**Institution:** Heriot-Watt University

**Unit of Assessment: B11 Computer Science and Informatics**

**Title of case study:** Pioneering Web Portals for Health Information

**1. Summary of the impact** (indicative maximum 100 words)

Scotland's Health On the Web (SHOW) was the first Healthcare Information Network of its kind and was developed in an EU project between 1996 and 1999. The original aim was to develop ways of exploiting the Web to provide trustworthy and authoritative health information in a way that was easy to find. The resulting system was adopted as the major vehicle of NHS Scotland for providing healthcare information to public and professionals. Serviced by a specially appointed team, it currently supports around 400 sites, and in recent years usage has been high, averaging around 50 million website hits per month.

**2. Underpinning research** (indicative maximum 500 words)

The Database/Knowledge Base Research group was a major research group in HWUCS, engaged in a wide range of research into databases from the early 1980s until it transformed into the PUMA lab after RAE 2008. Some of our early research was focused on problems relating to distributed databases, and included work done on linking heterogeneous medical databases [1, 2]. We were also partners in one of the first EU projects developing telemedicine systems (1989-90) and in several subsequent projects, e.g. [3].

After the Web was made available for general use in 1993, usage began to grow and websites to proliferate. At that stage, search facilities were very crude and the notion of a web portal did not exist. The ease with which a website could be created resulted in a significant proportion of the health information being of questionable quality and it was difficult for the uninformed user to know where to look for information and which sites to trust. This coupled with the huge size and anarchical organisation of information on the Internet was creating difficulties for users in finding relevant and reliable health information quickly.

This was the motivation for developing Healthcare Information Networks, and led to our participation in the EU project CHIN (Co-operative Health Information Networks) from 1996 to 1999. Prof. Williams was the PI at HWUCS and collaborated with Dr George Venters of Lanarkshire Health Board. Gavin Venters was RA on the project.

The specific role of HWUCS in this project was to develop a Healthcare Information Network (HIN) for Scotland which would address the following problems:
(a) Trust. By providing access to a connected set of trusted sites, a HIN should remove the problems arising from websites offering healthcare information of questionable quality.
(b) Usability. Web search engines were still at an early stage of development and finding specific information or a relevant website was still a challenging problem. Thus contributing websites needed to be systematically organised with some structure imposed on their contributions to enable users to find the required information rapidly.
(c) Scale. A HIN needs to be sufficiently large scale to provide the wealth of information needed to make it useful. In our case it was aimed at both the public and medical practitioners in Scotland, and provided information on available healthcare services together with educational and reference material on a wide range of health topics.

To achieve this we had to gain the confidence and support of the major healthcare organisations in Scotland. Working with them we developed a set of acceptable guidelines and structures which obtained a balance between the autonomy of individual participants and the structure needed for consistency and for efficient and effective operation. A set of user guides was produced to assist website developers in the different organisations, providing advice on style and layout to fit these common structures and produce a common look and feel. We also created a tool to assist developers in generating compliant websites, and were responsible for creating and maintaining

the overall portal linking the various websites.

The outcome of the research is reported in [4-6].

**3. References to the research** (indicative maximum of six references)

(1) J.HU and M.H.WILLIAMS, Locating patient data among multiple heterogeneous medical databases, Information and Software Technology, 35, 439-447, DOI: http://dx.doi.org/10.1016/0950-5849(93)90041-Z (1993).

(2) M.H.WILLIAMS and J.HU, Making heterogeneous medical databases interoperable, Computer Methods and Programs in Biomedicine, 43, 275-281, DOI: http://dx.doi.org/10.1016/0169-2607(94)90080-9 (1994) – invited update on our MIE 93 paper.

(3) M.H.WILLIAMS, B.MAHR, G.VENTERS and D.LUTZEBACK, A Framework for Telemedicine services, Proc. Eleventh Int. Congress of the European Federation for Medical Informatics, Eds. A. Reichert et al, Freund Publishing, 430-434 (1993).

(4) M.H.WILLIAMS, G.VENTERS, G.VENTERS and D.MARWICK, Developing a Health Care Information System for Scotland, Proceedings of Medical Informatics Europe '99 (MIE99), Ljubljana, P. Kokol et al (eds.), IOS Press, pp. 125-128 (1999).

(5) E.TAMBOURIS, M.H.WILLIAMS and C.MACROPOULOS, Co-operative Health Information Networks in Europe: Experiences from Greece and Scotland, Journal of Medical Internet Research, vol. 2(2):e11, doi: http://dx.doi.org/10.2196/jmir.2.2.e11 (2000).

(6) M.H.WILLIAMS, G.VENTERS, G.VENTERS and D.MARWICK, Developing a Regional Healthcare Information Network, IEEE Trans on IT in Biomedicine, vol. 5, No. 2, pp. 177-180, DOI: http://dx.doi.org/10.1109/4233.924809 (2001).

**4. Details of the impact** (indicative maximum 750 words)

By the end of the CHIN project (1999), it had grown to provide services for over one hundred organisations in the NHS Scotland. These included all 15 health boards and most of the 28 hospital trusts as well as a number of major NHS information providers. In so doing we had created the basis for an effective HIN for Scotland.

At that time healthcare organisations within the NHS were accepting that patients should take a more active role in their own healthcare. Most healthcare institutions were producing a range of paper-based documents aimed at patients and were quick to see the potential benefits of moving these to electronic form and making them available via the Internet, thereby reducing overall costs. The advantage that SHOW offered at this time was to bring together the distributed contributions from all the key healthcare providers in Scotland and create a single virtual healthcare library for Scotland. In so doing one creates a huge source of information that is accessible from any part of the country. An additional benefit is that institutions can easily learn from each other and are motivated to improve the information sets that they want to target at patients.

Medical practitioners were also catered for within SHOW, which included information aimed primarily at the professional. Examples were:

- TOXBASE – an online toxicology database provided by Scottish Poisons Information Bureau
- TRAVAX – online travel medicine advice provided by SCIEH
- Clinical guidelines for practitioners provided by Scottish Intercollegiate Guidelines Network (SIGN)
- Information from hospitals on new services, changes to services, laboratory handbooks, etc.

After the initial prototype service went live in 1996, the number of services grew steadily and the common structures evolved naturally. During this period the rate of access to these services grew accordingly, and by the end of the project in 1999 it averaged over 50,000 page hits per day (over 1.5 million hits per month). In 1997 the Scottish government recognised its importance and it was adopted as part of the IT strategy of the NHS in Scotland in the Scottish Office White Paper, "Designed to care: Renewing the national health service in Scotland". As a result at the end of the project, development was taken over by NHS Scotland and became the NHS' main vehicle for providing health information to patients and professionals in Scotland.

One of the problems which we had identified was that of protecting access to sensitive health information for professionals (and used passwords to do so). However, the NHS has been able to handle this with a dual system in which a full range of information is available to professionals within the NHS firewall and a subset available to any user outside the firewall. Currently the full set of websites available to professionals within the NHS firewall through SHOW numbers over 400 (see http://www.showsupport.scot.nhs.uk/About/About.aspx) while 289 of these are available to any user outside the firewall.

In turn the use and dependence on the site by both public and professionals has grown steadily, and during the 2008—2013 period it has averaged 1.7 million hits per day (50 million per month). Since the population of Scotland is around 5 million people, this represents a significant rate of access. This put Scotland well ahead of developments in other countries and was regarded as a major success.

Since take over by the NHS, SHOW has been managed by a support team within NISG (National Information Systems Group) which currently consists of 8 personnel (see http://www.show.scot.nhs.uk/aboutSHOW/howSHOW.aspx ).

One of the important benefits of SHOW is its ability to reach a large number of people very rapidly. This has been particularly useful when emergency situations such as e-coli outbreaks have occurred. It has also been useful in providing access to new developments such as NHS24.

Following our developments on SHOW, researchers at the National Centre for Scientific Research "Demokritos" in Athens adopted a different approach but used some of our developments [5] as a basis for a HIN for Greece. Other HINs have been developed for different purposes such as exchange of patient data (NHIN), public health (PHIN), etc. Note that SHINE (Scottish Health Information NEtwork) is a later development produced by library and information services and has nothing to do with SHOW.

**5. Sources to corroborate the impact** (indicative maximum of 10 references)

SHOW Service Manager, NISG, NHS National Services Scotland,

Telecommunications Consultant for NHS Scotland

The SHOW home page: http://www.scot.nhs.uk/index.aspx

About SHOW (including its history): http://www.scot.nhs.uk/aboutSHOW/aboutSHOW.aspx

An About SHOW page aimed at current and future client sites
http://www.showsupport.scot.nhs.uk/About/About.aspx

The current list of SHOW sites:
http://www.show.scot.nhs.uk/sites_az.aspx