing the most promising local business capabilities.** These include:
   - Call centre based infrastructure and services (embracing for instance see Argyll Telecom, Highland Hub)
   - Web, social networking and TV (on the model being developed in Moray, and embracing for instance Sitekit, Maverick TV)
   - Diabetes related initiatives (embracing for instance the development plans of AccuNostics and Johnson and Johnson / LifeScan)
   - The iterative development approach being implemented with Glasgow School of Art in Moray, which is potentially extendable into many other settings
   - (other emerging high potential services or applications e.g. as specified as part of DALLAS implementations)

b. **Converting expressions of interest from market leaders into inward investment.**

Leading P4 Digital Healthcare companies in UK and internationally have expressed interest. This now needs to be transformed into agreed partnership models for delivering a – to be specified – shared economic development agenda for P4 Digital Healthcare in the Highlands and Islands. Not all companies will wish to or be able to participate, and this may create challenges.

c. **Partnership working** to build and sustain collaborative working between stakeholders in health and care both within and out with the region. In particular the possibility of creating a procurement framework which enables locally successful innovative P4 companies should be explored. The Glasgow School of Art’s iterative design approach
could be usefully deployed to support the emergence of partnerships to tackle service transformation and develop joint initiatives.

A number of existing structures for public sector collaboration exist including the Convention of Highlands and Islands, Community Planning Partnership; Regional Steering Committee; NHS NoS Group

d. **Innovation test beds:** HIE should actively support and/or lead the development of initiatives with a credible ambition to add value at local, national and international level. This could for instance lead to creation of a P4 Digital Pilot Fund to stimulate novel thinking and activity in the private and public sector.

e. **Inward investment by means of grant awards:** HIE should expect to invest in supporting the (on occasion substantial) pre-bid costs associated with preparing winning submissions for grant funding.

f. **Tailoring HIE’s generic services** to support the needs of a developing P4 Digital Healthcare cluster. These are expected to cover for instance:

   - Developing the approach to providing financial support to businesses and covering for instance, seed investment for start-ups. The speed at which smaller amounts of money can be released may need attention.
   - Enhanced Account Management for high potential businesses including for instance support for recruitment and talent development
   - Marketing communications to include:
     - Effective publicity for the P4 Digital story in the Highlands and Islands
     - Publicising what HIE does and how it can help develop P4 Digital Healthcare.
     - PR / Lobbying / Profile Raising to generate more market opportunities
   - Sector insights and know how
     - Development of web services to support the local P4 actors
     - Identification of niche markets opportunities for Highlands and Islands businesses and making connections to ‘Buyers’ in UK and internationally
     - Specialist sector insights to support more effective sales and marketing
   - Adaptation of other HIE supported initiatives to underpin P4 Digital Healthcare objectives covering for instance:
     - how to deliver solutions for fast internet to rural areas
- transport links (especially ferries between islands)
- Office space and associated lease terms for start-ups (and existing companies) especially for Life Sciences

It is recommended that HIE proceeds to develop plans to scope the required set of infrastructure and services needed to help the region realise emerging and new opportunities in digital healthcare. This exercise will need to be grounded in the needs of key stakeholders including the statutory sector academia and business (SMEs and corporates) associated with digital healthcare. It should also address the gaps within regional expertise and activity and deliver practical strategies to overcome the existing and potential barriers to growth of digital health in the region. The approach will need to be informed by the financial, commercial and engagement model(s) for engagement with stakeholders, so that unambiguous commitment can be obtained to deliver against jointly agreed priorities.
c. Creating a global impact

7 Public Sector Leverage
NHS and Local Authorities purchase/solutions which uses services supported by HIE

8 Inward Investment Leverage
A (multiple) major new company decides to locate in H&I geography

9 International Leverage
HIE and other European Regions with P4 equivalents attract grant funding.

10 Start-up Leverage
New start-up businesses start to emerge which build on/enrich the cluster

Discussion

Step 7: Public Sector leverage

Commitment to economic development and innovation from business

A number of structures for public sector collaboration across the Highlands and Islands exist and include for instance the Convention of Highlands and Islands, Community Planning Partnership; Regional Steering Committee; NHS North of Scotland Planning Group. A clear and unambiguous commitment to joint working on economic development activities associated with P4 Digital Healthcare does not yet appear to be in place across the Region. It seems probable that the way in which public sector partners can contribute to economic development is either not yet fully understood or being prioritized by some key partners.

It is recommended that HIE review the way in which the economic development agenda is being communicated through existing structures for public sector collaboration. This review should
include identification of which people and organizations it needs to be engaging with to
overcome the barriers which exist to scaling up P4 Digital Healthcare services and / or releasing
their potential for collaboration. HIE should then take a co-ordinated approach to
communicated targeted messages and securing the key agreements it will need to realize the
progress it is targeting from P4 Digital Healthcare related economic development.

_Co-ordinated service delivery within the Region_

This study has identified a number of potential areas in which businesses could engage with
public sector organizations to deliver innovative solutions to the business problems being
tackled by the NHS and Social Services organizations across the Region. Examples include the
health and social care integration agenda, deployment of P4 Digital solutions to help tackle cost
and service delivery problems associated with Out of Hours service delivery and the
introduction of self-directed care. In addition, there is a possibility of framing region-wide
solutions to tackle problems which are common to a number NHS Boards or other bodies
across the Region. Involvement of business in a Region wide virtual Joint Equipment Store could
be a case in point. The point is that it would seem that the dialogue between HIE, local
businesses and public sector structures across the Region is not yet leading to identification of
these sorts of opportunities or the realization of the potential for innovation which P4 Digital
Healthcare businesses are capable of delivering. In most sites (with exception of Western Isles),
There is insufficient linkage between plans for technology deployment and overarching public
sector / health service transformation initiatives such as the Change Fund.

In addition there is a strong case for developing joint initiatives with private sector
organizations to share learning with the public sector, but also to deploy shared services /
infrastructure so that better service access for consumers (end-users) results.

_Leveraging success within the Region to ‘Go National’_

A practical barrier in this market is the mechanism whereby apparently significant local
implementations do not translate into national opportunities for the businesses involved. This is
the practical manifestation of the ‘pilotitis’ which afflicts some segments of the market. There
may be an opportunity for HIE to intervene and break the cycle. It is therefore recommended that HIE work with stakeholders to explore the possibility of creating a procurement framework which enabled businesses involved in local P4 Digital Healthcare implementations to seamlessly go Scotland wide. This could involve working with Innovation Funds and structures established at a national level in Scotland.

**Step 8: Leverage with inward investors**

During the work on this scoping study as has been documented, more than 10 major international organisations already active in P4 Digital Healthcare markets have submitted material and indicated that they are interested in a more detailed dialogue with HIE and other stakeholders. This of itself can be taken as a positive indication of the attractiveness of the Region as a globally significant location for Digital Healthcare. However these potential inward investors have questions for which HIE may not yet have answers. Questions to be expected include:

- What is it in this for our organisation?
- What form of exclusivity can be provided?
- What incentives are on offer?
- What support can be provided to enable locally developed reference solutions to go national?
- What is the prospect of making sales of our core products and services locally?

‘Observational studies’ – an attraction for the Pharmaceutical Industry

One of the companies we spoke to in this context said:

- Investors/partners need outcomes data or some other strong indicator, even in early proof-of-concept work, that the solution being created produces healthier people and reduces healthcare costs. They of course prefer a predictable ROI to have confidence in any investment.
- Where possible, outcomes & other measures must be built in from the beginning, including baseline(s). Without clear goals stated upfront, post hoc analyses are usually seen as less rigorous.
- Investors/partners must have confidence that pilots can scale with similar or better results.
We would like to understand if all or some of the specifics of Scotland (genetics, population diversity, rural lifestyle, access to healthcare, payer system, etc.) can be extrapolated into other countries/regions. This is important to ensure broad applicability of studies conducted here, i.e., healthcare data & solutions useful beyond Scotland.

In order to demonstrate quality and outcomes, it will be important to evaluate normal clinical practice, embracing a variety of real world data methodologies. The NHS in England set out a vision in the White Paper Equity and Excellence: Liberating the NHS, published in July 2010. The White Paper states that: “…in order for the Government to achieve their ambition for world-class healthcare outcomes, the NHS must move away from meeting targets and be focused on quality and outcomes.” The White Paper makes extensive reference to the importance of the conduct of research and the use of research evidence, as key elements of the NHS. It recognises that: “Research is vital in providing the new knowledge needed to improve health outcomes and reduce inequalities.”

Digital solutions will be critical to delivery of value based pricing and outcomes focused healthcare delivery. Healthcare organisations that have systems to monitor outcomes, capture data (including patient reported outcomes software), audit disease registries and interpret data will give companies the first opportunity to demonstrate value leading to inward investment in observational studies.

Work on preparing an inward investment proposition for potential inward investors should be put in hand in partnership with public sector stakeholders. It should also be recognized that choices will need to be made, and that it is not realistic to expect to convert all or most expressions of interest so far received.
Step 9: Leverage with international grants

Funds from European and UK grant giving organisations appear to be accessible to support pre-commercial research and to a lesser extent practical deployment of P4 Digital Healthcare initiatives.

It is recommended that HIE actively target a sum of money to be attracted into the Region annually by means of grant funding - £500k annually is suggested.

<table>
<thead>
<tr>
<th>How much EU Funded R &amp; D Healthcare should be targeted by HIE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population of Europe: 500,000,000 (2010, Eurostat)</td>
</tr>
<tr>
<td>Population HIE geography: 450,000 (0.0000009%)</td>
</tr>
<tr>
<td>EU Health R &amp; D spend 2012: €656,000,000</td>
</tr>
<tr>
<td><strong>HIE Population based target:</strong> €590,400 per annum</td>
</tr>
</tbody>
</table>

Step 10: Leverage with start-ups

Success in attracting major inward investors (see Step 8 above) and implementation of the set of services described at Step 6 can be expected to make the Region an attractive location to start a business. These inward investors can be expected to establish a local supply chain (if it is accessible and properly promoted) creating opportunities to establish profitable businesses within the Region.

Other key factors from the perspective of these SME’s will be delivering enhanced access to the NHS locally and nationally, opportunities to realise export potential and the availability of grant funding.
7. **Recommendations: measures to promote the Regional sector**

A set of recommendations has been developed so that the steps identified in the 3 year Roadmap (Section 6 above) can become a reality. Objective 7 of this report is to make recommendations on priority areas for growth and development within the Regional (Highlands and Islands) sector. The recommendations made address:

- Prioritising primary and social care and research based pharmaceutical customer groups;
- Building a shared commitment amongst local, business and public sector stakeholders to implement services to deliver organisational innovation and system redesign;
- The support services HIE should consider to foster the emergence of a digital healthcare cluster of international significance in the Region.
- The approach to be taken to ensure that investment in supporting digital healthcare is leveraged to produce outcomes of economic significance.

1. Prioritise activities where Highlands and Islands Region can be world leading.

2. Priority customers groups are:
   - Primary care services
   - Social services
   - Research based pharmaceutical organisations.

3. Market segments relevant to these customers include:
   - Booking Centres & Scheduling,
   - Inter-operability across care settings,
   - Clinical trials / test beds for new models of service delivery,
   - Closed Loop Clinical Systems (Call Centre based),
   - Intelligent Medical devices ( home / primary / self monitoring solutions),
   - Lab on a chip / point of care / diagnostic testing,
   - Social networking & TV related to health,
   - Telecare,
   - mHealth,
➢ Telehealth,
➢ Business Intelligence for Health.

4. De-prioritise lower priority customer groups or market segments.

5. Improve engagement with leading local organisations and professionals in primary care and social services.

Engagement needs to be improved with leading local organisations and professionals in primary care and social services. There needs to be a shared economic development objective, with a clear role for business. A joint commitment is required to developing innovative services capable of supporting organisational innovation and system redesign. For these customer groups, this is more important than clinical innovation.

6. Develop a proposition for Highlands and Islands as a location of choice for ‘observational studies’ to attract pharmaceutical businesses.

For pharmaceutical companies, the focus is on value based pricing and outcomes focused healthcare delivery. So products or services which will make the Region more attractive and lead to inward investment in observational studies will be digital solutions to monitor outcomes, capture data (including patient reported outcomes software), audit disease registries and interpret data.

7. Agree co-branding with NHS (and Technology Strategy Board) for H & I DALLAS sites.

HIE and NHS 24 / DALLAS and local stakeholders need to agree co-branding for Highlands and Islands sites involved in DALLAS and an overall agreed identity for economic development initiatives associated with digital healthcare initiatives in the Region. It is recommended that P4 is only used internally and not with public sector audiences.

8. Agree governance, funding and commercial models for collaboration with stakeholders for HIE Supported services, making it clear HIE cannot fund NHS / public sector activity.
Governance, Funding and Commercial Models for collaboration on HIE Supported services for Digital Healthcare roll-out are not yet clear or agreed with stakeholders. Careful and full elaboration of a model (s) will be needed with key stakeholders, so that unambiguous commitment can be obtained to deliver against jointly agreed priorities.

9. Develop business and investment cases to further develop the most promising digital healthcare opportunities.

10. Gain fuller commitment from other public sector partners to the economic development agenda as it applies to digital healthcare.

11. Explore creation of a procurement framework to allow businesses involved in local Digital Healthcare implementations to seamlessly go Scotland wide.

12. Develop inward investment proposition for ‘interested’ inward investors in partnership with public sector stakeholders.

It should be recognized that choices now need to be made, and that it is not realistic to expect to convert all or most expressions of interest so far received.

13. Adopt target of £500k p.a. in grant funding for digital healthcare initiatives within the Region.