

A Novel National Master's in Digital Health Transformation: driving cohesive systemic digital change

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Abstract

To spearhead the digital transformation of the Irish Health system, a National Master's in Digital Health Transformation was co-designed between the Irish Health Service (HSE) and the eight Irish research universities. The Master's was designed around the new Stay Left, Shift Left-10X paradigm which advocates for shifts in focus from illness to wellness, hospital to home and a patient rather than clinician centred health system. A key feature of the Masters is that the main deliverable is a digital change project in the health service instead of the traditional 30,000-word dissertation. The Digital Change project, while an extremely valuable learning process also created a cohesive wave of digital change in an organization and ecosystem known for resistance to change. An additional innovation is the use of a patient jury to guide selection and to score projects. More than one hundred and fifty clinical students delivered over 85 completed projects which brought significant positive benefits across the quadruple aim lens. The education and change initiative achieved a massive return on investment, with some individual projects achieving return on investments significantly greater than the overall cost of the Master's program. In parallel to the National Master's program, other initiatives aligned with the national health strategy Slaintecare, such as the building of a network of primary care centres were carried out. Despite many remaining challenges, Ireland's global health system ranking improved 74 places over the first five-year duration of the Masters. Acknowledging multifactorial reasons for improvement, we can still conclude that education led digital change is highly effective at introducing positive digital change in a complex adaptive systems environment.

Keywords: *Digital health; change; masters; digital transformation; adoption.*

1. Problem and Opportunity

Over the past two centuries remarkable improvements have been made in health systems, with average life expectancy more than doubling since 1800 (Human Mortality Database, 2019). However, despite this remarkable progress, there is increasing evidence that modern health systems are buckling under the challenges of increasing demand, aging populations and workforce shortages (Figueroa et al., 2019). Digital technologies and data driven innovations offer the promise of transforming national and indeed global healthcare systems.

In Ireland in May 2017, the Committee on the Future of Healthcare (a cross-party parliamentary committee) published its final report, the Sláintecare Report (Shorthall et al., 2017), a ten-year plan to reform the Irish health system. Despite the all-party political agreement and record investment in the Irish Health Services, a 90% increase in the budget over an eight-year period, there was declining performance in most major indicators with waitlists almost doubling in the period since Sláintecare was introduced. Clearly a different approach was needed.

A key question then was 'What to do?' and 'How to do?'. The HSE Digital Transformation team chose to use the 'Open Innovation 2.0' methodology (Curley and Salmelin, 2017) to help drive the system wide change and to develop a new transformation strategy "Stay Left, Shift Left-10X" (Curley, 2018) as the directional lens for focusing all transformation efforts to ensure a coherent, cohesive, and compounding approach to system wide change.

2. Advances in Higher Education Achieved

Beginning the paper, we would like to set forth the five key advances introduced and achieved in the master's program.

1. Academics from all eight Irish Universities rallied around and co-designed a unique national Master's in Digital Health Transformation to address a critical and urgent national problem, that of an increasingly overwhelmed health system. Using the Open Innovation 2.0 methodology (Curley and Salmelin, 2013, 2017), academics worked using an agile collaborative way to deliver disproportionate national shared value.
2. The master's program introduced a significant innovation in requiring students to deliver a digital change project as their major work contribution rather than the more traditional 30,000-word dissertation. This was a pedagogical innovation and over 85 digital change projects were delivered from the first three intakes of one hundred and fifty students, and this had the effect of delivering a tsunami of digital change across the system, and very importantly started to change the culture of the HSE organization.
3. The deep involvement of patients in the design and selection of student projects was critical in having the patient voice heard, creating a portfolio of projects optimized based on patient need and centricity.

4. Accelerated Impact. Because of the applied learning focus of the curriculum, when various crisis such as COVID-19 and a catastrophic cyberattack on the health service occurred, student leaders from the master's program were able to step forward to lead.
5. Unlike the NHS Digital Academy, the master's program was primarily aimed at clinicians rather than technologists, with a goal to produce digital savvy clinicians.

Open Innovation 2.0 which underpins the National Masters is a non-linear change methodology which seeks to establish critical connections, critical capability and critical mass to yield multiplicative results through synthesis, strategy and synergies. At the start of the Digital Transformation Program in 2019 a key goal was to move Ireland from a Laggard to a Leader in Health as measured by Ireland's place in the CEO World Rankings of Healthcare Systems (a leading indicator of health system performance). In 2019 Ireland's global healthcare index ranking was a lowly 80th position (CEO World, 2019) despite above average spending on health per capita (OECD, 2023).

3. Laying the Foundations

In late 2018, the Director General, Mr John Connaghan of Ireland's HSE approved the creation of a new Digital Transformation function at the HSE to be led by Professor Martin Curley. The mission of this function being to lead the digital transformation of the Health Service. As the cornerstone for any transformation is awareness and education, the first strategic action decided was to create a Digital Academy and immediately a master's in Digital Health Transformation. Key National Directors within the HSE were canvassed and agreed to support and fund the new Masters.

Professor Curley approached all the Digital Health professors and senior lecturers in Ireland with the vision of creating a Master's in Digital Health Transformation. These leading academics agreed to collaborate on this unique initiative, participating in an initial co-design workshop at the Innovation Value Institute in Maynooth University in May 2019.

In this workshop an outline syllabus was agreed, with responsible for each module allocated to a university. The original intention was to deliver a Masters that could start in September 2020. Because of the urgency of educating HSE employees/leaders for the digital transformation, a stretch goal of January 2020 was agreed and using a rapid agile development process, the curriculum and module specifications were developed in a series of sprints. The lead accreditation and delivery university was switched to University of Limerick for speed. A HSE Master's Steering Group was established to approve the curriculum and select the clinicians approved for scholarships. A robust and rigorous campaign and selection process was launched in August 2019 and 50 offers were generated with an oversubscription rate of 4X.

Unlike traditional master's programs whereby students are required to write a 30,000-word dissertation, students are instead required to specify, develop and implement a digital change project. This significantly increased the impact of the education experience, delivering real value to the HSE as well as creating a cohort of digital leaders across the organization.

4. Master's Design and a Leapfrog Strategy

The master's program was designed around a new paradigm "Stay Left, Shift Left – 10X" whose objective is to create a new kind of health system which would enable a leapfrog (cf. Figure 1) from a 'paper, presence and physician' centred system to a 'people/patient, proactive and participatory' system.

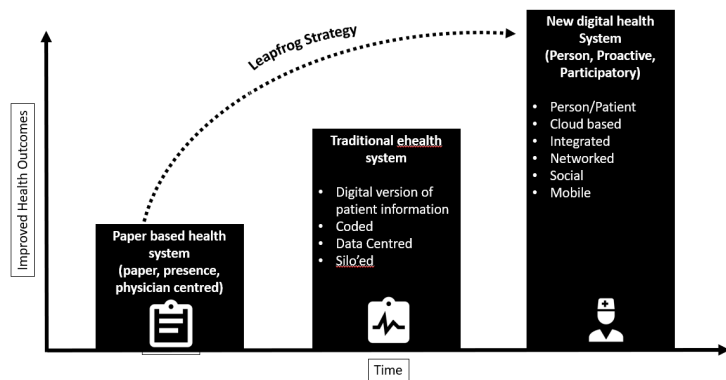


Figure 1 Ireland's Leapfrog Strategy, source Curley inspired by PWC

The goal was to inspire, inform and enable clinicians and other leaders to create digital change projects which when a critical mass was achieved, would create a metamorphosis of Ireland's Health System. When the Digital Transformation and Open Innovation strategy was reviewed and approved by the HSE Board (HSE, 2021) in April 2021 the Board noted that "*this initiative will require a radical rethinking of our organizations culture to fundamentally change and improve the patient and clinician's experience*". Thus a key additional goal of the Masters was to induce culture change by seeding a network of change oriented digital change leaders across the HSE.

4.1. Stay Left, Shift Left – 10X

Stay Left, Shift Left -10X (Curley et al, 2018, 2021) is a strategy which is about first keeping people well and enabling self-care, shared care in the home. **Stay Left** is about first keeping well people, or if a person has a chronic condition or need rehabilitation this person can be best managed from home. **Shift Left** is about moving patients as quickly as possible from an Acute to a Community to a Home setting. A key goal of the strategy was to create a portfolio of

innovations which were coherent and complimentary and hopefully compounding which could create a shift to the left of the entire health system. Embracing Stay Left, Shift Left created a new vision to direct innovation efforts in the same direction.

The National Sláintecare report (Shorthall et al., 2017) specifically identified a need for a strategy like Stay Left, Shift Left stating “*A key cause of Ireland’s relatively high spending may well be its emphasis on an expensive model of healthcare delivery*”. *Stay Left, Shift Left hoped to fix that.*

10X is the notion that Digital and Data Technology when applied to healthcare which is essentially an information management discipline and an information intensive industry leads to 10X or tenfold outcomes (10X faster, 10X cheaper, 10X better, 10X higher volume etc). Stay Left, Shift Left – 10X became the core principle underpinning the design and the delivery of the entire Masters. In parallel to the National Master’s a network of digital health living labs was established and managed by HSE Digital Transformation and yield evidence of a consistent pattern of digital health solutions yield multiple 10X benefits. This observed phenomenon was coined Curley’s law by Insightscare (2022)

4.2. Design Thinking

In designing the Masters, we defined Digital Transformation as coordinated Digital Change effort at scale, throughout all aspects of the organization and ecosystem, and wanted to design a curriculum that would build a network of digital health change leaders.

A design thinking process was used to design the Masters. Design Thinking is a non-linear iterative process used to design solutions to tackle difficult and/or undefined problems. Typically Design Thinking involves five phases: understand/empathize, define, ideate, prototype and test. Before engaging the broader group of national academics, Professor Curley developed a prototype curriculum which was used as a key input to share for the next iteration of the design thinking process when the broader group of academics were brought together. A number of iterations of the curriculum design were led by Annette McElligott. Further details on this program such as Learning Outcomes, Brief Module Descriptions and so forth are available <https://www.digitalhealthtransformation.ie>

5. Master’s Delivery

The program director Annette McElligott was faced with a significant challenge, build a schedule to accommodate the busy rosters of working clinicians across multiple sites within Ireland. She devised a hybrid delivery mechanism which involved students mainly attending modules on Fridays and Saturdays at the various universities. This seemed to work well as attendances typically average over 90% or higher. The program designers felt that

interdisciplinary and inter-site learning would be a critical component of the masters and that face-to-face attendance was strongly encouraged and achieved.

5.1 Participant Numbers

We were able to achieve consistently high demand, and participants each year on the program significantly exceeded our target of 35 students (Year 1: 49 students; Year 2: 50; Year 3: 53 students; Year 4: 44 students; and Year 5: 40 students). Many of the students were sponsored by the HSE which indicated the HSE's commitment to educating clinical leaders in digital transformation.

5.2 Participants' Demographics

The course designers and HSE leadership felt it was critical to have a diverse set of clinicians and others attending the masters to facilitate interdisciplinary learning and to ensure digital clinical leaders were seeded across the health system. In parallel, we felt it was crucial to have attendees from outside the health system and key industry leaders were encouraged to join the program. We had a very broad mix of roles including consultants, doctors, nurses, physiotherapists, pharmacists, dentists, managers, technical leaders, industry executives and other roles.

5.3 Project Topics and Portfolios

We actively solicited a broad set of project topics and these were heavily influenced also by patient needs and inputs through the Patient Dragons' Den process. The portfolio of projects were classified using the World Health Organisation's Digital Health Interventions taxonomy (WHO, 2023).

5.4 Patient Dragons

A core principle of the masters is that the patient or person is the ultimate end customer in aspiring to create a person or patient centric healthcare system. To really 'live' this principle and embed this thinking in the students, we partnered with the Irish Platform for Patient Organizations, Science and Industry (IPPOSI) to make sure the patient voice was influential in project selection and focus. We borrowed the Dragons' Den concept from the world of TV, Venture Capital and Start-ups to establish a Patients' Dragons' Den to review the students' project proposals from a patient perspective. The process produced patient centred projects and when mapped against the WHO Guidelines (WHO, 2023) for digital interventions we achieved a remarkable balance against the four high level impact levels.

6. Master's Impact

We believe the Masters has had a very important non-linear impact on the Irish health system by building people capability, delivering important and critical projects and slowly but surely changing the culture of the Irish Health Service, where we have many outstanding clinicians but pockets of the service who are vehemently opposed to change.

6.1. Systemic Change by Stealth

Eric Topol (2015) has said healthcare is the industry most resistant to change. A very specific but not widely communicated goal was to use the Master's Change Projects as a coordinated mechanism to introduce cohesive systemic digital change into the Irish health system using the Master's learning mechanism as a kind of trojan horse.

In essence, the Master students were setup as Guerilla Innovators, successfully innovating in spite and against a system which deeply resisted innovation. The average failure rates of digital transformation projects can be up to 70%. Bucking this trend 18 of the 21 projects delivered by students from the first intake were viable, being implemented or currently under development and being progressed, thus an 80% success rate.

6.2. Digital Skills Leadership

Developing Digital Leaders was a key goal of the master's program, and we are very pleased to see that about 50% of graduates have been promoted into digital health related roles since graduating. There has been significant role mobility to and from industry.

6.3. Example Successful Projects

Several projects have been extraordinarily successful. A project on remote COVID-19 monitoring by Lorraine Smyth won student project of the year at the National Health Awards but more importantly was pivotal in the HSE's response to COVID-19. The total budget for the master's per year is 0.5 million but on this project alone the return on investment (ROI) was **>24X**

The master's project of Niall Ginnity and Mendinaro Imcha, to create an 'Interactive Infrastructure Map' was absolutely pivotal and essential to the HSE Conti Cyberattack recovery resulting in a 3X faster recovery. The ROI from such an impact is immeasurable – it is impossible to value the lives that were potentially saved and better outcomes for patients that were achieved.

7. Results and Conclusions

To address many overwhelming and concurrent challenges to its ailing health system, a new National Master's in Digital Health Transformation was co-designed and introduced in Ireland by the HSE and all eight Irish research universities, building critical capability, connections, projects and achieving a critical mass to really move the needle in helping the Irish health system transform and shift to the left. Five significant advances were introduced and achieved and the results in terms of patient impact, financial return and project viability were extraordinary, demonstrating the role and value of leader education when trying to introduce radical non-linear change to a system whose defining characteristic is of extreme resistance to change. While much remains to be improved in the Irish Health system, a key success measurement of radically improving Ireland's ranking in the CEO World's Health system ranking was achieved, years in advance, with Ireland improving from 80th place to 6th by 2024.

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