Technology and Innovation in Health and Well-being

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Bio: Bill is a Professor in the School of Computing at Edinburgh Napier University, and a Fellow of the BCS and the IET. In 2017, he was awarded an OBE for his services to Cyber Security. He currently leads the Centre for Distributed Computing, Networks, and Security and The Cyber Academy. His main research focus is around information sharing, e-Health, threat analysis, blockchain, machine learning in cyber security, cryptography, and digital forensics. This has led to several World-wide patents, and in three highly successful spin-out companies: Zonefox; Symphonic Software; and Cyan Forensics. Bill regularly appears on TV and radio related to computer security, and has given evidence to committees within the Scottish Parliament and in the House of Commons. Bill was named as one of the Top 100 people for Technology in Scotland for in each year from 2012 to 2017. He was named by FutureScot in the "Top 50 Scottish Tech People Who Are Changing The World". Recently his work on Secret Shares received “Innovation of the Year” at the Scottish Knowledge Exchange Awards, for a research project which involves splitting data into secret shares, and can then be distributed across a public Cloud-based infrastructure. He was also included in the JISC Top 50 Higher Education Social Media Influencers in 2015. Overall Bill has one of the most extensive academic sites in the World (http://asecuritysite.com), and is involved in many areas of novel research and teaching in cryptography, e-Health and cyber security. He has published over 28 academic books, and more than 250 academic research papers, along with many awards for excellence in research, innovation and teaching.

Abstract

The Scottish Government’s draft Digital Health and Social Care vision 2017-2022 has clear and ambitious aims and, if enacted, will considerably improve the health and well-being environment in Scotland. We do, though, need to learn from some dramatic failures within changing health and social care in the UK and Scotland, and make sure they do not happen again. A clear route must be set out for true citizen ownership and engagement, and for those with vision and leadership to be supported with investment based on success and then to deliver at scale. The risk adverse and silo’ed nature of the public sector must be overcome, and where the public sector is actively seen as a co-creator of the next generation of public services.

We are currently a long way short of anything which could be seen as something which is fit-for-purpose to scale into a citizen-focused health care infrastructure, and must define most of our existing digital methods as being built of legacy techniques and where ownership of external stakeholders and security are often seen as after-thoughts. The under investment in health care IT in the UK will not be fixed by purchasing lots of new computers and upgrading their operating systems. The infrastructure needs a radical redesign of health and social care services, with a long-term commitment from Government to use the best practice from industry and apply into health and social care. With the changes, we need a radical integration across all our public-sector areas, and for a more integrated approach to be taken, which both respects the rights to privacy, but also the security and ownership of data.

We are currently a long-way-off creating a modern health and social care infrastructure which is in any way trustworthy and which truly integrates citizens, while being robust and secure. Along with this we must define that virtually all of our existing IT infrastructures and approaches within the public service are legacy-based, and there is a need to transform it into an infrastructure where every single
interaction can be trusted and audited. The solution is not to keep investing in our existing approaches but to look at a radical change in our approaches and provide a mechanism for everyone to interact and truly be citizen-focused.

The lack of integration across the different stakeholders involved within health and social care is one thing that needs to be addressed in any new plan, and how we can still respect the rights of privacy of individuals, but understand how we can best use data for their care and support. In health care, especially, we have to be more open about future plans, and have a continual modernisation plan which more tightly integrates disparate systems, and brings them together in a secure infrastructure, while looking towards the future of on-line provisions. The citizen should be at the centre of this design! At present the NHS struggles to cope with creating a fit-for-purpose range of services for its own staff, and the concept of the citizen being part of this is still something which it is struggling with. Resilience, too, will be a core element, as a loss of service could lead to a loss of life.

After the recent headlines, it is now time to take stock of the current state of cyber security within health care, and look at new ways of improving the access to health and social care systems. Cyber Security thus provides a core part of this, especially in creating trustworthy systems which put the citizen at the core. We must all take a part in supporting these developments, and allow data to flow, while minimising risks of data breaches and outages.

Time is running out in terms of building systems which are fit-for-purpose for the Information Age, and many other countries are pushing forward with innovation and are moving fast to create more dynamic and trustworthy infrastructures, and where citizens and businesses can have the opportunities to interact with public services.

1. Success of current eHealth and telecare/telehealth strategies

I feel that there are small and piecemeal steps with little in the way of radical changes in an infrastructure which will fit within a completely trusted environment. The gulf between primary and secondary health care has still not been addressed, and there is little in the way of integration in social care and third sector work. The access to on-line services is generally patchy, and often just scratches the surface, with pin-point impact.

2. Main failures of the existing Scottish Government’s eHealth and telecare/telehealth strategies and why?

Failings perhaps include:

- Lack of true leadership for a new vision of the future. Apart from a few cases, there is generally a lack of leadership and in risk aversion on taking our public services into the 21st Century, and in creating a trustworthy infrastructure which allows for interacts by all of the key stakeholders, and which is secure and robust. For some reason the citizen is still not trusted to have any real digital integration with the health and social care infrastructure, and will never have with our existing disparate systems. At present there is virtually no way to have a consistent and sustained interaction with health and social care professionals in a digital form. I have personally observed two major programmes in Scotland which were created with good intentions, and which provided an opportunity to build a modern infrastructure, but where pushed off-track by a lack of true leadership and vision. The DALLAS Living It Up (LiU) project had excellent objectives at the start, but has delivered very little in building a foundation that would allow Scottish SMEs the opportunity to integrate and to create services which would be useful to the NHS and Councils. In the end there was no real leadership and overall vision, and DALLAS LiU went off into developing things which were often superficial and did little in providing a long-term foundation or impact. The Named Person Act (GIRFEC), too, has also lacked technical leadership and any form of proper engagement with the public, and has ended-up being a system which is not trusted by citizens. Both these projects could have provided new ways of building a trust infrastructure at scale in Scotland (and understand how citizen pathways could be defined and the security of the data
capture and presented), but have lacked true vision in converting the objectives of politicians into new ways of working, and delivered often delivered “point solutions”. The last real hope for radical change can be found within the DHI and CivTech, but we need a long-term commitment to radical change from our leaders and to drive forward the public sector as co-creators and to admit that the systems we have at present are based on legacy methods. Possible solution: Provide the stimulus for real change in Scotland and use the London Data Sharing Partnership as a possible road map to driving forward an infrastructure at scale in Scotland. Every part of the public sector needs to change and open up, and work together on a road map that takes the nation into a more trustworthy infrastructure, which understands risks, and how best data can flow.

- **Continued domination by large companies.** The way that the public sector still favours the award of large contract awards, on a long-term basis, to large companies is stifling innovation, and provides major barriers for Scottish SMEs. Many Scottish SMEs companies often look to London to order to build at scale, as Scotland is dominated by several large companies who have often failed to deliver on their initial promises and where the same old technology is pushed with minimal impact around citizen interaction. Possible solution: Wherever possible support innovation and transformation, and then commit to a scale-up. Ambitious targets should be set for public agencies and for staff to commit to these. Ideas should be encouraged from every level, and successful implementation and piloting should lead to further funding, and those who continue to fail to deliver and innovate should be identified at any early stage, with funding moved to successful investments. Impact rather than the delivery against milestones should be key, and targets within contract work should be ambitious on the scale of the impact involved and the readiness to scale-up.

- **Little support for SME innovation.** For all the calls for more SME engagement within health and social care in Scotland, there are still major barriers for small and innovative companies in interfacing with front-line services, and then to build at scale. There is a strong requirement to change procurement processes, and to have more openness and transparency. Possible solution: Provide an open architecture and a road-map for service integration with a licencing model which supports innovative SMEs. Large companies would also have to commit to spending funding with SMEs and where innovation is ranked highly in contract bids. A new architecture also needs to be supported, and one which can be grown outside the existing “locked-down” infrastructure, but is trusted to interact with existing services (in a secure way). The procurement process needs to be based on electronic methods and needs to be open with a high value set on innovation and on engagement, impact and transformation.

- **Lack of openness in the health and social care architecture.** Many of the services within health and social care are locked up by large companies and where there is little opportunity for Scottish SMEs to integrate within a larger infrastructure and allow them to link with existing services. Solution: A more open infrastructure with well-defined standards for integrating would considerably aid the development of an infrastructure for innovation (while defining improved standards for security). If possible, this architecture should be build outside the existing public sector architecture, and be reviewed openly by security professionals and digital architectures.

- **Lack of open source and open standards.** The public sector needs to move into a world where the code generated is open and which can be reviewed by others, and also for others to contribute to. At present large companies often lock-down the code. Possible solution: Move to open source repositories for code and make them open for review. The code would then be licenced with co-creators of new systems.

- **Lack of citizen focus.** With a continued call for citizen-focused systems for the past decade within the public sector, there has been little change in providing access for innovative companies and in providing a solid foundation that can be used to build an infrastructure which is fit for the 21st Century. The Named Person’s Act in Scotland provided a way for Scotland to be more open in its approaches, and to build a care system which understood risk, but which was open and transparent. Unfortunately it has completely failed in providing any information on the mechanics
of its operation. Public services, especially health and social care, need to be more open and transparent in their operation, and allow citizens to understand how they operate. **Possible solution:** A trust infrastructure needs to be built at scale and where there are clear routes for citizen engagement and feedback on important performance indicators, which are open for review.

- **Lack of information sharing.** There are also failings in properly integrating health and social care, and in providing an infrastructure which allows information to flow between domains and which allows citizens access to their own data.

- **Lack of citizen-focused health care.** For all the talk of citizen-focused systems, there is virtually no infrastructure within the public sector in Scotland which truly defines the citizen as an active part of health and social care. The Sitekit sourced e-Red Book provides an excellent opportunity for a new model in providing citizen focused health and social care, but they had to go to London for large-scale adoption. **Possible solution:** A clear plan with deliverables to take us towards an infrastructure where the citizen is at the centre of care. We need radical changes, where every citizen has a health and social care record from the time of birth, with ownership of some parts of the data by citizens. Leaders too need to stand-up for radical change, and allow these changes to be informed more by their impact on citizens rather than on procurement processes.

- **Lack of pre-emptive approaches.** Our health care system is still fairly passive in its scope, and where there is often a lack of intervention before illnesses. Our citizens need to have more digital engagement with health care and modern engagement methods to be used (and not just set-up passive information on Web sites).

- **Lack of transparency.** The public sector, in generally, needs faster and more transparent ways to engage with the general public and provide data on where spending and contract awards can be done in a transparent way. **Possible solution:** Setup an infrastructure which directly engages with the citizen, and provide them mechanisms to pass viewpoints and understand the deliverables against key targets.

- **Lack of citizen engagement for electronic methods.** There are few places where citizens can go in order to provide their input into the operation of health and social care (apart from questionnaire’s which are sourced by practitioners), and in the NHS in Scotland in polling citizens for their viewpoints. **Possible solution:** Build an engagement platform which has well defined mechanisms to poll citizens and receive feedback, and on addressing concerns. Increase public engagement and continually spark new ideas on innovations.

- **Lack of innovation around university research.** While there is good work on-going in universities, very little of it is focused on real-problems around fundamental issues within health and social care, especially in integrating health care within the home. Much of the good work going on in Scotland is sourced with Scottish SMEs. **Possible solution:** Provide stronger integration of Scottish SMEs and universities around technology innovation around digital systems in health care, and support the building of strong collaborations.

- **Too much legacy.** Generally our infrastructure still supports too much legacy and needs to focus on modern and more trusted methods of defining the patient pathway, and focus on 0% paperwork and more trustworthy methods for accessing systems. **Possible solution:** Be ambitious, and set out plans to reduce paper, wet signatures and desktop computers, and focus on virtualised infrastructures, cryptography, always-on devices, and multi-factor authentication.

- **Lack of adoption of new practices.** The public sector should adopt new methods and build teams which rapidly build prototypes for evaluation, and have rapid plans to scale-up. The move to blockchain and serverless systems, for example, provide ways to disrupt existing methods, and build at scale. **Possible solution:** Build internationally-leading teams for innovation and create an open environment for new ideas, within an infrastructure that supports real-life evaluation. There should be routes to public engagement for discussion, and rapid evolution.
3. How well does the Scottish Government’s draft Digital Health and Social Care Vision 2017-2022 address the future requirements of the NHS and social care sector?

The vision is first class and we are proud to support it, but we need to make sure that the plan does not start with excellent objectives and then get lost in the implementation. Connecting For Health involved the investment of £15 billion, and little came out of it. We need true leaders and champions to implement the vision, and Scottish SMEs to provide the route to its implementation. London, in many places, has managed to support many of the objectives of the plan and have implemented things which will scale into the future, and could be used as an example of how Scotland can move towards a citizen-centric infrastructure. Trustworthiness needs to be embedded into every single element of the infrastructure, and security and resilience should be at the core of the creation of a new architecture and which supports the well-being of our citizens. Key measures of success should be built around transformation and in improving engagement, and where co-creation is a core attribute of radical change.

4. Do you think there are any significant omissions in the Scottish Government’s draft Digital Health and Social Care vision 2017-2022.

While the focus on the citizen is excellent, there are no penalties defined for not achieving these targets. The public sector often shows a resistance to change and can typically be risk averse. There needs to be a strong action plan with achievable targets and which supports innovation and a change in practices, and for citizens to be an active part of this. Any failing of the system or barriers should be identified at early stages, and thus to avoid the “Seven-year plan” syndrome (where plans for change within health and social in the UK often last for seven years, and then are seen to fail, and where a new innovative is then created). We need to crystallise the deliverables and put dates on these, and for these to provide a target for each of the partners involved. A 0% target for wet signatures, and for every Scottish citizen to sign for their identity, by the end of 2019, might be achievable targets. Without targets it is difficult to access the action plan.

5. What key opportunities exist for the use of technology in health and social care over the next 10 years?

We need to invest in a proper trust infrastructure which can be trusted for all of its interactions. This includes providing an identity infrastructure where the ID of the citizen is properly integrated into the system, and where citizens have some control of their identity and can sign with their identity with an electronic method. Every Scottish citizen must thus be given the opportunity to sign things with a trusted identity, without using wet signatures. They should also have rights to own and control parts of their data (and revoke access, if required). Every citizen must be allowed the opportunity to understand where their data is stored and how it is being used, and (again) revoke access for non-critical services. Every pathway through the public service needs to be mapped, and in how data is used.

6. What actions are needed to improve the accessibility and sharing of the electronic patient record?

The production of an electronic patient record is just the first part of a journey which much takes us to the point where there is a co-creation of health and well-being. Without taking the first step, we will never be able to modernise our provision.

As a university we developed work through two research projects around information sharing, but had to trial these in London, as it was difficult to get any form of significant engagement within Scotland. The work was a complete success and led to a spin-out company – Symphonic. As part of Healthy London initiative, the Health and Social Care ecosystem in London is piloting new ways to provide a data sharing environment to allow the 7,000 diverse organisations involved in patient care to access all patient records. The work delivers the key governance layer to this important programme.
to ensure that any data access meets with data controller agreements, which codify the inter-organisational rules for patient data access, and allow citizens to express their own data sharing preferences. There are now a number of agencies that interconnect, and span of the integration of health and social care services including: 9 million people; 1,500 GP practices; 1,500 Dental practices; 1,800 Pharmacies; 400 Opticians; 30 NHS Trusts; Hundreds of formal and informal care organisations; and 32 CCGs and 32 Councils.

If Scotland looked to London they would see a model for properly integrating information sharing, and how over 7,000 agencies have managed to work together.

7. What are the barriers to innovation in health and social care?

The barriers in health and social care is that there is very little overall vision to radically build a new infrastructure for health and social care in Scotland. Our new infrastructure cannot be defined within the NHS, and requires the expertise by expertise from external sources. The existing models are still build on legacy systems, and where there is little trust in any interaction that occurs. We are still trying to build from inside to the outside world, but where we should be looking the other way around. As outlined before, my worry would be that we start off with great intensions, and then after a few years we just end up with a whole lot of investment and just bits and pieces of change. We perhaps need to look at ways of “forcing” change and in risk taking, and be more open in our approaches.