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Global challenges:

- **Responding to Climate Change.**
  Explores sustainable approaches to food and environment security, addressing the scientific, cultural, health and social issues that govern our response to a changing climate.

- **Public Health (Non-Communicable Disease).**
  Emphasizes a life-course approach to addressing non-communicable diseases (NCDs), especially but not exclusively, in low and middle income countries and transitioning populations.

- **Global Higher Education and Research.**
  Proposes policy reforms to address the sources, mech-
2. WUN Web Observatory

The Web Observatory infrastructure [3,4], developed under the auspices of the Web Science Trust, brings the principles of the early Web to this emerging research data ecosystem, with the same goal of transformational growth through decentralisation [1]. Below we describe three components to this infrastructure that the WUN Web Observatory project seeks to exploit.

2.1 Virtual Research Data Repositories

Anyone can establish a Web Observatory to create their own virtual research data repository with its own, possibly highly focused, scope and self-determined rules for access and sharing. At a foundational level this enables researchers and organisations to create individualised or project-specific research data directories and to maintain control over the description, ownership and access to their own research metadata. Indeed, one of the objectives of the WUN Web Observatory project is to create a WUN research data directory by establishing a network of Web Observatories cataloguing the institutional research data repository and other major holdings of all the WUN member universities. The resultant self-updating and readily searchable directory of WUN research data will facilitate research data sharing within and between WUN universities and support interdisciplinary and inter-institutional research.

2.2 Management of ‘Live’ Research Data

However, the greater significance of creating the WUN virtual research data repository is that its constituent network of Web Observatories provides the requisite critical mass for the realisation of the WUN Web Observatory project’s transformational vision: to position the WUN as global leaders in the exchange and re-use of research data between disciplines and institutions, driving forward research underpinning WUN’s priority Global Challenges and Cross-Cutting Themes while, at the same time, bootstrapping the worldwide development and adoption of the Web Observatory infrastructure envisioned and supported by the Web Science Trust. Establishing a network of Web Observatories facilitates the bottom-up adoption of Web Observatory infrastructure by WUN researchers for the creation and widespread use of virtual research data repositories as the default means of research data discovery and exchange. Crucial to its appeal, and unlike the current generation of research data management software, Web Observatory infrastructure supports the management of active, ‘live’, research data, not just archival post-publication research data.

2.3 Secure Access Control and Attribution

Using a technical trick, known as “reverse proxying”, Web Observatories enable authentication and access control to decentralised research data - regardless of where that data is held, whether it is in an archival repository or in working, active research stores, digital asset management systems or in arbitrary cloud-hosted platforms or even in streamed real-time data feeds. This distinguishes a virtual research data repository from a research data directory or a traditional research data repository and is the core innovation of the Web Observatory concept that the WUN Web Observatory project seeks to investigate and develop through a range of research demonstrator activities, described below.

3. Research Demonstrators

To explore research questions across the four Global Challenges, the WUN Web Observatory project established four corresponding demonstrator activities that also support the Cross-Cutting Themes as depicted by numbered circles and themes in the annotated WUN research matrix of Figure 1.

Each of the four research demonstrator activities explores different aspects and configurations of the Web Observatory infrastructure to enable and support WUN research as outlined below.

3.1 Demonstrator 1: Online Learning

Aggregates datasets from different online learning platforms across the WUN and provides analytics on those datasets, quantifying the diverse usage patterns of Massive Open Online Courses (MOOCs) to reveal success criteria for online learning and to provide insights into future directions.

3.2 Demonstrator 2: Ageing and Well-being

Combines data from established sources, such as cancer registries, with newer (often personalised) sources, such as wearable sensors, mobile devices and crowdsourcing, to enable visualisation and analysis of ageing patterns and poor

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1 Online Learning lead: Spanakis, Universiteit Maastricht.
3.3 Demonstrator 3: Disaster Management

Enables and investigates social and technical mechanisms for Citizen-Driven Disaster Management, where individuals provide their own data in a decentralised system to proactively support emergency response and planning prior, during, and post natural and urban disasters, while retaining control and privacy of their own data.

3.4 Demonstrator 4: Youth and Digital Media

Links and analyses disparate WUN datasets to explore the patterns and impact of youth reliance on social media and digital information platforms for their political involvement, and the consequences for young citizens’ attitudes toward government, citizenship, politics and civic engagement.

4. SUMMARY

Building on experience from these four research demonstrators, the WUN Web Observatory project aims to instantiate a collection of virtual research data repositories, enable effective management of ‘live’ research data, and control of its access and attribution; thus becoming the default pathway for WUN’s researchers working in pursuit of its Global Challenges. Such widespread international adoption significantly advances the project’s longer-term ambition to bootstrap the worldwide development and adoption of Web Observatory infrastructure to the benefit of all research.

5. REFERENCES