Knowledge for the 'risk society': developing an International Social Science Risk Database (ISSRD)

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Recent decades of globalisation have seen a number of social changes in communication modes in relation to societal risks, including the development of an increasingly critical public, and a growing reliance on public information. Under these conditions, the need for evidence-based public

information resources, including archives, focused on societal risks has become more apparent. Published scientific resources are readily available, but the social and political sciences lack resources which provide knowledge about the regulation, perception and public responses to risk, in order to improve the outcomes of risk governance. This article reports on a project which has tested the feasibility of developing such a resource, the International Social Science Risk Database (ISSRD). The recent swine flu outbreak was used as an Australian-focused test case. The underlying structure of the ISSRD is drawn from the informatics articulated in the Australian Commonwealth Record Series (CRS) system for archival documentation and controlling metadata, but is extended to include a wider range of entity and relationship types. It is proposed that the resultant mapping of risk events as a network, and in particular their visualisation, provides insights that will help archivists identify the most important record creators and appraise records for long-term value. The ISSRD provides broader contextualised understandings and this will contribute to improved societal management of risk.

Keywords: risk society, database, visualisation, swine flu, knowledge, archive informatics, archival appraisal, network science

Introduction

Recent decades can be characterised by a number of significant social changes across many societies and on a global scale. Current debates, in particular in Western industrialised societies, have shifted towards new risks[1] such as nuclear power, genetic engineering, financial crises, energy shortages, climate change and international terrorism, and re-emerging risks such as infectious diseases (swine flu, bird flu, AIDS, Ebola, and the like).

At the same time, political decisions regarding risks have been increasingly scrutinised by the media, non-government organisations (NGOs) and critical consumers.[2] Indeed, the risks involved in decisions made by politicians, public servants (archivists) and private companies, which often have long-lasting and incalculable after-effects, are of increasing concern.[3] Fifty years of risk research have shown that local or practical knowledge is a valuable complementary resource for

good risk management and that public concerns about risk cannot be satisfied just through the provision of scientific knowledge. More than simply educating the public, public participation has become central for successfully dealing with risk decisions.[4]

Under these conditions, transparency of decision-making, a central tenet of archival practice, and authoritative knowledge available to all stakeholders are necessary conditions for successful societal management of complex decisions. In present knowledge societies,[5] the availability and accessibility of information, in particular via the Internet and search engines such as Google, are recognised as crucial, and the manageability of information and its transformation into knowledge become growing concerns. As Kenneally noted in her interview with Findlay and Cumming:

> Rather than making the nation's record keepers obsolete, the digital revolution has greatly increased their workload. In fact, in the last 20 years, the role of the archivist has fundamentally changed: it used to be that the archivist's raison d'être was to carefully preserve, now one of their most important jobs is to throw away.[6]

But how do archivists make those decisions and are they being invited to the conference table where those decisions are made? Are reasonable appraisal processes even possible in a world of hyper-interconnectivity and continuous change?

Traditional notions of the public record are challenged by hidden biases, selective provision of knowledge, and continual rewriting and re-presentation of the past, and for risk analysts these are major issues of debate.[7] Furthermore, open resource initiatives (for example, open source scientific journals), Project Gutenberg,[8] and the controversies about WikiLeaks[9] indicate the need and will to have good-quality evidence-based information available for transparent and more responsible decision-making in democratic societies. The International Social Science Risk Database (ISSRD) project, following this broader research agenda, explores the utility of evidence-based knowledge (records) in the management and perception of, and public response to, both new and old risks. A working hypothesis is that standardised, contextualised, evidence-based knowledge, widely available to

the public and social science researchers worldwide, will improve understanding and responses to risk.[10]

For archivists, the records continuum is a persuasive model and provides a means for understanding this major challenge to traditional archival and records practices.[11] It also provides a useful means by which the practical and conceptual underpinnings of recordkeeping can be explained to those in other fields. The use of social media and related digital network technologies, which bypass traditional recordkeeping processes, are now present in the day-to-day activities of decision-makers. This poses significant challenges for archivists in the twenty-first century.[12] Sue McKemmish observes that, in terms of the records continuum, 'the role of recordkeeping professionals relates to setting up recordkeeping regimes that can ensure that *from their creation*, records are managed in ways that enable them to fulfil their multiple purposes contemporaneously *and* over time'.[13] It may be that the ISSRD and similar public knowledge resources will prove useful not only for the understanding and management of societal risk but also for archivists in establishing appraisal processes covering diverse and distributed sets of records.

The structure of the International Social Science Risk Database (ISSRD)

The major aim of the International Social Science Risk Database (ISSRD) is to make knowledge about the political and social science aspects of societal risks available to researchers and the public, to advance knowledge, and to improve the management of risks on a national and international scale. In 2010 the ISSRD project at the University of Melbourne tested the feasibility of such a database using the 2009 swine flu outbreak as an example.

At present the prototype database is managed by the University of Melbourne and is available for local researchers. It is planned that, via the Internet, a published version of the database will be freely available under a Creative Commons licence, (see <*http://riskanduncertainty.net/issrd/*>).

The standards-based informatics[15] underpinning the ISSRD not only provides annotated bibliographies about key publications and links to

such sources, but can be extended to include any source of evidence, including archives and records. Most importantly, it establishes the functional context in which that evidence was created through the identification and registration of key stakeholders. This can happen retrospectively through the analysis of records or through the registration of the stakeholders as they appear in an unfolding of a risk scenario.[16] The ISSRD could be used to document historic risk scenarios or used in real-time to map an emerging societal risk.

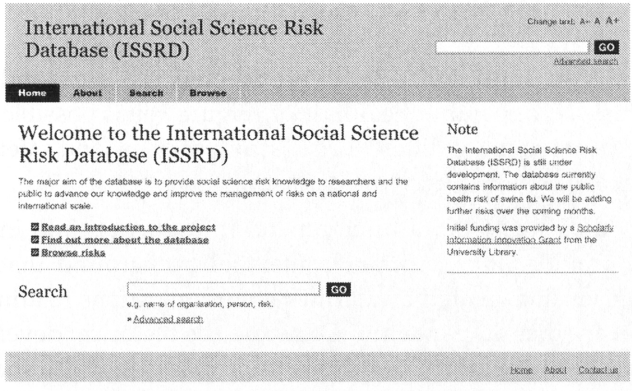

Figure 1. Welcome page of the ISSRD

The registration of major events occurs at the same informatics level as the stakeholders or record-creators. The relationships between the events and the stakeholders, which are described and dated, allows for a network of relationships to be viewed through time. Important stakeholders can be identified by the relative number of links. The dated events establish the time period for the risk scenario and therefore the period of recordkeeping interest, that is, the period for which records are most likely to be of value in understanding that risk scenario.

For the case study on Australia's response to the 2009 swine flu outbreak, data from *The Australian*, available via LexisNexis, was used to identify key events. Extensive Internet research and databases of academic publications were used to identify further knowledge and information sources such as government publications, reports by general practitioners in professional journals, and other news coverage.

- A media/Internet analysis which helps to identify important events regarding a specific risk and public debates about it
- International social science research publications
- Publications of NGOs, governments and other relevant stakeholders

Figure 2. Knowledge sources of the ISSRD

The key entry points into the ISSRD are different risk areas and specific societal risks. From 'Public health risks' (Figure 3) it is possible to track through to a number of different risk issues, such as food safety, binge drinking, obesity and infectious diseases.

In the case of swine flu, a brief general introduction into infectious diseases provides an important contextual background that frames the public tension created by alarmist communications relating to the danger of another flu pandemic. Of note is the historical development of a strong decrease in the mortality of such diseases. It also shows that there is a recent increase in infectious disease mortality, but it is not yet clear whether this really indicates an overall reversal of this trend, or whether it might remain on this comparatively low level.

The introduction to 'Influenza pandemics' (Figure 4) sets the 2009 swine flu in the context of other influenza pandemics. It highlights the problem of the uncertainty around when and how such a pandemic will strike again and how many lives it may cost. The influential and key global player in the management of the 2009 H1N1 influenza pandemic was the World Health Organization (WHO). The WHO refers to past pandemics when claiming that it is not a question of whether we will experience another deadly influenza pandemic, but when. As a worst case scenario, the WHO repeatedly refers to the 1918 Spanish flu. For example, the WHO's spokesman, Gregory Hartl, said: 'The Spanish flu (of 1918–19, which killed an estimated 50 million people) showed a surge in the spring and disappeared in the summer, only to return in the autumn with a vengeance. We cannot lower our guard' (5 May 2009).[17] Since it is important to see that this claim is contested, the database provides different positions on the issue.

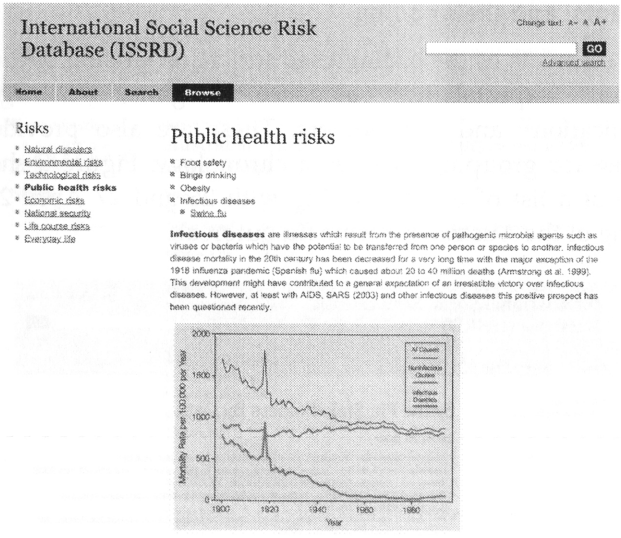

Figure 3. Introduction to 'Infectious diseases'

Figure 4. Introduction to 'Influenza pandemic'

The 'events' and their coding

The key elements of the coding used for characterising single events are risks,[18] expectations,[19] evidence,[20] regime,[21] management,[22] communication[23] and stakeholders. These are also provided with a time-tag for grouping them as a chronology. Figure 5 shows the example of a list of events starting with 26 and 27 April 2009, the beginning of the Australian swine flu outbreak.

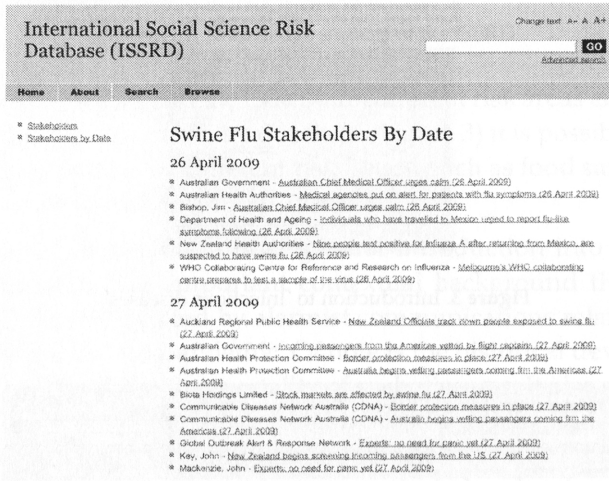

Figure 5. Swine flu events by stakeholders and date

Each heading links to the other coding terms and the source of information which gives a short summary, and links to related entries. The case of Jim Bishop and the Australian Government is illustrative of what emerges through the systematic inclusion of event entities and their relationships (see Figure 6). The 'Related entries' section of the Jim Bishop link in Figure 6 leads to an entry that documents Bishop's position at the time of the risk scenario – he was the Chief Medical Officer in the Commonwealth Department of Health and Ageing. Along with other information, his connections with other people and organisations can also be found in this entry. All of these types of entries can be updated as new evidence is located.

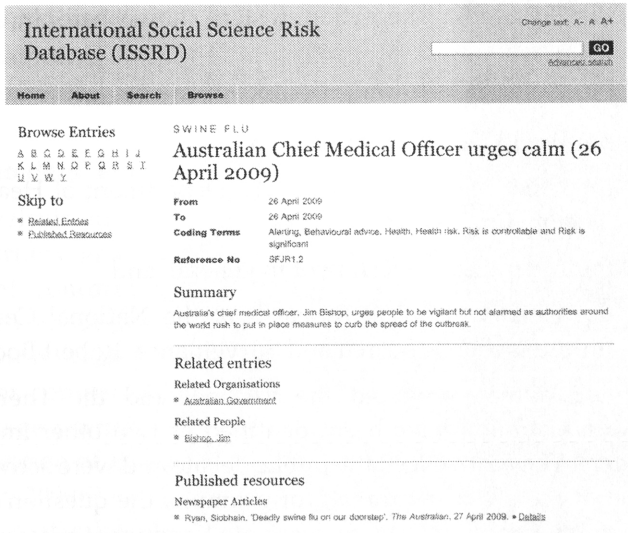

Figure 6. Event description with related entries and published resources

Identifying key stakeholders and their role in the swine flu case

There are several ways to find out about key stakeholders in a risk scenario. Individuals could use personal or anecdotal information sources about the formal responsibility of the government and governmental institutions. They could also try to make judgements about the impact of social movements or NGOs. With the ISSRD there are evidence-based methods to determine the key players in the societal negotiation and management of risk scenarios that go beyond the juridical boundaries (for example, the Australian Government) to include scientists, private companies, the media, state organisations and social researchers. Through the registration of individuals and organisations based on their participation in the risk scenario it is possible to move beyond formal responsibilities and document the real-life involvement in the unfolding of societal risk management.

Because of the systematic registration of events and key players, it is possible to visualise the number of events and connections to

stakeholders (Figure 7). The major clusters shown here, in order of connectedness, are:

- the Federal Minister for Health, Nicola Roxon;
- the World Health Organization;
- the Chief Medical Officer of the Department of Health and Ageing, Jim Bishop;
- the Australian Government in general; and
- the Head of Clinical Research at the National Centre for Immunisation Research and Surveillance, Robert Booy.

CSL Limited, which provided the vaccine, and the Therapeutic Goods Administration have been identified as two other important stakeholders. They influenced the public debate and were active in the regulation of the swine flu threat, for example, the question of who and how many people should be vaccinated and what precautionary measures should be taken.

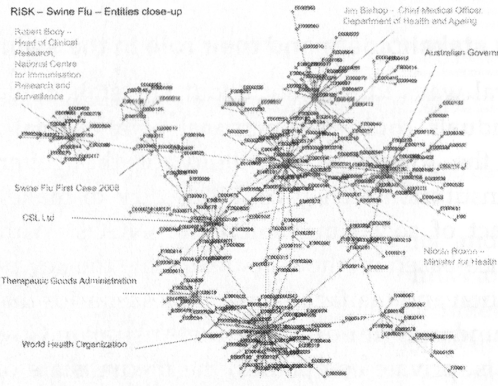

Figure 7. Key players in the Australian 2009 H1N1 swine flu pandemic

Although what is shown here is only a starting point and an example of the types of visualisations that could be derived from the data, it gives an overview of the whole risk scenario and an introduction to the public debates and controversies as well as the regulation of the swine flu threat. On the basis of this information, it is possible to have

a closer look at the stakeholders and the events they are connected to, and what role they have played in the unfolding of the swine flu risk scenario.

Stakeholders' involvement in the swine flu risk

The analysis of the involvement of the Australian federal, state and territory governments and the WHO shows that they followed different communication strategies. The WHO was driving the discourse about swine flu through alarmist communications, referring to the worst case scenario of the 1918 Spanish flu pandemic and the need for comprehensive measures to deal with it. However, at an early stage, journalists at *The Australian* criticised what they saw as an exaggeration of the swine flu risk, describing it as a 'news pandemic' (1 May 2009)[24] and a product of fear-mongering (4 May 2009),[25] and in particular the WHO was criticised as encouraging hysteria (7 May 2009).[26] This critique reflects on the scientific epidemiological rationality which drove the WHO's approach, emphasising the possibilities and uncertainties involved. Even when it turned out at the end of 2009 that swine flu was less harmful than expected, CSL Limited (the pharmaceutical company which produced the swine flu vaccine *panvax*) emphasised the possibilities of mutations and that the virus might come back to be even more harmful than before (6 January 2010).[27] The WHO, the Australian Government and CSL still supported vaccination in early 2010 but public demand decreased. It is open to debate whether support for vaccination is the result of organisational self-interest (a kind of precautionary approach which considers even very unlikely possibilities), or a justification of past decisions which seem in the light of better knowledge as an overreaction, or an expression of a different scientific rationality.

The unfolding of swine flu shows that during 2009 the government and key people within the health administration followed a more practical line of risk communication, balancing the need to make people aware of the dangers while at the same time preventing panic by reassuring that necessary measures were in place.

This approach is clarified in the request to the WHO to carefully consider whether the pandemic alarm level should be raised another time (20 May 2009).[28] At the end of May the Australian Football League Chief Executive Officer stated that there was no need to cancel football because of swine flu (30 May 2009)[29] while federal health authorities considered the strategy of quarantining people who had come into contact with swine flu (30 May 2009)[30] and 11 schools in Victoria closed (1 June 2009).[31] The difference between the Australian and WHO responses to swine flu became even more obvious on 12 June 2009 when Victorian and federal health officials argued that there was no reason to cancel public gatherings while the WHO warned that Victoria should cancel events that involve mass gatherings.[32]

With the data structured in this way multiple coding exercises could be conducted using the same evidential foundations. This opens up the possibility of new analytical tools including data visualisation. For example, the differences in WHO communication strategies and the approaches of the federal, state and territory governments could be visualised to identify reassuring risk communication events and alarmist risk communication events, different focuses on the controllability of the flu, and the uncertainties and possible mutation of the virus into something even more harmful.

Structuring the data by coding schemes

A coding scheme for the swine flu scenario was developed to assist in the analysis of a range of political and societal variables. The events were coded according to their relevance to related risks, for example, a health, legal, economic, political, or societal (everyday life) risk. In addition, as already mentioned, the database supports a range of visualisations. Figure 8 shows when different risks were communicated and how this changed over time. While visualisations such as this clearly show some aspects of the shift in the risk over time, such as the sudden increase then gradual decline in the interest in health risks (Figure 8, bar 2 for each month), qualitative analyses of these changes can also be captured in the database.

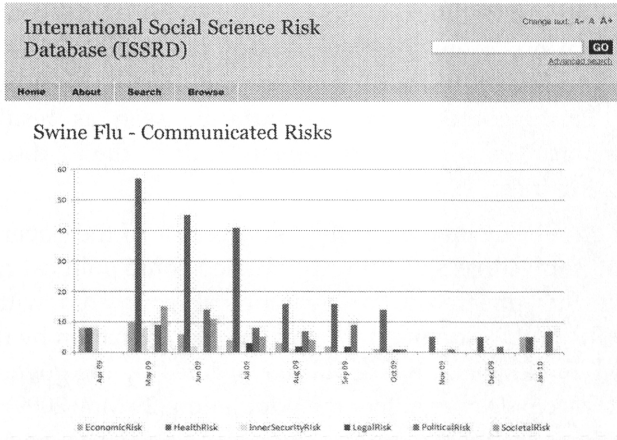

Figure 8. Communicated risks during the H1N1 swine flu epidemic in Australia – April 2009 to January 2010

Using the example of communicated political risks (Figure 8, bar 5 for each month), it can be observed that at the beginning of the scenario political risks focused on the proper management of the flu and the implementation of the Australian Health Management Plan for Pandemic Influenza (AHMPPI). A number of issues appeared, revealing a mixed picture, for example:

- Temperature scanners and health declaration cards were distributed but kept on standby initially (29 April 2009).[33] Only in response to criticism (30 April 2009)[34] were the scanners used for scanning of international passengers. However, several experts, such as the sociologist Claire Hooker, coordinator of the medical humanities program at the University of Sydney, and Alan Hampson, the chairman of Australia's Influenza Specialist Group and a WHO consultant, agreed that the effectiveness of temperature scanners was limited in preventing the infection spreading. 'Not everyone infected with flu has a temperature, and someone can have the infection and be infectious to others without running a fever that would be picked up by scanning equipment' (26 May 2009).[35]

- Indonesia introduced strict swine flu controls on visitors from Australia after confirmed cases arrived on flights from Melbourne and Perth (25 June 2009).[36] This rigorous response could be seen as result of the perceived mismanagement of the disease in Australia.

In hindsight, the evaluation of the performance of the government in early 2010 shows that swine flu still carried some political risk. Since the swine flu appeared to be a minor risk compared with normal seasonal flu, and the demand for preventive vaccination by the public decreased, the high amount of vaccine ordered by the government to be able to vaccinate over half of the population (29 May 2009)[37] seemed wasted. However, there were still stakeholders, such as the Australian Medical Association (AMA) president Andrew Pesce, Nicola Roxon for the Australian Government, the vaccine producer CSL and the medical virologist Dominic Dwyer, who urged the public to participate in mass vaccination, supporting concerns that the flu could mutate and return in a more vigorous form (6 and 7 January 2010).[38] This perspective of swine flu vaccination as a precautionary measure was increasingly accompanied by critical views. Among others, senior infectious disease expert Peter Collignon has labelled the value of mass vaccination as inappropriate and inefficient in the case of swine flu, in particular in the Australian summer when the number of flu-infected people will be low (6 January 2010).[39]

The ISSRD and archival informatics

With limited seed funding available, the ISSRD prototype was only made possible through the use of the eScholarship Research Centre's Online Heritage Resource Manager (OHRM) technology, originally developed for a project to map the complexity of the history and archives of science in Australia.[40] At the core of this technology is a database built on the informatics of the Australian Series System,[41] but extended to include events, coded and defined as if they were records creators. The events are given a heading (named) and linked to a description of the key evidential sources. HTML pages can be rendered from the OHRM, and the resulting website presents evidence-based

interpretations of the unfolding of the case of the 2009 swine flu in Australia. These stories are linked to a list of sources (for example, newspaper coverage, Internet, government publications, professional publications, research journal articles) which can also be grouped and researched in other ways by users of the database and site.

Turning to the structural and technical aspects of this system in more detail, just as the records continuum model 'identifies key evidential, recordkeeping and contextual features of the continuum and places them in relationship to each other',[42] the ISSRD identifies key events and stakeholders based on documentary evidence, then creates relationships between these elements in order to establish the contextual environment in which they operate. The technology behind the ISSRD is capable of producing an Encoded Archival Context (EAC) output of the data, which can then be used to interact with data in other systems; for example, the data can be harvested by the National Library of Australia's TROVE service, thus opening the system up to a much broader range of data sources.

The dissemination of information has become instantaneous through technologies such as the Internet. From the time of their creation, records can form part of 'collective memory',[43] which creates powerful opportunities for the sharing and analysis of information, but also creates challenges. Documents which are available today on the Internet might not exist in the future as governments or private business produce new documents and try to construct and change their history in a favourable way. Maintaining online resources so that they are 'accessible and retrievable'[44] long term is vital in order to create an enduring understanding of events and their context. The ISSRD could provide a vehicle for identifying, documenting and preserving key digital records that could be at risk of being lost – a major concern for contemporary archivists[45] – and at the same time provide a valuable source for research and decision-making.

There is a potential to add web-based discussion tools to the ISSRD in order to gather information about individual experiences and responses to the flu, thus adding personal perspectives to the knowledge base. This could provide additional information about the development of public responses during a flu epidemic and potentially provide

evidence for claims, such as those made by Robert Booy, Head of Clinical Research at the National Centre for Immunisation Research and Surveillance at the University of Sydney, that the public did not take the risk of swine flu seriously enough (30 May 2009).[46] To date, the closest to this sort of data can be seen in surveys[47] about the perception of the H1N1 flu epidemic in May 2009, and in the new responses and vaccination behaviour that occurred later in the year.

In the future, the ISSRD could provide general information about a risk (such as swine flu, nuclear power or bushfires) from the moment it was first mentioned in a national context, and could also include information on whether it was predicted, what regulative measures were put in place to deal with it and whether they changed, who the main stakeholders within risk controversies were, and how risk controversies developed. The ISSRD could help overcome the lack of social science resources for informing stakeholders about risks and the best strategies to respond to them. What is needed is a better understanding of the factors that influence the failure of risk communication and the sociocultural and institutional conditions through which perception and responses to risk are mediated, leading to improved societal risk management.

Conclusions

The strength of the ISSRD is its evidence-based provision of knowledge. The identification and coding of events allows documentation of the contributions of different stakeholders. It can also identify differences – for example, regarding risks where many independent stakeholders are involved compared with risks involving only a few dominant stakeholders – and be used to analyse how this influences the unfolding of societal risk perception and responses.

Testing the feasibility of the ISSRD started with a case study using one newspaper, available resources on the Internet and a qualitative analysis of those resources. A fully developed analysis would have to include a number of different news resources to minimise the impact of the stance of a specific newspaper; however, though different papers may report in different ways, relevant events generally appear in all papers.

Network graphic visualisations not only use the emergent functional network to identify the key stakeholders (that is, the ones that will hold critical evidential records) but also allow one to view the evolution of the risk scenario in real time or in hindsight, providing an insightful means of characterising and better understanding the nature of such events. It is envisioned by the research team that retrospective analysis of past risk scenarios (for example, the 1918 Spanish flu pandemic) will enable the use of archival sources directly in the ISSRD evidence base and provide a means of assessing past appraisal choices.

Even though increasingly more data is available on the Internet, not everything is there, and public and private experience has to find its way into the database. Concrete research and annotated bibliographies are therefore key complementary resources of the database, and blogging and newsgroups might help to allow real-time observation and analysis of debates.

The underlying algorithms of popular Internet search engines can 'privilege information' based on popularity and commercial incentives,[48] leading to a lack of transparency and potentially biased search results. Publicly and independently set up knowledge bases, which allow accessibility to the evidence produced in the past, are valuable resource in a world where the ability to disseminate and curate information has been opened up to anyone through technologies such as the Internet.[49] Such public knowledge activity needs strong (public) partners which allow making such knowledge available. WikiLeaks and other developments indicate the growing want and need for high-quality information and resources to bring transparency to publicly policy and decision-making in our societies. This aligns strongly with the focus of archivists in Australia in the late twentieth century on the accountability of government and the needs of the citizenry more generally.

The application of archival principles of evidence-based documentation and the use of archive informatics provide a means by which researchers and the community more generally can contribute to the work of archivists. By creating a public knowledge space which contains a broad contextual mapping of major public risk events, archivists will have a major new tool in their records appraisal armoury.

By registering record creators in the ISSRD, interconnection between evidence-based public knowledge systems, such as the National Library of Australia's TROVE service, can be enacted with significant knowledge exchange gains for all parties.

Endnotes

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[14] The project was set up in 2010 financed by a Scholarly Information Innovation grant of the University of Melbourne's Library (see <*http://www.library.unimelb.edu.au/about_us/innovation_grants*>).

[15] GJ McCarthy and JE Evans, 'Mapping the socio-technical complexity of Australian science: from archival authorities to networks of contextual information', *Journal of archival organisation*, vol. 5, issue 1/2, 2007, pp. 149–75.

[16] For the purposes of the International Social Science Risk Database (ISSRD) we have defined 'risk scenario' as an unfolding risk which is managed and communicated in, for example, the media, press releases and governmental papers.

[17] 'Mexico to reopen as flu contained', *The Australian*, 5 May 2009.

[18] In the case study on swine flu, the following codes were used: economic risk, health risk, inner security risk (among other broader protection measures), legal risk, political risk and societal risk (among other everyday life issues such as whether to go to a football match or the cancellation of a tournament).

[19] Expectations were distinguished regarding the quality of risk as being minor, moderate, significant or catastrophic, whether they have been seen as decreasing or increasing and as manageable/controllable or unmanageable/uncontrollable.

[20] Evidence can grow, shrink or can be contested and disputed in a specific event. It can be certain, uncertain or unknown.

[21] For identifying the regulatory regimes expressed in a specific event we distinguished between top-down and bottom-up approaches, participatory, precautionary and reactive approaches, as well as monitoring and educating the public, voluntary involvement and advice, market strategies or even when it was seen as unmanageable.

[22] Whether management of a risk is seen as successful, sufficient, ineffective or insufficient.

[23] Different players communicate risk differently. They might alert, alarm, assure or calm down the public, or try to engage in a more neutral information strategy.

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[39] ibid.

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