Final Report: ESRC Scoping review on "Ways of being in digital age"

Simeon Yates

Bridgette Wessels

Liz Robson

Paul Hepburn

Stephen Crone

Gerwyn Jones

Abdulsamad Zhangana

Michael Pidd

Ann Light

Claire Taylor

Leanne Townsend

Vishanth Weerakkody

Monica Whitty

March 2017

1 Executive Summary

This report details the findings from the Economic and Social Research Council (ESRC) scoping review on 'Ways of Being in a Digital Age'. The aim being to inform a potential future ESRC theme. The report and the review it is based on, seeks to provide an holistic view of how digital technology mediates our lives the ways in which technological and social change co-evolve and impact on each other. The scoping review undertook:

- A systematic review and synthesis of literature using digital tools
- A Delphi assessment of expert opinion
- Workshops with academic and non-academic stakeholders

The analysis of data from these three activities has been used to identify gaps in our knowledge base and where the ESRC can add most value. A further aim of the scoping review is to build and extend networks among the academic community, other stakeholders and potential funding partners. The project involved an interdisciplinary research team (see Appendix: Part 15) with experience of projects across the social sciences, arts and humanities, engineering and science.

1.1 Domains examined

The project split the review into seven domains. These were defined using the intimal scoping questions and materials set out in the ESRC call to tender. Table 1 details these seven domains. This split was an attempt to separate the scoping questions and review tasks along reasonable topic and disciplinary lines, accepting that any segmentation would be in part artificial. This domain split was integral to the proposed approach outlined in the response to tender. The definitions for the domains were not fixed, and the review expected considerable overlap in experts' responses to the domains and in literature from these domains. This report presents the results for each of the domains separately in Parts 5 to 11 and looks at cross-cutting and contrasting elements in Part 12.

Table 1: Seven domains examined by the review

<table>
<tr>
<td>1. Citizenship and politics
How digital technology impacts on our autonomy, agency and privacy – illustrated by the paradox of emancipation and control
Whether and how our understanding of citizenship is evolving in the digital age – for example whether technology helps or hinders us in participating at individual and community levels</td>
<td>2. Communities and identities
How we define and authenticate ourselves in a digital age
What new forms of communities and work emerge as a result of digital technologies – for example new forms of coordination including large-scale and remote collaboration</td>
</tr>
<tr>
<td>3. Communication and relationships
How our relationships are being shaped and sustained in and between various domains, including family and work</td>
<td>4. Health and wellbeing
Whether technology makes us healthier, better educated and more productive</td>
</tr>
<tr>
<td>5. Economy and sustainability
How do we construct the digital to be open to all, sustainable and secure?
What impacts might the automation of the future workforce bring?</td>
<td>6. Data and representation
How we live with and trust the algorithms and data analysis used to shape key features of our lives</td>
</tr>
<tr>
<td colspan="2">7. Governance and security
What are the challenges of ethics, trust and consent in the digital age
How we define responsibility and accountability in the digital age</td>
</tr>
</table>

1.2 Method

1.2.1 Delphi process

The project undertook seven sets of Delphi process interviews. Round one of the Delphi process was undertaken with the project steering group. The results from this were used to develop a snowball sample of additional domain experts. Round two was undertaken with the identified sample. Round three consisted of a confirmatory survey of international scholars and a consultation workshop with the UK steering group and a set of invited UK academics (see Appendix: Part 16)

The Delphi process identified three sets of data for each domain:

1. Scoping questions for future programmes of research
2. Key topics to be addressed within these programmes of work
3. Key challenges when undertaking these programmes of research
4. Key authors and key literature for each domain

One of the important features of the Delphi process was the commonality of responses to the "challenges" questions across all seven domains. We have therefore reported these cross-cutting challenges as a separate section and sought to identify specific challenges when reporting on each domain.

1.2.2 Systematic literature reviews

1.2.2.1 Approach

The Delphi process provided two overlapping sets of key literature identified in rounds one and two. As noted in the response to tender, given the volume of published work within these domains, undertaking a meta-analysis to synthesise the quantitative results of available empirical studies was not possible. Rather, the work was a partly automated systematic narrative review with the goal of synthesising primary studies and descriptively exploring the heterogeneity of work.

A key element of the approach was that of addressing the large volume of work in each domain within the timescale. At the time of writing the project had a database of over 6,000 publications from key authors identified by the first two rounds of the Delphi work. Of which close to 5,000 were available in digital format for analysis. Given the ten-month timescale for the project we undertook linguistic, content and reflective methods to assess the literature. First, the literature was analysed using corpus linguistic and digital humanities tools to identify predominant topics and concepts within each domain. Three approaches were taken:

- Data were subjected to a lengthy and detailed concept mapping analysis using digital humanities tools – undertaken by the Digital Humanities Institute at the University of Sheffield – to identify the key concepts in the literature.
- Data were analysed to identify topics using comparable but different methods by the Digital Humanities and Social Science team at the University of Liverpool.
- Data were examined using the commercial WordStat tool[1]. This tool produced similar results to those from the University of Liverpool analysis.

The intent in using these tools was to gain an overall appreciation of key concepts and topics within this very large literature set within a short time frame. Thus, allowing the team to

[1] https://provalisresearch.com

compare the literature topics with the proposed future topics identified in the Delphi process. Interactive visualisations of the literature data can be examined at:

- https://waysofbeingdigital.com/literature-analysis-interactive-results/

The second approach to the literature consisted of a content analysis of the round one materials. This was undertaken to identify the main theories, methods and analytic approaches deployed in the reported research. This work involved coding each item against a fixed set of methods, theory and research approach criteria. As a third step, the lead researchers undertook a reflective review of the literature and workshop activities relevant to the domains that they had focused on.

1.3 Workshops

The project has run a range of facilitated workshops to engage academic and stakeholder partners:

- Monthly Salon events in collaboration with Digital Leaders (digileaders.com). Salon events were and are being led by academics based on the domains and the team has attended industry led Salon events.
- A joint ESRC and DSTL funded facilitated workshop to explore research topics around the social impacts of automation and augmentation in the workplace. A separate report on the outcomes of this workshop accompanies this report.
- A joint MECSSA and ESRC review supported workshop on "digital policy" this workshop examined the policy and policy making issues arising from digital media.
- An ESRC project and DCMS Digital Project workshop to explore the impacts of digital on the arts and cultural sector.
- A final consultation workshop to review the outcomes of the Delphi process.
- A further joint ESRC and NSF workshop on "Work at the Human Technology Interface" will take place in Autumn.
- An academic symposium discussing the results from the project and seeking further invited review papers will be run by the project just prior to the ESRC and NSF workshop.

Details on the MECSSA policy and DCMS culture workshops can be found in Part 13 where potential gaps in the overall scoping review are discussed. Details of the affiliations of workshop attendees can be found in the Appendix, Part 16.

1.4 Recommendations

1.4.1 Assumptions

The recommendations for the core areas to be addressed by the Ways of Being in a Digital Age theme are detailed below. In proposing these areas, we have tried to consider the following assumptions:

- This is to be an ESRC programme. The work should therefore have a strongly social science focus, even where it is inter and cross-disciplinary.
- The topics should avoid areas that are already well researched or have been supported by recent or current research council programmes. We have therefore sought to avoid areas served by programmes such as:
    - EPSRC Digital Economy
    - AHRC Connected Communities and Digital Transformations
    - AHRC/MRC medical device design and evaluation

- The title of the programme is "ways of being" and we have taken this as an indication that areas need to look more holistically at the social, economic, political, cultural and community impacts and roles of digital technologies.

1.4.2 Assessment

From our assessment of the Delphi and literature materials we would recommend that the seven initial 'domains' used in this review need to be reduced and reworked. We would propose two substantive broad areas combing:

- Communication and Relationships with Communities and Identities
- Citizenship and Politics with Governance and Security

We would then suggest four smaller focused areas that could stand alone or cross cut the two main areas:

- Economy with a focus on the impact of major digital platforms
- Data and digital literacies
- Health and wellbeing focused on workplace, every day and governance issues
- Digital divides and digital inequalities, including the two-way interaction between digital inequities and other areas of social inequity

We would expect any project to address one or more of the cross-cutting challenges identified in Part 12. We would strongly emphasise the need for projects that address:

- Multi platform/Holistic studies

The review of the literature to date indicates that much good work has already been done exploring specific technologies – Twitter, Facebook, Google, Uber, Mobiles, Smart phones, Blogs, specific government systems, etc. The Delphi responses have strongly argued for the need to look at digital technology use in the round. To ask broad social science questions and then explore which technologies are relevant to citizens actual practices and in what ways. To develop a more holistic picture of the integration of digital into their lives (or not in the case of digital inequalities). This does not preclude single technology studies where this has relevance, but such decisions should have a strong social science basis – not simply one based on the utility of available data. For example, there appear to be class differences in the uses of different social media platforms. If this is true then a case could be made that a project focused on a specific community may explore one technology use more than others. The one area where this may be more acceptable would be the case of the economic domain as the study of the impact of a platform on a sector might be limited to one technology (e.g. Uber).

Overall projects should address:

- Methods innovation
    - Including risk taking on digital tools – with a strong methods evaluation component
- Theory testing and evaluation, with theory development were needed
    - We are agnostic on the need to inherently develop new theory to understand the everyday uses and impacts of digital technologies. The literature content analysis has found little evidence of consistent dominant theory in the area. There may be a need for greater clarity on 'most relevant' theory and on incremental theory development as opposed to a need for 'digital specific' theory development.
- Ethics

- This needs to cover both ethics with regard to methods, but also wider ethical concerns around social, commercial and government use of data, systems automation and human augmentation.

The one area where we would not argue for substantive additional investment is in "big data". Not only could we not find consensus on what is "big" in "big data" – nearly all the research councils have substantial investments in big data initiatives. There are substantive ESRC investments in big data and methods (e.g. Consumer Data Research Centre, various PGR training programmes) as well as substantive STFC investment in the necessary computing facilities. We would argue that the programme should be positively open to projects that have a "big data" component but the focus should be on the use of such methods for social science - with a robust element of reflection and evaluation on the usefulness, limitations, tools used to analyse and representativeness of the big data sets examined.

1.5 Proposed ways of being in a digital age domains and topics

We propose the following 6 areas for the ways of being programme. For each we have=e identified research topics from the Delphi and literature work.

1.5.1 Ways of being in a digital age – Communication, community and identity

We propose the following potential topics (not in a priority order):

- The norms and values of digital communication and relationships
- The 'affordances' different platforms provide for digital communication and relationships
- The quality of relationships and communication supported by digital media and technologies
- The management of relationships via digital media and technologies
- Social and community aspects of everyday digital technology use
- Digital community exclusion/inclusion
- Digital community participation, action and social change
- Power in online communities
- Understanding global diaspora as digital communities
- Understanding function of aspects of identity online (gender/race/ethnicity/sexuality)

1.5.2 Ways of being in a digital age – Citizens politics and governance

We propose the following potential topics (not in a priority order):

- Digital technologies, radicalisation, mobilisation and political action
- Digital technologies and the disruption of current political institutions
- Digital technologies and new forms of citizenship
- Digital technologies, political communication, debate and media
- Digital technologies and state control – especially in non-democratic regimes
- Impact of social media on governance
- Success factors in digital governance at local, national and international level
- Privacy, citizenship, the state and surveillance in the digital age
- Regulation and governance of automated systems

1.5.3 Ways of being in a digital age – Understanding the platform economy

We propose the following potential topics (not in a priority order)::

- Role and impact of major corporate digital platforms
    - Impacts on firms of digital platforms
    - Role of digital monopolies and large corporations
- Forms of digital labour
    - Impacts of digital labour on people's life experience
    - Gig economy (linked to platforms)

1.5.4 Ways of being in a digital age - Data and digital literacies for engaged and included citizens

We propose the following potential topics (not in a priority order):

- Citizen and community use of data
- Citizen interaction with data and algorithms
- Data literacy in everyday life
- Power and accountability for data and algorithms
- Social construction of data and algorithms
- Citizens/Everyday life experiences and uses of data
- Understanding open data/algorithm transparency/accountability
- Digital identity and data
- Data exclusion/inclusion/divides

1.5.5 Ways of being in a digital age – Everyday digital health and wellbeing

We propose the following potential topics (not in a priority order):

- Understanding and addressing the governance of digital health technologies
- Need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g. fit bits)
- Questions of health and wellbeing in the digital workplace
- Digital technologies and health communication and health behaviour change

1.5.6 Ways of being in a digital age – Digital inequalities

We propose the following potential topics (not in a priority order):

- Digital Community Exclusion/Inclusion
- The two-way interaction between digital inequities and other areas of social inequity
- Data Exclusion/Inclusion/Divides
- Digital cultural capital and cultural exclusion/inclusion
- Digital governance, policy and inclusion
- Digital health inequalities

1.5.7 Funding models

The consultation workshop informally reflected on the potential finding models for the programme. Though no overall consensus was obtained the following elements were suggested:

- Strong support for Early Career Researchers – opportunity for those "born digital" to lead digital research projects
- Need for several large projects in the substantive areas identified by the review
- Need for smaller projects (maybe for ECRS) to explore specific facets of the topics

- Need for a co-ordinating network to link the projects and build on the networks created by the review

Two options that were not strongly supported were:

- Single national centre/project
- Sandpits

2 Contents

3 Introduction

Report details the findings from the Economic and Social Research Council (ESRC) scoping review on 'Ways of Being in a Digital Age'. The aim being to inform a potential future ESRC theme. The report and the review it is based on seeks to provide an holistic view of how digital technology mediates our lives the ways in which technological and social change co-evolve and impact on each other. The scoping review undertook:

- A systematic review and synthesis of literature using digital tools
- A Delphi assessment of expert opinion
- Workshops with academic and non-academic stakeholders

The analysis of data from these three activities has been used to identify gaps in our knowledge base and where the ESRC can add most value. A further aim of the scoping review is to build and extend networks among the academic community, other stakeholders and potential funding partners. The project involved an interdisciplinary research team (see Appendix: Part 15) with experience of projects across the social sciences, arts and humanities, engineering and science.

3.1 Domains examined

The project split the review into seven domains. These were defined using the intimal scoping questions and materials set out in the ESRC call to tender. Table 2 details these seven domains. This split was an attempt to separate the scoping questions and review tasks along reasonable topic and disciplinary lines, accepting that any segmentation would be in part artificial. This domain split was integral to the proposed approach outlined in the response to tender. The definitions for the domains were not fixed, and the review expected considerable overlap in experts' responses to the domains and in literature from these domains. This report presents the results for each of the domains separately in Parts 5 to 11 and looks at cross-cutting and contrasting elements in Part 12.

Table 2: Seven domains examined by the review

<table>
<tr>
<td>1. Citizenship and politics
How digital technology impacts on our autonomy, agency and privacy – illustrated by the paradox of emancipation and control
Whether and how our understanding of citizenship is evolving in the digital age – for example whether technology helps or hinders us in participating at individual and community levels</td>
<td>2. Communities and identities
How we define and authenticate ourselves in a digital age
What new forms of communities and work emerge as a result of digital technologies – for example new forms of coordination including large-scale and remote collaboration</td>
</tr>
<tr>
<td>3. Communication and relationships
How our relationships are being shaped and sustained in and between various domains, including family and work</td>
<td>4. Health and wellbeing
Whether technology makes us healthier, better educated and more productive</td>
</tr>
<tr>
<td>5. Economy and sustainability
How do we construct the digital to be open to all, sustainable and secure?
What impacts might the automation of the future workforce bring?</td>
<td>6. Data and representation
How we live with and trust the algorithms and data analysis used to shape key features of our lives</td>
</tr>
<tr>
<td colspan="2">7. Governance and security
What are the challenges of ethics, trust and consent in the digital age
How we define responsibility and accountability in the digital age</td>
</tr>
</table>

3.2 Structure of report

The report is designed to work on two levels. First, for those readers seeking to gain substantive understanding, the report provides an overview of all aspects of the research and findings with further details in the appendices. This introduction, the reflections in part 12 on the cross-cutting topics and challenges, and the conclusion (Part 14) seek to set up and synthesise these overarching findings. Second, for those readers concerned with one or more specific domains, the results for each domain have been set out in a comparable format but also as stand-alone pieces. The seven domain reports follow a standard format:

- Outline of the initial ESRC scoping question(s)
- Initial reflections from the research team
- Review of the Delphi findings – covering scoping questions, key topics, key challenges with data and reflections from the confirmation workshop
- Review of the literature analyses covering concepts, topics, methods and theory
- Reflections from the research team on the key issues identified
- Comparison of the Delphi and literature findings
- Conclusions on key areas for future research

4 Outline of methodology

4.1 Delphi process

The project undertook seven sets of Delphi process interviews (Linstone and Turoff, 1975). A planned eighth set, to be run with stakeholders, was replaced by a series of workshops and 'salon events'. Round one of the Delphi process was undertaken with the project steering group. The results from this were used to develop a snowball sample of additional domain experts. Round two was undertaken with the identified sample. Round three consisted of a confirmatory survey of international scholars and a consultation workshop with the UK steering group and a set of invited UK academics (see Appendix: Part 16)

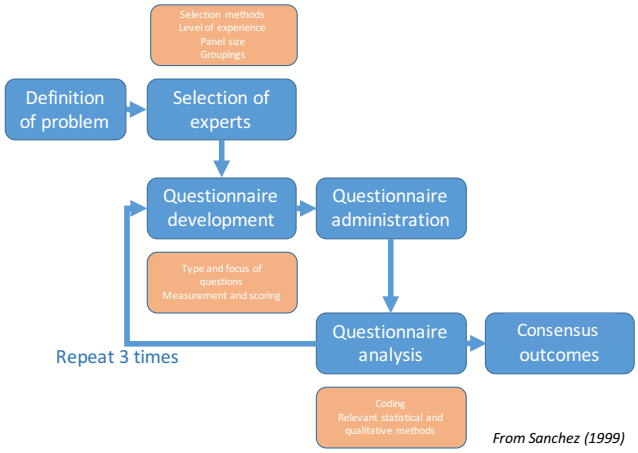


Figure 1: Delphi process

The Delphi process identified three sets of data for each domain:

1. Scoping questions for future programmes of research
2. Key topics to be addressed within these programmes of work
3. Key challenges when undertaking these programmes of research
4. Key authors and key literature for each domain

One of the key features of the Delphi process was the commonality of responses to the "challenges" questions across all seven domains. We have therefore reported these cross-cutting challenges as a separate section and sought to identify specific challenges when reporting on each domain.

4.2 Systematic literature reviews

4.2.1 Approach

The Delphi process provided two overlapping sets of key literature identified in rounds one and two. As noted in the response to tender, given the volume of published work within these domains, undertaking a meta-analysis to synthesise the quantitative results of available empirical studies (Blundell, 2013) will not be possible. Rather, the work will be a partly automated systematic narrative review (Popay et al., 2006) with the goal of synthesising primary studies and descriptively exploring heterogeneity of work. This work will provide the basis for targeted systematic literature reviews for hypothesis generation (Petticrew and Roberts, 2006) likely to be undertaken by the future studies supported by the ESRC in 'Ways of Being in a Digital Age' theme. A key element of the approach will be that of addressing the large volume of work in each domain within the timescale. At the time of writing the project had a database of over 6,000 publications from key authors identified by the first two rounds of the Delphi work. Of which close to 5,000 were available in digital format for analysis. Without formally agreed commercial access to publisher APIs it was not possible to scrape these from search results. As a result, the majority of papers were downloaded 'manually'. To systematically read, review and codes these by hand for all aspects of the analyses below would have taken over 6,000 person hours or around 3.5FTE. Given the ten-month timescale

for the project this was not possible. Though this challenge is not unique and reflects a current problem within academic research, as Petticrew and Roberts note:

> *"The problem is not just one of inconsistency, but one of information overload. The past 20 years have seen an explosion in the amount of research information available to decision makers and social researchers alike. With new journals launched yearly, and thousands of research papers published, it is impossible for even the most energetic policymaker or researcher to keep up-to-date with the most recent research evidence, unless they are interested in a very narrow field indeed." (2006, p.7)*

To undertake the review linguistic, content and reflective methods were used. As a first step, the literature was analysed using corpus linguistic and digital humanities tools to identify predominant topics and concepts within each domain. Three approaches were taken. First, Round one data were subjected to a lengthy and detailed concept mapping analysis using digital humanities tools. Concept modelling procedures, developed at the Digital Humanities Institute at the University of Sheffield, in association with the University of Sheffield's School of English, examine patterns within discourse to identify recurrent associations and themes. The default process outputs groups of words representating dominant associations within each given dataset; we call these groups "concepts". For the current survey, groups were limited to pairs accompanied by a non-ranked list of further associates.

Table 3: Example concept mapping by Humanities Institute at University of Sheffield Digital

business, competence	consumer, self-service	knowledge, seeker
administration	academy	ability
area	addition	action
awareness	adoption	ambiguity
breadth	amount	anticipation
capability	anxiety	average
category	attitude	awareness
client	attribute	beginning
collaboration	banking	bit
competency	behavior	capacity
component	characteristic	caution
concept	checkout	choice
construct	comparison	colleague
contribution	control	complexity
core	customer	condition
creation	customization	conjunction
definition	delay	correlation
deployment	delivery	cross
depth	determinant	decision
development	difference	delay
dimension	ease	description

For example, prominent concepts in the sample of just over 2000 documents supplied to the Sheffield team included "business, competence", "consumer, self-service" and "knowledge, seeker" (internally alphabetised). Table 3 shows these concept-pairs with twenty associates (arranged alphabetically, as ranking of associates represents a further analytical step). Distinct from topic modelling, concept modelling focuses on neighbouring sections of discourse with a goal of extracting conceptual structure and tracing patterns and change in language and thought.

Second, the same round one data were analysed to identify topics using comparable but different methods by the Digital Humanities and Social Science team at the University of Liverpool. Third, the total set of literature collected after rounds one and two were examined using the commercial WordStat tool[2]. This tool produced similar results to those from the University of Liverpool analysis.

The results from these three approaches are presented in the literature analysis sections of the domain reports below. These are established, but still relatively novel and experimental methods. The intent in using these tools was to gain an overall appreciation of key concepts and topics within this very large literature set within a short time frame. Thus, allowing the team to compare the literature topics with the proposed future topics identified in the Delphi process. Interactive visualisations of the literature data can be examined at:

- https://waysofbeingdigital.com/literature-analysis-interactive-results/

The second approach to the literature consisted of a content analysis of the round one materials. This was undertaken to identify the main theories, methods and analytic approaches deployed in the reported research. This work involved coding each item against a fixed set of methods, theory and research approach criteria. As a third step, the lead researchers undertook a reflective review of the literature and workshop activities relevant to the domains that they had focused on.

4.3 Workshops

The project has run a range of facilitated workshops to engage academic and stakeholder partners:

- Monthly Salon events in collaboration with Digital Leaders (digileaders.com). Salon events involve short presentations to develop discussion followed by open "Chatham house rules" discussions among academic, industry and policy partners. Salon events were and are being run led by academics based on the domains and the team has attended industry led Salon events.
- A jointly ESRC and DSTL funded facilitated workshop to explore research topics around the social impacts of automation and augmentation in the workplace. A separate report on the outcomes of this workshop accompanies this report.
- A jointly MECSSA and ESRC review supported workshop on "digital policy" this workshop examined the policy and policy making issues arising from digital media.
- An ESRC project and DCMS Digital Project workshop to explore the impacts of digital on the arts and cultural sector.
- A final consultation workshop to review the outcomes of the Delphi process.
- A further joint ESRC and NSF workshop on "Work at the Human Technology Interface" will take place in Autumn.

[2] https://provalisresearch.com

- An academic symposium discussing the results from the project and seeking further invited review papers will be run by the project just prior to the ESRC and NSF workshop.

Details on the MECSSA policy and DCMS culture workshops can be found in Part 13 where potential gaps in the overall scoping review are discussed. Details of the affiliations of workshop attendees can be found in the Appendix, Part 16.

5 Citizenship and politics

This part of the report provides an overview of the analyses of the Delphi process, literature and any relevant workshops for the Citizenship and Politics domain. The part first sets out the results of the Delphi Process (section 5.2 concluding with the key questions, topics and challenges identified by the process (section 5.2.4). The part (section 5.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 5.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 5.6. As a reminder, the initial ESRC scoping questions for this area of work were:

- How digital technology impacts on our autonomy, agency and privacy – illustrated by the paradox of emancipation and control
- Whether and how our understanding of citizenship is evolving in the digital age – for example whether technology helps or hinders us in participating at individual and community levels

5.1 Initial comments

This domain, ironically the first to be reported on, was the most substantively responded to in the Delphi process. Both in terms of the number of responses and in the extent and detail of the response (see Appendix - Part 17, to see the more extensive Delphi response as compared to the other six domains). In the following sections, much of the focus of the analysis and of the consultation workshop was on reducing the breath of material provided. This section therefore has a slightly different structure to the other six as the consultation workshop materials are integrated rather than separately reported. The team reflected on the reasons for this much stronger response. Two potential non-academic explanations have been offered:

- The project steering group has a number of members whose current or prior work has touched on this area, this may have biased the snowball sample or potentially motivated respondents in this area. Though considerable effort was put into ensuring the steering group was balanced across the domains.
- The Delphi process took place just after the Brexit vote and during the US presidential election. It is possible that the issues around citizenship, politics and digital media struck a chord with respondents at this time.

A third option is that this an area of key concern and rich academic value at the present time. It has not been possible to determine the material reason for this much more extensive response.

5.2 Delphi review

The full details of the Delphi review process outcomes can be found in the Appendix, Part 17. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 5.2.1)
- Key topics to address within these questions (section 5.2.2)
- Key challenges to researching these questions (section 5.2.3)

5.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the eight categories and 36 specific questions as detailed in Appendix - Part 17. The consultation workshop reduced these to those in Table 4. The ranking of these categories by the number of questions allocated to the category is provided in Table 5, and by their ranked importance from the confirmatory survey is given in Table 6. It is important to note that ranked importance is almost same in both tables. As will be discussed in section 12 there are a number of areas identified in the scoping question and challenges analysis that are cross cutting, a key one of these being governance. There are also some strong overlaps with the Governance and Security domain (Part 10).

Table 4: Scoping questions

Category	Questions
"Digital technologies", radicalisation, mobilisation and political action	• In what ways do digital technologies impact traditional forms of mobilization, collective action, and/or political participation? • How have 'negative' online behaviours (such as trolling and flaming) impacted on civic and political activity?
"Digital technologies", emancipation, agency and control	• How and in what ways are digital technologies challenging or reinforcing existing power relations? • What are the impacts on our autonomy, agency, dignity and privacy?
"Digital technologies" and the disruption of current political institutions	• How do new technologies disrupt and challenge incumbent political institutions? • What are the opportunities and challenges facing democracy in an age of digital participation? • How do social media affect the quality of democracy/citizenship? • And what about non-democratic states?
"Digital technologies", political identity, emotion and empowerment	• Does access to digital technologies have a positive emotional impact on citizens, making them feel empowered, with a voice and potential influence?
"Digital technologies" and new forms of citizenship	• How does technology enlarge or change our understanding of, and interaction with, citizens outside of our own national borders? What constitutes citizenship? • Is it meaningful to talk about digital citizenship? • Does digital expand the notion or simply provide a new space for the exercising of citizenship rights and duties? • How are youth engaging with digital technologies and online politics?
"Digital technologies" and governance	• How does technology improve governance (i.e., government's responsiveness to citizen concerns and ability to effectively manage competing interests)? Does electronic governance transform relationships between states and citizens and the nature of politics?
"Digital technologies", groups and elites	• How do political elites use digital media? • How do old and new parties use new technologies and with what consequences? • Does new media promote populism? • How do emerging media platforms impact the ongoing digital divide?

"Digital technologies", political communication, debate and media	• How do new ecosystems of information and delivery impact on political participation, opinion forming, and education? • How do people perceive 'success' in online political participation? • How does digital media interact with traditional media in shaping public opinion?

Table 5: Scoping questions ranking by number of cases

Category
"Digital technologies" and the disruption of current political institutions
"Digital technologies", political communication, debate and media
"Digital technologies", radicalisation, mobilisation and political action
"Digital technologies", emancipation, agency and control
"Digital technologies", political identity, emotion and empowerment
"Digital technologies" and new forms of citizenship
"Digital technologies", groups and elites
"Digital technologies" and governance

Table 6: Scoping questions ranking by Importance

Category	Percent
"Digital technologies", radicalisation, mobilisation and political action	21%
"Digital technologies" and the disruption of current political institutions	17.3%
"Digital technologies" and new forms of citizenship	16%
"Digital technologies", political communication, debate and media	16%
"Digital technologies" and governance	12.3%
"Digital technologies", emancipation, agency and control	9.9%
"Digital technologies", political identity, emotion and empowerment	6.2%
"Digital technologies", groups and elites	1.2%

5.2.2 Key research topics

The topics identified in the Delphi review were coded into 28 categories as detailed in Table 7. The ranked importance of these from the confirmatory survey are presented in Table 8. Unlike the scoping questions those topics that were most commonly cited in the Delphi workshop were also those deemed most important in the confirmatory survey. These topics also closely match the scoping questions. Given the number and detail of the scoping questions provided in the initial rounds of the Delphi process this overlap was highly likely. Especially as respondents would differently interpret the 'levels' of overarching questions and the topics within them. This does though provide reinforcing evidence, along with the broad support of the consultation workshop, for the relevance of the questions and topics.

Table 7: Key topics ranked by number of items

Topics	Percent	Topics	Percent
Divides	8%	**Technologies**	3%
Mobilisation	8%	**Civic**	2%
Talk	7%	**Commercial**	2%
Control	6%	**Cultural**	2%
Data	6%	**Direct democracy**	2%
Media	6%	**Empowerment**	2%
Other	6%	**Geopolitics**	2%
Participation	6%	**Policy**	2%
Citizenship	5%	**Trust**	2%
Engagement	4%	**Young people**	2%
Governance	4%	**Contestation**	1%

Privacy	4%	**Parties**	1%
Identity	3%	**Populism**	1%
Methods	3%	**State**	1%

Table 8: Key topics Ranked by importance

	Very important	Important	Neutral	Unimportant	Very unimportant
Governance in a digital age	51.9%	37.0%	11.1%	0.0%	0.0%
Political mobilisation via digital media	48.1%	40.7%	7.4%	3.7%	0.0%
Digital and state control	48.1%	37.0%	11.1%	3.7%	0.0%
Citizenship in a digital age	48.1%	33.3%	14.8%	3.7%	0.0%
Data - big, small and citizen	44.4%	37.0%	14.8%	3.7%	0.0%
Political participation and engagement	44.4%	37.0%	14.8%	3.7%	0.0%
Privacy in a digital age	40.7%	40.7%	11.1%	3.7%	3.7%
Political media, old and new	29.6%	44.4%	18.5%	7.4%	0.0%
Digital divides	22.2%	59.3%	11.1%	7.4%	0.0%
Political identity in a digital age	22.2%	48.1%	29.6%	0.0%	0.0%
Online debate and interaction	18.5%	70.4%	11.1%	0.0%	0.0%

5.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 14 categories. These categories are detailed in Table 9 and ranked by the number of coded items. None of the main challenges were deemed to be domain specific by the consultation workshop. The ranking of these by the confirmation survey are presented in Table 10. Such cross-cutting topics and challenges are discussed in Part 12.

Table 9: Domains challenges - ranking by number of cases

Challenges	Percent
Methods	42%
Theory	14%
Big data	12%
Epistemology/Ontology	7%
Ethics	6%
Psychology	5%
Technology	4%
Exclusion	2%
Education	1%
Funding	1%
Impact	1%
Individualism	1%
Policy	1%
Training	1%

Table 10: Domain challenges - ranking by importance

	Very important	Important	Neutral	Unimportant	Very unimportant
Developing new theory	55.6%	37.0%	7.4%	0.0%	0.0%
Developing new methods	44.4%	33.3%	18.5%	3.7%	0.0%
Dealing with 'big data'	44.4%	33.3%	18.5%	3.7%	0.0%
Ethics	37.0%	51.9%	7.4%	0.0%	3.7%

Epistemological and ontological issues	37.0%	25.9%	25.9%	7.4%	3.7%

5.2.4 Conclusion

As with the other domains we believe that the complexity and variety of potential work warrants consideration to be taken of all the questions topics and challenges identified. Noting this, we would argue that the analysis here has identified key areas for future research, these being:

- "Digital technologies", radicalisation, mobilisation and political action
- "Digital technologies" and the disruption of current political institutions
- "Digital technologies" and new forms of citizenship
- "Digital technologies", political communication, debate and media

We would note that the Governance and Security domain significantly addresses the issue of "Digital technologies and governance" which is also the top ranked topic in the confirmatory survey. The other key topics identified fit within the four scoping areas above, except for:

- Digital and state control

This fits with comments at the consultation workshop that the issue of digital political communication in non-democratic regimes was not visible in the Delphi results. The discussion of cross-cutting topics in Part 12 and challenges will address the remaining two topics of:

- Privacy in a digital age
- Data - big, small and citizen

5.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

5.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 10 most common concepts identified by the UoS team in the Round 1 literature are listed in Table 11. These represent the topics covering 2% or more of the identified cases. Table 10 lists the sub-topics within these groups.

Table 11: UoL analysis topics – Ranked

Row Labels	Count of Part-i
citizen	7.56%
action	7.32%
network	6.21%
campaign	5.35%
citizenship	4.35%
channel	4.08%
access	3.46%
engagement	3.35%
government	2.92%
participation	2.81%
information	2.59%
link	2.43%
delivery	2.40%

Table 12: UoL topics and sub-topics

Concept	Percent	Concept	Percent	Concept	Percent
citizen	**13.79%**	**campaign**	**9.75%**	**engagement**	**6.11%**
democracy	2.96%	candidate	2.02%	norm	1.13%
engagement	2.91%	election	2.91%	participation	2.46%
government	4.43%	movement	1.03%	use	2.51%
participatory	1.58%	party	2.86%	**government**	**5.32%**
perception	1.92%	practice	0.94%	latino	1.13%
action	**13.35%**	**citizenship**	**7.93%**	responsiveness	2.27%
activism	1.87%	engagement	2.02%	stage	1.92%
campaign	1.82%	people	2.17%	**participation**	**5.12%**
frame	3.20%	phenomenon	0.89%	participatory	2.86%
membership	1.18%	study	1.43%	protest	2.27%
protest	4.29%	youth	1.43%	**information**	**4.73%**
talk	0.99%	**channel**	**7.44%**	literacy	1.43%
network	**11.33%**	citizen	2.17%	overload	0.49%
power	6.65%	consumer	0.99%	protest	2.81%
recognition	2.36%	phone	1.43%	**link**	**4.43%**
strength	1.18%	service	2.86%	pattern	1.13%
transformation	1.13%	**access**	**6.31%**	site	2.41%
		citizenship	0.44%	twitter	0.89%
		latino	1.67%	**delivery**	**4.38%**
		percentage	1.33%	perception	1.48%
		survey	1.77%	phone	1.38%
		white	1.08%	value	1.53%

5.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat which identified 15 topics which are presented in Table 13. These map closely to the topics identified in the UoL analysis.

Table 13: Wordstat analysis of topics

Topic name	Keywords	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Twitter	TWITTER; TWEET; HASHTAG	1.57	0.78	2267	181	36.49%
Social Network Analysis	INFECT; NODE; CONTAGION; NEIGHBOR; THRESHOLD; TI	2.77	0.93	2144	313	63.10%
Homophili	HOMOPHILI; NOIS; AGENT; NEIGHBOR; INFLUENC	1.63	0.82	2044	315	63.51%
Cyber hate crime	CRIME; VICTIM; HATE; GUARDIANSHIP; CYBER; POLIC; SECUR	2.14	0.86	2632	317	63.91%
Political online fora	FORUM; THREAD; TALK	1.65	0.73	2255	325	65.52%
Mobile	PHONE; MOBIL; SM; CHANNEL	1.72	0.82	3746	395	79.64%
Gender and ethnicity	GENDER; WOMEN; EDUC; FEMAL; ETHNIC	1.83	0.85	4741	400	80.65%
Elections	ELECT; PARTI; VOTER; CAMPAIGN; CANDID; ELECTOR; VOTE	2.37	1.22	11159	407	82.06%
Partisan politics	EXPOSUR; PARTISAN; POLAR; ATTITUD; ATTITUDIN; PERCEIV; OPINION	2.01	1.01	5060	429	86.49%
Civic engagement	CIVIC; ENGAG; CITIZENSHIP; YOUTH; LEARN	1.81	1.09	8650	455	91.73%

Web and social media	SITE; WEB; PAGE; USER; BLOG; SEARCH; LINK; GOOGL; FACEBOOK	1.92	1.07	14607	470	94.76%
Protest and activism	MOVEMENT; PROTEST; ACTION; COLLECT; ORGAN; ACTIVIST; OCCUPI	2.69	1.25	12940	473	95.36%
Measurement	VARIABL; REGRESS; STATIST; TEST; TABL; MODEL; MEASUR; PREDICT; ESTIM; SIGNI; SAMPL; CORREL	3.19	1.27	18205	474	95.56%
Public sphere	SPHERE; DELIB; HABERMA; DEMOCRACI; DELIBER; DEMOCRAT; PUBLIC; DEBAT; DISCOURS; FORUM; POLIT	10.5	1.27	29329	486	97.98%
Governance	GOVERN; SERVIC; POLICI; PUBLIC; SECTOR; ADMINISTR; MANAG	2.52	1.37	20565	490	98.79%

5.3.3 Overall topic analysis

The concepts and topic mapping analyses generated very similar results (Table 14). These also closely overlap the Delphi results. The close mapping of the Delphi and literature analyses potentially indicates that this is a well-developed domain of research with clear foci. The consensus around the consolidation of research questions in the consultation workshop reinforces this. There may be a number of good clear reasons for this. Political communication and behaviour are substantive aspects of both communication studies and political science. These are both areas that have been dramatically impacted in very public ways by digital media. In contrast to the very real but less visible impacts of digital technologies on governance or public policy. There are also indications that the visibility of digital media from the web to social media, have made processes of political communication very visible and open to analysis.

Table 14: Comparison of concept and topic mapping

	citizen	action	network	campaign	citizenship	channel	access	engagement	government	participation	information	link	delivery
Twitter												■	
Social Network Analysis			■									■	
Homophily													
Cyber hate crime							■						
Political online fora												■	
Mobile						■							■
Gender and ethnicity							■						
Elections				■									
Partisan politics													
Civic engagement	■				■								
Web and social media												■	
Protest and activism	■	■								■			
Measurement			■										
Public sphere													
Governance									■				

5.4 Theory, method and approach

This analysis builds on Borah (2015). The majority (45%) of the papers undertook primary data collection with 23% being discursive reviews of or reflective on existing research (Table 15). The main disciplines from which theory was used or for which theory was developed were:

- Politics and public administration (48.6%)
- Sociology (28.0%)
- Communication and media (14.3%)
- Psychology (5.1%)
- Other (3.4%)
- Geography (0.6%)

Only actual use for the purposes of deign or analysis were coded. General references to prior work and theory were not coded. There was considerable variety in the specific theories applied from these disciplines and no clear preference. Ideas of the public sphere (6%) and political participation (5%) were the most common in the political science literature. The main research methods were literature reviews (33%), surveys (29%) content analysis (8%) and interviews (7%) (Table 16). The majority of the empirical work focused on specific groups (e.g. Facebook users) with a limited number of general population studies (Table 17). The majority (53%) of the analyses were qualitative (Table 18). Only one study overtly stated that they were using a "big data" approach.

Table 15: Empirical approach

Empirical approach	Percent
Primary empirical-data collected and analysed	45.1%
Theoretical-synthesis of current or prior work	33.3%
Discursive/Descriptive-no new data or theory	13.7%
Secondary empirical-analysis of existing data	7.8%

Table 16: Research methods

Research methods	Percent
Literature Review (General or Narrative)	32.7%
Survey	28.6%
Content Analysis	7.8%
Interview(s)	6.9%
Theory Building	6.9%
Other	4.2%
Experiment	3.2%
Ethnography	3.2%
Focus Groups	2.8%
Social Network Analysis	1.8%
Textual-Linguistic-Discourse Analysis	0.9%
Meta-analysis or Systematic review	0.9%

Table 17: Study population

Population	Percent
Specific group	48.8%
General population	33.7%
Case study(ies)	17.4%

Table 18: Analytic approach

Analytic approach	Percent

Qualitative (Textual - Non-Discourse)	53.48%
Statistical (Numerical)	32.17%
None	8.26%
Not applicable	5.22%
Discourse (Textual - Linguistic-Discourse)	0.87%

5.5 Reflections on the literature and the data

Given that the literature and the Delphi recommendations strongly overlap the research has not identified any clear topic gaps to highlight for future work. Having said this, the social and political changes experienced over the last five years have often been associated with the use of digital media – such as the Arab Spring, Brexit the election of Donald Trump. These appear to remain under-researched areas. We would argue that for the health of democratic institutions there is a need to empirically understand political behaviour and participation in the contexts of digital technology use. The overlap with the Governance and Security domain will be discussed further in Part 10. In the other domains we have noticed a "platform focus" in many studies, here in this case and example might be a focus on political uses of Twitter. As opposed to boarder studies of the full range of digital media citizens may utilise for political communication. Though there are examples of this it does not appear as pronounced as in other domains.

5.6 Conclusions

As with the other domains we believe that the complexity and variety of potential work warrants consideration to be taken of all the questions topics and challenges identified. Noting this, we would argue that the analysis here has identified key areas for future research, these being:

- "Digital technologies", radicalisation, mobilisation and political action
- "Digital technologies" and the disruption of current political institutions
- "Digital technologies" and new forms of citizenship
- "Digital technologies", political communication, debate and media
- "Digital technologies" and state control – especially in non-democratic regimes

These questions need to be examined in a multi-platform or holistic manner – see Parts 7 and 8.

6 Communication and relationships

This part of the report provides an overview of the analyses of the literature, Delphi process and any relevant workshops for the Communication and Relationships domain. The part first sets out the results of the Delphi Process (section 6.2) concluding with the key questions, topics and challenges identified by the process (section 6.2.4). The part (section 6.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 6.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 6.6. As a reminder, the initial ESRC scoping question for this area of work was:

- How our relationships are being shaped and sustained in and between various domains, including family and work

6.1 Initial comments

The original ESRC domain question was criticised for its ambiguity and questions were raised as to whether it constitutes a viable standalone question since communicating and building relationships necessarily forms a pivotal strand of activity in all Ways of Being in a Digital Age. The offered alternatives are discussed below. However, specificity was not seen as straightforward given the multiple ways in which relationships are expressed. This can bring about change depending on how interests, conditions and constraints ebb and flow with changing digital technology developments.

6.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 18. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 6.2.1)
- Key topics to address within these questions (section 6.2.2)
- Key challenges to researching these questions (section 6.2.3)

6.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the five categories detailed in Table 19. The ranking of these categories by the number of questions allocated to the category is provided in Table 20, and by their ranked importance from the confirmatory survey is given in Table 21. It is important to note that ranked importance is almost the inverse of the number of questions allocated to the category. As will be discussed in Part 11 there are a number of areas identified in the scoping question and challenges analysis that are cross cutting. A key one of these being digital literacy.

Table 19: Scoping questions

Question category	Example questions
Digital literacies	• What literacies are required for effective communication using digital technologies? Should these literacies be taught, or can we assume that they develop organically? • To what extent does an individual's digital legacy and digital capability affect their interactions with others in work and leisure?
Norms and values	• What normative pressures do people experience related to relationships shaped and sustained by digital technologies?

	• What is the new normal for relationships now they are shaped and sustained by digital technologies across multiple domains?
Platform affordances	• What are the Platform affordances of digital technology that construct or constrain relationships? • How do particular platforms affect various kinds of relationships: social, sexual, familial, collegial, activism, fandom, etc.?
Quality of relationships and communication	• How does communication via digital technologies facilitate the quantity and quality of our relationships? • How are our relationships being shaped, sustained and diminished by digital technologies, in and between the domains of work and family?
Relationship management	• How are family, friend, and work relationships shaped by, and reshaping, the trajectories that new digital technologies are taking. • How are our friendships being shaped, sustained and diminished by digital technologies?

Table 20: Scoping questions ranking by number of cases

Scoping question category
Relationship management
Platform affordances
Quality of relationships and communication
Digital literacies
Norms and values

Table 21: Scoping questions ranking by Importance

Scoping question category	Percentage
Digital literacies	85.7%
Quality of relationships and communication	71.4%
Norms and values	64.3%
Relationship management	50.0%
Platform affordances	28.6%

6.2.1.1 Consultation workshop review

The consultation workshop identified a set of issues or additional scoping questions for each of the five categories. These are detailed in Table 22. The workshop also noted that the following topics appeared to be missing from the results of the Delphi work:

- Issues of cultural specificities
- Cultural analysis
- Mixed modal interaction

Table 22: Consultation workshop scoping comments

Scoping question category	Example questions
Digital literacies	• Who needs help with digital literacies? • Are these taught or learnt? • Understanding our 'digital communication assets'
Norms and values	• What are the origins of normative pressures?

	• How are communicative norms formed and transmitted? • Which behaviours and activities are "normal"?
Platform affordances	• What types of relationship are supported? • What types are "new"? • Changes to proximities/propinquity? • Manging privacy? • Platform is the message – or platform focus may be to technological determinist?
Quality of relationships and communication	• Interaction versus functioning online? • Why focus on old categories of work, home, family? • Overlaps to wellbeing? • Overlaps to relationship management?
Relationship management	• Interaction versus functioning online? • Why focus on old categories of work, home, family? • Overlaps to wellbeing? • Overlaps to quality of relationships?

6.2.2 Key research topics

The topics identified in the Delphi review were coded into 25 categories as detailed in Table 23. The ranked importance of these from the confirmatory survey are presented in Table 24. As with the scoping questions those topics that were most commonly cited in the Delphi workshop were not those deemed most important in the

Table 23: Key topics ranked by number of items

Topics	Percent	Topics	Percent
Friendships and relationship formation	12%	**Identity**	2%
Age	10%	**Integration**	2%
Privacy and ethics	10%	**Interpersonal**	2%
Work and organisations	8%	**Methods**	2%
Education	6%	**Other**	2%
Social and community support	6%	**Place**	2%
Bubbles	4%	**Platforms**	2%
Data and representation	4%	**Psychology**	2%
Exclusion	4%	**Quality and variety**	2%
Politics	4%	**Sexuality**	2%
Social change	4%	**Textuality**	2%
Dependency	2%	**Theory**	2%
Family	2%		

Table 24: Key topics Ranked by importance

Topics	Very important	Important	Neutral	Unimportant	Very unimportant
Privacy and ethics	57.1%	35.7%	7.1%	0.0%	0.0%
Friendship and relationship formation	57.1%	35.7%	0.0%	7.1%	0.0%
Social change	42.9%	42.9%	14.3%	0.0%	0.0%

Social and community support	35.7%	57.1%	7.1%	0.0%	0.0%
Education	35.7%	28.6%	35.7%	0.0%	0.0%
Exclusion	28.6%	57.1%	14.3%	0.0%	0.0%
Age factors - cohort and age	28.6%	50.0%	14.3%	7.1%	0.0%
(Social) Media 'Bubbles'	21.4%	42.9%	21.4%	7.1%	7.1%
Work and organisations	14.3%	57.1%	28.6%	0.0%	0.0%
Political communication	14.3%	50.0%	35.7%	0.0%	0.0%
Data and representation	14.3%	50.0%	28.6%	7.1%	0.0%

6.2.2.1 Consultation workshop review

The consultation workshop highlighted the following topics:

- Age – user age versus user experience
- Social "bubbles"
- Cross over to data and representation and methods

The workshop participants also identified potential gaps in the Delphi topics list:

- Culture
- Misinformation and miscommunication
- Teaching of digital literacies
- Exclusion/Inclusion/Participation
- Friendship formation – especially regarding young people

6.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 16 categories. These categories are detailed in Table 25and ranked by the number of coded items, with those deemed to be domain specific by the consultation workshop marked in bold. The ranking of these by the confirmation survey are presented in Table 26.

Table 25: Domains challenges - ranking by number of cases

Challenge	Percentage	Challenge	Percentage
Multi-platform studies	17%	Community	2%
Theory	17%	Data access	2%
Co-design	13%	Exclusion	2%
Big data	10%	Longitudinal studies	2%
Ethics and privacy	8%	New forms of publication	2%
Surveys	6%	Old media	2%
Methods	4%	Other	2%
Multidisciplinary working	4%	Uses and gratifications	2%

Table 26: Domain challenges - ranking by importance

Challenges	Very important	Important	Neutral	Unimportant	Very unimportant
Ethics and privacy	64.3%	14.3%	21.4%	0.0%	0.0%
Theory	53.8%	30.8%	7.7%	7.7%	0.0%
Multidiciplinary working	46.2%	38.5%	7.7%	7.7%	0.0%
Multi platform studies	42.9%	35.7%	21.4%	0.0%	0.0%
Big data	35.7%	28.6%	35.7%	0.0%	0.0%
Methods	28.6%	42.9%	28.6%	0.0%	0.0%
Surveys	14.3%	21.4%	50.0%	7.1%	7.1%
Co-design	0.0%	38.5%	38.5%	15.4%	7.7%

6.2.3.1 Consultation workshop review

The consultation workshop identified specific challenges for research in this Domain within the above categories.

6.2.3.1.1 Co-design

- Co-designing technologies - how to work with and alongside communities that are often ignored to co-design technologies that are of use to them and in their lives - focussing on improving relationships rather than distancing ourselves from others.
- Technologies are often designed FOR communities with some 'user testing' but little engagement with people and their lives. Social scientists, working alongside designers and engineers, can use methodologies and approaches central to social science to work alongside communities to understand and communicate their needs and broker relationships.
- One method I have been a proponent of is giving people their data back in a new way, so they can reflect on it. To do this, the researcher needs to understand what sorts of visualizations will be most beneficial to start a conversation, which is not necessarily the same thing as good infoviz practice one would learn in design school.
- Encouraging creative use of technologies for civic engagement in communities not used to using digital technologies.
- How can we work with communities who are not familiar with digital technologies to consider the creative use of technologies in their lives, to enable them to communicate and build better relationships at community level but also with those in more powerful positions e.g. potentially building social movements or use of technologies for civic change?

6.2.3.1.2 Ethics and privacy

- Relationship mining
- Whether for research or advertising, how will relationship mining affect our use, trust, or selection of digital technologies?

6.2.3.1.3 Multi-platform studies

- Multimodal relationships
- How do we assess the influence of any one particular technological platform, when many important relationships involve so many platforms (incl. face to face, phone, text, social media, etc.)? How do we assess combinations?
- How to follow people' digital communication in their everyday lives?
- Making conclusions about relationships from single-media studies
- Understanding communications platforms as mass media and hybrid media.
- Dynamic network analytics
- Understanding the physical and embodied use of the digital in communication activities and processes
- We see social media studies of young people at leisure; email studies of people at work and 'quantified health' studies of general fitness - but there is space to break down these contextual barriers.

6.2.3.1.4 Multidisciplinary working

- Multi/transdisciplinary working - how to work with computer scientists and
- Theory

- Developing a theory of speech act that can account for the performative, avatar, dramatic nature of much digital communication
- Including critical approaches, Marx, Gramsci, Hall, critical theory, Bourdieu, Foucault et al.

6.2.4 Conclusion

As with the other domains we believe that the complexity and variety of potential work warrants consideration to be taken of all the questions topics and challenges identified. Noting this, we would argue that the analysis here has identified key areas for future research, these being:

- The norms and values of digital communication and relationships
- The 'affordances' different platforms provide for digital communication and relationships
- The quality of relationships and communication supported by digital media and technologies
- The management of relationships via digital media and technologies

Within these areas the top five topics to consider are:

- Social and community aspects
- Privacy and ethics
- Exclusion
- Social change
- Work and organisations

With key domain-specific challenges being:

- Multi-platform studies
- Ethics and privacy

6.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

6.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 10 most common topics identified by the UoS team in the Round 1 literature are listed in Table 27. These represent the topics covering 2% or more of the identified cases. Table 28 lists the sub-topics within these groups.

Table 27: UoL analysis topics - Ranked

Topics	Percentage of cases
friend	9.9%
media	8.2%
pair	8.0%
group	4.3%
adolescent	4.3%
phone	4.0%
communication	3.9%
relationship	2.5%
time	2.5%

medium	2.3%
level	2.1%
teen	2.1%
life	2.0%
parent	1.9%

Table 28: UoL topics and sub-topics

Topics	Percentage	Topics	Percentage	Topics	Percentage
adolescent	**4.3%**	**friend**	**9.9%**	**pair**	**8.0%**
adult	2.0%	friendship	2.4%	percentage	0.9%
life	1.5%	instant	0.3%	rate	1.3%
realism	0.3%	judgment	0.5%	relation	1.3%
uncertainty	0.5%	newcomer	0.7%	sociability	1.1%
social-media	**8.2%**	pair	1.3%	status	1.1%
communication	0.9%	photo	1.4%	total	0.6%
group	0.4%	post	1.3%	week	0.4%
information	0.8%	tie	2.1%	whole	0.4%
interaction	0.4%	**group**	**4.3%**	writing	0.9%
medium	0.9%	identification	1.2%	**parent**	**1.9%**
member	0.6%	in-group	0.8%	phone	1.9%
pair	0.9%	out-group	0.7%	**phone**	**4.0%**
relationship	0.9%	poster	0.4%	plan	1.1%
student	0.5%	sip	0.5%	punishment	0.4%
tie	0.8%	socialization	0.7%	someone	0.9%
work	1.0%	**level**	**2.1%**	subgroup	0.5%
communication	**3.9%**	move	0.7%	teens	1.0%
controllability	0.7%	pair	0.9%	**relationship**	**2.5%**
correspondent	1.0%	var	0.6%	root	0.6%
monograph	0.9%	**life**	**2.0%**	work	1.9%
propinquity	0.9%	pew	1.4%	**teen**	**2.1%**
sip	0.4%	writing	0.6%	twitter	1.2%
		medium	**2.3%**	voice	1.0%
		multitasking	0.3%		
		richness	1.5%		
		storytelling	0.5%		

6.3.2 Method 2: Bespoke UoL Digital Humanities and Social Sciences

The UoL approach used the work of

Chuang et. al (2012) and Sievert & Shirley (2014) to identify the 14 topics listed below (Table 29) in rank order by percentage of topic distribution.

Table 29: UoL analysis topics

Topics	
1. Mobile	10. Digital media use
2. Adolescents-sex-sexuality	11. Identity verification
3. Facebook	12. Social network analysis
4. Media and policy	13. Avatars
5. Computer-mediated communication	14. Home and neighbourhood
6. Teenagers-mobiles-parents	15. Privacy and trust
7. Workplace communication	16. Online chat
8. Online relationships and dating	17. Risks

9. Political communication	18. Protest communication

6.3.3 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat. Wordstat identified 21 topics which are presented in Table 30. These map closely to the topics identified in the UoL analysis.

Table 30: Wordstat analysis of topics

Topic name	Keywords	EIGEN VALUE	%VAR	Freq	Cases	% Cases
Facebook	FACEBOOK; ELLISON; SITE; NETWORK; FRIEND; SN; SNSS; BOYD; CAPIT; SOCIAL	1.91	0.86	44414	559	95.88%
Measurement	MEASUR; VARIABL; WA; SAMPL; ITEM; SURVEI; DATA	1.64	0.82	28226	552	94.68%
Twitter	TWEET; TWITTER; HASHTAG; RETWEET; USER; REPLI; API; PLATFORM; ACCOUNT; CHAPTER	11.88	1.42	28460	537	92.11%
Higher education	STUDENT; COLLEG; TEACHER; EDUC; SCHOOL; LEARN	1.73	0.75	13949	521	89.37%
CMC vs FTF	CMC; FTF; CUE; WALTHER; PARTNER; INTERACT	2.26	0.76	13697	511	87.65%
Storytelling	CCM; STORYTEL; CREATIV; AUSTRALIAN; AUSTRALIA; ART; DIGIT; PROJECT	2.39	0.88	14149	507	86.96%
Nation and EU	NATION; EUROPEAN; COUNTRI; EUROP; POLIT; GLOBAL	1.70	0.80	13864	506	86.79%
Gender and language	WOMEN; MEN; MALE; FEMAL; GENDER; LINGUIST; FEMINIST; LANGUAG; SEX; SPEECH	2.69	0.91	16931	503	86.28%
SNA	PAIR; CERIS; TIE; MULTIPLEX; FREQUENC; FACULTI; TI; FRIENDSHIP; EXCHANG; EMPLOYE	2.96	1.11	9430	498	85.42%
Advertising	COMPANI; MARKET; BUSI; CORPOR; CONSUM; SERVIC; ADVERTIS	2.01	0.92	11752	490	84.05%
Class	MARX; LABOUR; FUCH; DIALECT; LUKiC; IDEOLOGI; ECONOMI; CAPIT; CRITIC; CLASS	3.37	0.95	11067	464	79.59%
Privacy	ION; PRIVACI; ER; AL; PROTECT	1.49	0.60	7717	452	77.53%
Health care	CARE; PATIENT; TELECONSULT; HEALTH; HOME	1.57	0.58	5937	421	72.21%
Blogging	BLOG; BLOGGER; READER; COMMENT	1.81	0.75	5106	403	69.13%
Media consumption	FILM; CINEMA; NARR; IMAG GAME; PLAYER; VIDEO; AVATAR	1.46	0.64	5557	340	58.32%
Adolescents and sexuality	ADOLESC; SEXUAL; EXPOSUR; SEIM; SEX	3.71	0.79	8015	326	55.92%
Social club	CLUB; FAN; SPORT; TEAM	1.45	0.56	1305	194	33.28%
Children and families	BOI; GIRL	1.40	0.62	2285	167	28.64%
Social network platforms	SOCIAL; COMMUN; THI; AR; INTERACT; PEOPL; SPACE; INFORM; NETWORK; THEI; SYSTEM	1.61	1.52 108173	569	97.60%	

Old media	TELEVIS; AUDIENC; WATCH; TV; BROADCAST; VIEWER; MEDIA 1.94	0.80	22518	523	89.71%	
Mobile phone	PHONE; CELL; TEEN; MOBIL1.88	0.72	8567	421	72.21%	

6.3.4 Overall topic analysis

Looking that the underlying keywords in each analysis, the key topics within the literature are as follows with the most common ones in bold:

- Access and inequalities (class)
- **Adolescents-sex-sexuality**
- Children and families
- **Computer-mediated communication compared to other media**
- Digital entertainment media use
- **Facebook**
- Home, neighbourhood and healthcare
- Measurement
- **Mobile phones**
- Old media and policy
- Online relationships and dating
- Privacy and trust
- **Social network analysis**
- Storytelling
- **Twitter**

A subset of topics were identified in at least two analyses,

- Workplace communication
- Identity verification
- Avatars
- Risks
- Protest communication
- Gender and language
- Advertising

6.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (64%) were inductive, either describing findings or building theory. Only 14% undertook theory testing (Table 31). Reflecting this 64% of the papers undertook primary data collection with 23% being discursive reviews of or reflective on existing research (Table 32).

The main disciplines from which theory was used or for which theory was developed were:

- Psychology (39.2%)
- Sociology (32.3%)
- Communications and media (15.6%)

Only actual use for the purposes of deign or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories applied from these disciplines and no clear preference. No one theory appeared more than three times. The main research methods were surveys (36%), interviews (24%) and literature reviews (20%) (Table 33). The majority of the empirical work focused on specific groups (e.g.

Facebook users) with a limited number of general population studies (Table 34). Less than 2% of studies overtly stated that they were using a "big data" approach.

Table 31: Epistemological approach

Epistemology	Column %
No clear epistemology	22.1%
Deductive (Testing of existing theory)	13.9%
Inductive (Conclusions driven by data)	64.0%

Table 32: Empirical approach

Empirical Approach	Column %
Discursive/Descriptive-no new data or theory	22.9%
Primary empirical-data collected and analysed	63.8%
Secondary empirical-analysis of existing data	5.1%
Theoretical-synthesis of current or prior work	7.7%

Table 33: Research methods

Research Methods	Column %
Content Analysis	5.4%
Ethnography	6.9%
Experiment	9.5%
Focus Groups	5.4%
Interview(s)	23.7%
Literature Review (General or Narrative)	20.3%
Meta-analysis or Systematic review	0.5%
Other	18.0%
Social Network Analysis	4.1%
Survey	36.0%
Textual-Linguistic-Discourse Analysis	4.1%
Theory Building	6.2%

Table 34: Study population

Study population	Percent
Case study(ies)	1.5%
General population	8.0%
Specific group	34.8%
No study group	56.0%
Grand Total	44.3%

6.5 Reflections on the literature and the data

This section presents reflections by the project team on the Communication and Relationships data and literature.

- It was suggested that communication behaviours and relationships are fundamental to almost all online activities, folded into and overlapping the other six domains.
- Communication on the scales now and likely to be undertaken (e.g. with the rise of the Internet of Things) remains, yet, unknown territory. Researching such change requires inter- and multi-disciplinary research methods and groups.

It was widely recognised in the literature, workshops and by the team that a whole new axis in communication has been brought about by the development and use of social media. Already, scholarly research is abundant, however, many commentators felt there were still under-researched areas and this was under-developed in terms of theory. Foremost, was why

people are able integrate digital media so easily into their everyday lives. Experts acknowledge that there will be benefits and further potential in social media but also that the well documented concerns are still not well understood. These include a range of behaviours that could normatively be described as negative, for example, hyper sociability, sexting, cyber bullying, online grooming, trolling and more generally – the broad area of internet safety.

There is an enduring concern with the virtual versus the physical aspects of communication with questions raised around costs and benefits of functioning effectively in a digital world and particularly if individuals were 'being shaped and diminished' by digital technologies as opposed to proactively assessing and shaping future technologies. Explaining a digital person or a digital citizen becomes problematic as digital forms of communication are folded seamlessly into lives in what has become for some and abstract manner.

A general observation was raised, which was that communication and relationships are impacted differently depending on the particular stages in the life course, e.g. children, adolescents, students, adults and seniors and also by the type of social relations. The team noted that the literature details in its breadth how communication density is intensified by digital technologies and attention must be given to formulating research questions that take this into account. This is likely reflected in the topics and challenges identified in the Delphi work around "multi-platform studies" within which there needs to be focus on:

- Communication and Relationships with other people
- Communication and Relationships with things
- Communication and Relationships with personal curations
- Communication and Relationships with nodes and networks
- The effects of various forms of Communication and Relationships, e.g. social, sexual, familial

As noted in the consultation workshop a potential important emerging theme is intra and inter-generational interactions as more and more different groups embrace online communication attentiveness to this should be stepped-up. Overall the team noted the following general issues that appeared to either cross cut the data and literature, or stand out as new issues:

- What normative pressures do people experience related to relationships shaped and sustained by digital technologies?
- What literacies are required for effective communication using digital technologies? Should these literacies be taught or do they develop organically?
- Teasing out how digital media facilitates the quality and quantity of our relations, e.g. 'to what extent does an individual's digital legacy and digital capability affect interactions with others in work and leisure?'
- Understanding more about gaming as an activity and a set of relationships.
- Literature reviews indicate that Twitter and Facebook are well represented in contemporary literature. But research studies need to include investigations and comparisons of other social media platforms.
- The team had concerns about the attractiveness of big data analytics, reflected in the Delphi results, and if this might undermine more holistic multi-method approaches required to get at the dynamics of offline and online aspects of communication and relationship.

6.6 Conclusions

Contemporary research in the Communication and Relationships domain studied here appears to have focused on:

- Facebook
- Twitter
- Computer-mediated communication compared to other media
- Mobile phones
- Social network analysis
- Adolescents-sex-sexuality

The work has employed fairly-traditional methods such as surveys and interviews. It is orientated towards psychological and sociological approaches with some Linguistic and Information studies aspects. The work does not appear to have extensively employed digital tools and big data methods. Most notably the work appears to have been "platform driven" and "platform specific" with a bias towards younger people.

The future research identified in the Delphi process is different, though there are some overlapping areas. The focus has shifted towards more general studies of communication and relationship in everyday life and the need to understand the integration of multiple media into communications and relationships behaviour. With the key questions, topics and challenges being:

- The norms and values of digital communication and relationships
- The 'affordances' different platforms provide for digital communication and relationships
- The quality of relationships and communication supported by digital media and technologies
- The management of relationships via digital media and technologies

Within these areas the top five topics to consider are:

- Social and community aspects
- Privacy and ethics
- Exclusion
- Social change
- Work and organisations

With key domain-specific challenges being:

- Multi-platform studies
- Ethics and privacy

7 Communities and identities

This part of the report provides an overview of the analyses of the Delphi process, literature and any relevant workshops for the Communities and Identities domain. The part first sets out the results of the Delphi Process (section 7.2) concluding with the key questions, topics and challenges identified by the process (section 7.2.4). The part (section 7.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 7.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section XX. As a reminder, the initial ESRC scoping questions for this area of work were:

- How we define and authenticate ourselves in a digital age
- What new forms of communities and work emerge as a result of digital technologies – for example new forms of coordination including large-scale and remote collaboration

7.1 Initial comments

The literature, Delphi and workshop data all raise questions about how senses of community are perceived and experienced in a digital age. The initial ESRC scoping questions were thought to be appropriate although the inclusion of the word 'work' might be left out as it draws attention to one narrow characteristic. Experts sought to broaden the view depending on context and institutional landscape because online communities tend to be structured and shaped by offline institutions as well as political, social and geographic contexts. However, some literature emphasises more autonomously created online communities or associations.

What is noticeable in many of the responses to the Delphi questions about identity is apparent uncertainty related to questions of authentication. Many of the responses interpreted authentication in terms of having an 'authentic' sense of identity rather than the technical process of individuals authenticating themselves online as the person they claim to be, indicating that research into communities and identities is fundamental to understanding how we live in the digital age.

7.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 19. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 7.2.1)
- Key topics to address within these questions (section 7.2.2)
- Key challenges to researching these questions (section 7.2.3)

7.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the three categories detailed in Table 35. Their ranked importance from the confirmatory survey is given in Table 36. Unlike some other domains these two rankings match.

Table 35: Scoping questions: Community and Identity

Question category	Example questions
Community membership and processes	• What is the glue that binds members to these communities? • What differences digital technologies have on communities?

	• Do digital technologies enhance or limit people's sense of belonging in local, national and transnational communities? • What are the net benefits of participation in online communities, considering both the positives (e.g., social support, information exchange) and the negatives (e.g., trolling, astroturfing) associated with online groups? • what questions do we need to ask in relation to the reconfiguration of communities in a digital age that enable us to understand the politics and socio-technical dimensions at play? • How has the definition of 'community' evolved since the inception of the digital age? (Relatedly: how do 'digital natives' -- people born since the mid-1980s who have never known a world without the internet -- define 'community')
Defining identity online	• What are the differences in how we define ourselves in a digital age by gender, class, age, etc. • What does "identity" refer to in an online context and must it always be assumed there is a connection between identity and authenticity? What is an authentic identity these days anyway? • What are the implications of the digital on questions of identity? • How does the digital enable or disenable us to ask better questions of identity? • How does personal identity evolve (or not) in the context of these communities?
Understanding remote relationships	• How are digital technologies being used to support interaction over distance?

Table 36: Scoping questions ranking by Importance

Scoping question category	Percentage
Community membership and processes	62.5%
Defining identity online	25%
Understanding remote relationships	12.5%

7.2.1.1 Consultation workshop review

The consultation workshop noted the following points:

- Online vs offline is too much of a duality as many communities have blended media use
- The proposed questions focused more on community than identity – understanding the relationship between identity and community online is key
- The more contemporary question might be that of understanding the specifics or different digital communities – building on the more general work already done.
- The challenge of managing identity – pseudonimity, authenticitiy, anonymity, genuineness
- Much of the existing research and the Delphi materials appears to have an overly positive take on digital participation – there is a need for work on negative aspects and the impacts of forced digital participation

7.2.2 Key research topics

The topics identified in the Delphi review were coded into seven categories as detailed in Table 37. The ranked importance of these from the confirmatory survey are presented in Table 38. As with the scoping questions those topics that were most commonly cited in the Delphi workshop were not those deemed most important in the

Table 37: Key topics ranked by number of items

Topic	Percentage	Topic	Percentage
Exclusion/Inclusion	17%	**Ethics**	4%
Participation, action and social change	17%	**Legal**	4%
Diaspora	13%	**Methods**	4%
Gender/Race/Ethnicity	13%	**Norms**	4%
Power	8%	**Tolerance**	4%
Citizenship	4%	**Urban**	4%
Digital labour	4%		

Table 38: Key topics Ranked by importance

Topics/Percentages	Very important	Important	Neutral	Unimportant	Very unimportant
Digital Community Exclusion/Inclusion	87.5%	12.5%	0	0	0
Digital community participation, action and social change	87.5%	12.5%	0	0	0
Power in online communities	75%	12.5%	12.5%	0	0
Understanding global diaspora as digital communities	37.5%	50%	12.5%	0	0
Understanding function of aspects of identity online (Gender/Race/Ethnicity/Sexuality)	37.5%	37.5%	25%	0	0

7.2.2.1 Consultation workshop review

The consultation workshop noted that these topics were important but already well studied for the majority of digital media. Though they noted new platforms lead to new challenges. They noted the considerable cross-over to the Communication and Relationship domain. Workshop participants also identified potential gaps in the Delphi topics list:

- Need to include Class as an element on digital identity
- Need for a greater focus on identity rather than demographics
- For work with diaspora there is the need to avoid assuming the goal is simply integration

7.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 6 categories. These categories are detailed in Table 39 and ranked by the number of coded items, with those deemed to be domain specific by the consultation workshop marked in bold. The ranking of these by the confirmation survey are presented in Table 40. There is a mismatch in the rankings with methods coming top of the confirmation survey results. As noted with other domains there is considerable cross-over in the identification of challenges. In this case, all of the challenges are shared with other domains.

Table 39: Domains challenges - ranking by number of cases

Challenges	Percentage
Holistic understanding of online and off line behaviour	33%
Ethics of dealing with digital data	24%
Methods to address complexity of digital media use	24%
Big data - developing and utilising large databases and corpora	10%
Comparative historical (diachronic) analysis of digital media use	5%
Representation of outputs	5%

Table 40: Domain challenges - ranking by importance

Challenge/Percentage	Very important	Important	Neutral	Unimportant	Very unimportant
Methods to address complexity of digital media use	75%	25%	0%	0%	0%
Ethics of dealing with digital data	62.5%	37.5%	0%	0%	0%
Holistic understanding of online and off line behaviour	50.%	50%	0%	0%	0%
Big data - developing and utilising large databases and corpora	12.5%	75%	12.5%	0%	0%
Comparative historical (diachronic) analysis of digital media use	0%	100%	0%	0%	0%

7.2.3.1 Consultation workshop review

The consultation workshop identified specific challenges for research in this Domain within the above categories.

- History and culture are important to the development of online community
- How identity gets lost outside citizens control – ethics of platforms use of big data
- Understanding privacy in online communities

7.2.4 Conclusion

As with the other domains we believe that the complexity and variety of potential work warrants consideration to be taken of all the questions topics and challenges identified. Noting this, we would argue that the analysis here has identified key areas for future research, these being:

- Community membership and processes
- Defining identity online
- Understanding remote relationships

Within these areas the top five topics to consider are:

- Digital Community Exclusion/Inclusion
- Digital community participation, action and social change
- Power in online communities
- Understanding global diaspora as digital communities
- Understanding function of aspects of identity online (Gender/Race/Ethnicity/Sexuality)

With key domain-specific challenges being:

- Holistic understanding of online and off line behaviour

7.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

7.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 13 most common topics identified by the UoS team in the Round 1 literature are listed in Table 41. These represent the topics covering 2% or more of the identified cases. Table 42 lists the sub-topics within these groups.

Table 41: UoL analysis topics – Ranked

Topic	Percentage of cases
group	13.7%
computer	13.6%
community	10.8%
gender	6.8%
identity	6.5%
child	4.0%
knowledge	3.9%
network	3.8%
machine	3.4%
communication	3.2%
leadership	2.8%
college	2.5%
game	2.1%

Table 42: UoL topics and sub-topics

Concept sets	Percent	Concept sets	Percent	Concept sets	Percent
child	**4.0%**	**computer**	**13.6%**	**group**	**13.7%**
game	0.7%	fear	0.2%	identification	1.3%
laptop	0.4%	hacker	1.0%	identity	3.3%
object	1.6%	language	1.1%	individuality	0.8%
programming	0.6%	mastery	0.6%	ingroup	0.5%
robot	0.4%	mind	1.6%	lea	0.6%
stage	0.4%	object	1.3%	manipulation	1.5%
college	**2.5%**	owner	0.6%	membership	0.7%
friend	0.7%	presence	0.5%	negotiation	0.4%
medium	0.7%	programming	1.7%	prediction	1.1%
student	1.1%	psychology	0.7%	prentice	0.3%
communication	**3.2%**	self	1.0%	psychology	1.4%
cue	0.4%	toy	1.0%	side	0.8%
dynamics	0.4%	transparency	0.3%	spear	1.0%
leadership	0.5%	world	1.9%	**identity**	**6.5%**
park	0.4%	**game**	**2.1%**	in-group	0.4%
personality	0.4%	mind	0.2%	influence	0.7%
psychology	0.8%	object	0.2%	member	1.8%
uncertainty	0.4%	play	0.6%	norm	1.0%
community	**10.8%**	screen	0.2%	path	0.8%
designer	1.1%	simulation	0.2%	pilot	0.3%
educator	0.3%	something	0.3%	prediction	0.7%
empathy	0.6%	space	0.5%	psychology	0.7%
leadership	1.7%	spear	1.0%	**knowledge**	**3.9%**
lurker	0.8%	**gender**	**6.8%**	organization	2.3%
membership	0.8%	genre	0.9%	platform	0.3%
moderator	0.8%	helper	0.6%	source	1.3%
poster	0.5%	herring	0.5%	**leadership**	**2.8%**
sociability	1.6%	identity	1.4%	network	0.9%
student	1.1%	judge	0.5%	participant	0.9%
usability	1.4%	man	0.6%	role	1.1%
		message	1.2%	**machine**	**3.4%**
		performance	0.5%	object	0.4%
		word	0.5%	program	0.5%
				programming	0.3%
				system	0.3%

				thing	0.5%
				way	0.8%
				world	0.5%
				network	**3.8%**
				proportion	0.7%
				single	0.4%
				size	0.7%
				tie	2.0%

7.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat which identified 12 topics which are presented in Table 43.

Table 43: Wordstat analysis of topics

Topic	KEYWORDS	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Online community	ONLIN; DATE; WALTHER; INTERPERSON; COMMUN; INTERACT; BEHAVIOR; CMC	11.92	0.93	12789	153	96.84%
Identity (Psychology)	POSTM; SPEAR; TURNER; HASLAM; GROUP; IDENT; PSYCHOLOGI; INTERGROUP	2.57	0.79	6241	149	94.30%
Friendship network	TI; NETWORK; WELLMAN; KIN; LOCAL; FRIEND	2.04	0.85	5683	145	91.77%
Education	EDUC; SCHOOL; TEACHER; STUDENT; LEARN; RESOURC; FUTUR; PARENT; CHILDREN; COLLEG	2.17	1.16	6520	144	91.14%
Computing	MACHIN; PROGRAM; COMPUT; INTELLIG; AI; SOMETH; HACKER; SYSTEM	1.58	0.91	5511	143	90.51%
Governance	EUROPEAN; POLIT; EU; POLICI; EUROP; GOVERN; DEMOCRAT; CITIZEN; NATION; SPHERE	1.57	0.80	5127	139	87.97%
Children	ALIV; TOI; CHILDREN; CHILD; OBJECT; ROBOT; MACHIN; PHYSIC; PSYCHOLOG	3.25	0.92	3889	130	82.28%
Facebook	FACEBOOK; ESTEEM; CAPIT; COLLEG; MEASUR; VARIABL	1.82	0.73	2665	128	81.01%
Mobile phone	PHONE; MOBIL; SERVIC; HANDSET; MARKET; PERCENT AAKHU; KATZ; EDIT; APPARATGEIST; MOBIL; PERFORM TEXT; PHONE; MESSAG; CELL; SM; MOBIL; SEND; PHILIPPIN RINGTON; RING; MUSIC PICTUR; PHOTOGRAPH; PHOTO; CAMERA; IMAG	3.44	1.11	1859	124	78.48%
Gender	MEN; WOMEN; MALE; FEMAL; GENDER	2.49	0.78	3597	118	74.68%
Migration and diaspora	TRANSNAT; MIGRAT; DIASPORA; MIGRANT; GLOBAL; ETHNIC; COSMOPOLITAN; ICT; CULTUR; DIGIT RELIGI; RELIGION; SUPERNATUR; TEEN; ISLAM; MUSLIM GITAL; PASSAG; MIGRANT; YOUTH	2.92	0.96	2114	105	66.46%
Identity (Assessment)	IDENTI; CATION; DEDUCT; MANIPUL	1.55	0.78	1534	96	60.76%

7.3.3 Overall topic analysis

Table 44 presents an analysis of the overlap between the concepts and topics analyses.

Table 44: Intersection of concepts and topic analyses

Concepts/Topics	Online community	Mobile phone	Children	Migration and diaspora	Identity (Psychology)	Gender	Education	Friendship network	Facebook	Computing	Governance	Identity (Assessment)
child			■									
college												
communication	■											
community	■				■			■	■			
computer												■
game			■									
gender				■		■						
group	■					■						
identity												
knowledge												
leadership												
machine										■		
network								■	■			

Exploring that the underlying keywords in each analysis, the key topics within the literature are as follows with the most common ones in bold:

- **Children and digital media**
- Computing technologies
- **Concepts/Topic**
- Facebook
- Friendship networks
- Gender and digital media
- Identity (Psychology)
- Migration and diaspora communities
- **Mobile phone use**
- **Online community**

7.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (62%) were inductive, either describing findings or building theory. 38% undertook theory testing (Table 45). The papers were split 57% papers that undertook primary or secondary data work with against to 43% discursive reviews of, or reflective on, existing research (Table 46).

The main disciplines from which theory was used or for which theory was developed were:

- Sociology (38.1%)
- Psychology (30.9%)
- Communications and media (19.6%)

Only actual use for the purposes of design or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories applied from these disciplines thought there was no substantive clear preference the main specific theories were:

- Sociology (38.1%)
    - Social network analysis (4%)
    - Technology acceptance models (3%)
- Psychology (30.9%)
    - Social identity theory (7%)
    - Self-categorisation theory (3%)
- Communications and media (19.6%)
    - All the theories identified "Computer-mediated communication" approaches

The main research methods were surveys (14%), interviews (14%),literature reviews (14%) and experiments (12%) (Table 47). The majority of the empirical work focused on specific groups (e.g. Students or Twitter users) with a limited number of general population studies (Table 48). Less than 3% of studies overtly stated that they were using a "big data" approach.

Table 45: Epistemological approach

Epistemology	Percent
Deductive (Testing of existing theory)	38.03%
Inductive (Conclusions driven by data)	61.97%

Table 46: Empirical approach

Empirical approach	Percentage
Discursive/Descriptive-no new data or theory	43.33%
Primary empirical-data collected and analysed	49.17%
Secondary empirical-analysis of existing data	7.50%

Table 47: Research methods

Research Methods	Percent
No clear methods	14.80%
Survey	14.20%
Interview(s)	13.50%
Literature Review (General or Narrative)	13.50%
Experiment	11.50%
Content Analysis	9.50%
Ethnography	6.10%
Theory Building	5.40%
Social Network Analysis	3.40%
Textual-Linguistic-Discourse Analysis	3.40%
Other	2.70%
Focus Groups	2.00%

Table 48: Study population

Study population	Percent
Case study(ies)	14.29%
General population	14.29%
Specific group	71.43%

7.5 Reflections on the literature and the data

Though for many people digitally mediated membership of communities is a vital part of their contemporary sense of wellbeing the team noted apprehensions and even some unease about aspects of digital identities and communities in the data and workshops. This is partly due to the pace of change but also because theory is still under developed and not yet capable of providing explanation, understanding and prediction. Current theories are mainly drawn

from social and behavioural psychology, networked approaches to sociology and the mixed approaches found in computer-mediated communication studies.

There is a strong focus on children and adolescents, as in the Communication and Relationships domain. With Debates surround the level and extent of digital communication in relation to personal development, e.g., whether high levels of use and highly immersive use might adversely affect young peoples' developmental processes. Our review suggests this is a relatively well-researched area yielding reliable findings from a range of disciplines, wide scale surveys and experiments. The main findings suggest that although there may be some risk to development attention must be focused on use in a wider set of social conditions that either mitigate or heighten risks.

What appears as a new concern in the Delphi materials that is not as present in the literature are a range of concerns associated with issues of inequality in both access and participation in online communities. The proposed research areas may typically probe whether digital processes can include or exclude certain individuals/groups/communities and if differences within and amongst these, whether physical, social, political or cultural, have a negative bearing on the dynamics of inclusion and exclusion. The review highlights that questions about identification, intersectionality and tackling of systems of discrimination or disadvantage are of primary importance in understanding contemporary processes of 'digital opt out' and 'digital opt in'. This contrasts with much early work (1985-2000) on computer-mediated communication that emphasised the potential of a progressively developed digital age. There therefore remains a questions bout what current platforms might offer in terms of addressing persistent inequality or whether they may add to its reinforcement.

Overall the team would argue that the following issues may needs to be addressed:

- Comprehensive research into identity and community to generate a deeper understanding of computer mediated communication (CMC) in terms of how, why and where individual identities are formed.
- What is important to communities is the way digital services feature in community life and understanding if online communities can be better designed to support communities.
- Understanding and analyses of the dynamics of various types of online communities that go beyond knowledge gained in the late 1990s and early 2000s.
- Research is needed in issues around digital skills and how different communities or groups are impacted by linguistic and cultural specificities and the ways in which they engage with and utilise digital technologies.
- An investigation of digital diasporas their cultural, social, and political configurations and transformations of and through digital connectivity. Connected migrants – how are migrants and refugees using digital technologies to connect with others, to find their place in the world and to develop skills for employment and integration.
- How does participation in digital communities influence collective action, either from among members of that community, or members engaging collectively beyond those communities?
- Critical analysis of online participation, i.e. what it means for individuals, social groups, and society and is it empowering, exploitive or both?

7.6 Conclusions

Contemporary research in the Community and Identity domain studied here appears to have focused on:

- Children and digital media
- Computing technologies
- Concepts/Topic
- Facebook
- Friendship networks
- Gender and digital media
- Identity (Psychology)
- Migration and diaspora communities
- Mobile phone use
- Online community

The work has employed fairly-traditional methods such as surveys and interviews. It is orientated towards psychological and sociological approaches with some Information studies research. The work does not appear to have extensively employed digital tools and big data methods. Most notably the work appears to have been ***less*** "platform driven" and "platform specific" but has a bias towards younger people and children.

The future research scopes identified in the Delphi process are substantially similar:

- Community membership and processes
- Defining identity online
- Understanding remote relationships

The notable shift is in the topics and challenges identified. As with other domains there is a shift away from technology and platform foci to broader social science questions though there remain some overlapping areas. As noted in the confirmatory workshop discussion there is a greater concern with the negative aspects of online identity and community. AS with the Communication and Relationships domain there is a concern to look at multi-platform or "holistic" aspects of digital media use. The suggested future topic areas being:

- Digital Community Exclusion/Inclusion
- Digital community participation, action and social change
- Power in online communities
- Understanding global diaspora as digital communities
- Understanding function of aspects of identity online (Gender/Race/Ethnicity/Sexuality)

With key domain-specific challenges being:

- Holistic understanding of online and off line behaviour

8 Data and representation

This part of the report provides an overview of the analyses of the Delphi process, literature and any relevant workshops for the Data and Representation domain. The part first sets out the results of the Delphi Process (section 8.2) concluding with the key questions, topics and challenges identified by the process (section 8.2.4). The part (section 8.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 8.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 8.6. As a reminder, the initial ESRC scoping question for this area of work was:

- How we live with and trust the algorithms and data analysis used to shape key features of our lives Initial comments

8.1 Initial comments

The team found the analysis of this domain to be very distinct form the other six. May of the issues and questions here seemed to be "born digital". That is, they are questions that can only really be asked in and of a digital age. This was also the area where the questions seemed to fit closest to the issues raised by stakeholders in the Salon sessions. In the discussion with stakeholders it was the disruptive potential, social impacts of data and automation and need for or lack of clear governance of these that came to the fore. Having said that thought the questions and issues appear "born digital" they are not necessarily "new" in that many could be and were asked of the impacts of ICTs over the last 30 years or so. What makes them all very pertinent and current is the intensification of digitisation, the migration of digital into all aspects of everyday life and the growth of platforms that deliver key social and personal services, as well as economic value, whose use of data and underlying algorithms are not visible.

8.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 20. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 8.2.1)
- Key topics to address within these questions (section 8.2.2)
- Key challenges to researching these questions (section 8.2.3)

8.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the seven categories detailed in Table 49. Their ranked importance from the confirmatory survey is given in Table 50. These two lists closely match.

Table 49: Scoping questions: Data and Representation

Question category	Example questions
Citizen and community use of data	• Alternative: How do groups across society relate to, trust and experience datasets, algorithms and data analysis that impact directly and indirectly upon key features of contemporary life? • How are citizens informed of the immediate and potential later uses of data that they provide in and of their uses of both commercial and public digital services?

Citizen interaction with data and algorithms	• What moments of intervention within digital life are programmed and expected? What range of motion is possible? • Sub-question: to what extent is trust a feature of our relationships to data and algorithms? • How do people feel (affectively) about algorithms and Big Data? After all this topic is called "ways of being"!
Data literacy	• What capacities of thought are necessary to recognize forms of algorithmic governance in everyday life? • How do we live with the algorithms and data analysis used to shape key features of our lives, how do we determine and ensure their trustworthiness? • How do we enhance data literacy to improve our collective abilities to interrogate, assess, understand, and communicate about the algorithms and data analysis increasingly shaping key features of our lives? • To what extent do we understand the algorithms and data that shapes our lives?
Methods	• Moreover, which approaches should be developed or adopted for the study algorithmic culture?
Power and accountability for data and algorithms	• How do we increase the accountability, transparency, and oversight of the algorithms and data analysis that influence key features of our lives? • Based on Tony Benn's five questions on power: What power do specific datasets and algorithms have over the lives of citizens in contemporary life? Where does that power originate from? In whose interests is it exercised? How is it held to account? And how can it be avoided or removed?
Social construction of data and algorithms	• Who are the organizations and groups that create socially consequential algorithms? • How to socially consequential algorithms (e.g. for social media news feeds and consumer recommendations) reflect the social backgrounds of their creators? • How do representations and discourses produce consent or dissent about algorithms and Big Data?
Social implications of data and automation	• What are the possibilities that you see for identifying the social, economic, and political costs, as well as the benefits to be derived from expanded use of algorithms, artificial intelligence, and data analysis more generally? • What kind of research needs to be done to understand the scope and impact of algorithms? • What are the effects of algorithms and data analysis? • How do we live with the algorithms and data that now shapes key features of our lives? • How do we materialise data? • What do you see as the most promising paths toward the assessment, evaluation, and minimization of the mal-distributed harms associated with expanded use of algorithms and massive data analysis? • How do we make sense of these materialisations and incorporate them into our everyday lives? • How to describe and analyse the consequences of datafication as well as algorithmisation? • Relative to other determinants of social position, such as wealth, education, culture etc. what influence do specific algorithms and data analysis carried out by governments and private firms have on individual and collective social welfare? • What prior forms of techno-social relations created foundational experiences for the speedy pervasiveness of digital life?

	• How to account for the drive towards further quantification and metrification of everyday life?

Table 50: Scoping questions ranking by Importance

Question category	Percent
Social implications of data and automation	24.4%
Power and accountability for data and algorithms	22.2%
Citizen interaction with data and algorithms	15.6%
Data literacy	15.6%
Citizen and community use of data	11.1%
Social construction of data and algorithms	11.1%

8.2.1.1 Consultation workshop review

See section 8.2.2.1 for the consultation workshop comments.

8.2.2 Key research topics

The topics identified in the Delphi review were coded into seven categories as detailed in Table 51. The ranked importance of these from the confirmatory survey are presented in Table 52. As with the scoping questions those topics that were most commonly cited in the Delphi workshop were also those deemed most important in the confirmatory survey.

Table 51: Key topics ranked by number of items

Topics	Percentage
Social impacts	20%
Privacy and surveillance	18%
Citizens/Everyday life	16%
Open data/Algorithm transparency/Accountability	16%
Exclusion/Inclusion/Divides	12%
Data visualization/Social construction	6%
Methods	6%
Digital identity	4%
Economics	4%

Table 52: Key topics Ranked by importance

Topic/Percentage	Very important	Important	Neutral	Unimportant	Very unimportant
Social impacts of data	86.70%	13.30%	0.00%	0.00%	0.00%
Privacy and surveillance	60.00%	33.30%	6.70%	0.00%	0.00%
Citizens/Everyday life experiences and uses of data	53.30%	33.30%	13.30%	0.00%	0.00%
Understanding Open data/Algorithm transparency/Accountability	53.30%	33.30%	13.30%	0.00%	0.00%
Data Exclusion/Inclusion/Divides	40.00%	53.30%	6.70%	0.00%	0.00%
Digital identity and data	40.00%	33.30%	20.00%	6.70%	0.00%
Data visualization/Representation/Social construction of data	40.00%	13.30%	46.70%	0.00%	0.00%
Research methods	26.70%	33.30%	33.30%	6.70%	0.00%
Economic impacts	20.00%	66.70%	0.00%	13.30%	0.00%

8.2.2.1 Consultation workshop review

The consultation workshop was in broad agreement with the above as research questions but argued for a "data" focused approach with six alternate ways of viewing the questions and topics are detailed in Table 53.

Table 53: Datafication topics and challenges

Topics	Issues
Datafication	• Ownership, exploitation, rights, boundaries, new sources • How is data being stored and by whom? • Data bias – inequity and stereotypes in the data? • Archiving – tools, algorithms and processes
Data literacies	• Making data and processes visible. • Domain and general literacy. • People who do not want to/cannot be "datafied"
Privacy, security and trust	• Needs to know more about the difference between personal and machine data. • Access and permissions. • Citizen choice in data creation and use. Unintended consequences
The future?	• Need to think beyond the current data environment
Data interpretation	• Beyond data to meaning. • AI and IOT and how they use data. • Algorithms and meaning. Data semantic gap. • Accountability, social values and transparency

8.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 8 categories. These categories are detailed in Table 54. The majority of these were methods issues and so this category has been further broken down into specific methods challenges. The ranking of these by the confirmation survey are presented in Table 55. There is a mismatch in the rankings with Ethics and Inequality coming top of the confirmation survey list. These are though key cross cutting issues. The challenges identified point towards specific concerns in working across the social sciences, information studies and computer science disciplines. Especially as the tools and methods being used often originate in computer science and information studies and must be integrated or translated into social science. This was the only area where there was explicit comment on the need to provide higher education support to develop and train both students and researchers in new methods and deeper data literacy.

Table 54: Domains challenges - ranking by number of cases

Challenges	Percentage
Methods	**57.89%**
Analytics and measurement	7.89%
Combining old and new social research methods	7.89%
Concepts	*15.79%*

Social measures	5.26%
Understanding and developing new research methods	*21.05%*
Social theory and social questions	**7.89%**
Access to data	**5.26%**
Data literacy	**5.26%**
Education	**5.26%**
Ethics	**7.89%**
Inequality/Exclusion/Inclusion/Divides	**5.26%**
Interdisciplinarity	**5.26**%

Table 55: Domain challenges - ranking by importance

Challenge	Very important	Important	Neutral	Unimportant	Very unimportant
Ethics	66.7%	26.7%	6.7%	0.0%	0.0%
Data Inequality/Exclusion/Inclusion/Divides	53.3%	40.0%	6.7%	0.0%	0.0%
Interdisciplinary working (Computing and Social Science)	53.3%	26.7%	13.3%	6.7%	0.0%
Methods - Combining old and new social research methods	46.7%	26.7%	20.0%	6.7%	0.0%
Social theory and social questions	40.0%	53.3%	6.7%	0.0%	0.0%
Methods - Concepts	40.0%	33.3%	26.7%	0.0%	0.0%
Higher Education and training	40.0%	20.0%	40.0%	0.0%	0.0%
Access to data	20.0%	60.0%	20.0%	0.0%	0.0%
Methods - Analytics and measurement	20.0%	53.3%	26.7%	0.0%	0.0%
Methods - Social measures	20.0%	53.3%	20.0%	6.7%	0.0%
Data literacy	20.0%	46.7%	33.3%	0.0%	0.0%

8.2.3.1 Consultation workshop review

See section 8.2.2.1 for the domain challenges identified by the consultation workshop.

8.2.4 Conclusion

This domain clearly separated out a set of social science research questions and areas. With topics that mixed both research and methods issues. Challenges were predominantly around methods. The social research questions were:

- Citizen and community use of data
- Citizen interaction with data and algorithms
- Data literacy
- Power and accountability for data and algorithms
- Social construction of data and algorithms
- Social implications of data and automation

Social research topics and challenges were:

- Social impacts of data
- Privacy and surveillance
- Citizens/Everyday life experiences and uses of data
- Understanding Open data/Algorithm transparency/Accountability

- Data Exclusion/Inclusion/Divides
- Digital identity and data
- Data visualization/Representation/Social construction of data
- Economic impacts

Methods challenges:

- Interdisciplinarity
- Analytics and measurement
- Combining old and new social research methods
- Concepts
- Social measures
- Understanding and developing new research methods

8.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

8.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 13 most common topics identified by the UoS team in the Round 1 literature are listed in Table 56. These represent the topics covering 2% or more of the identified cases. Table 57 lists the sub-topics within these groups.

Table 56: UoL analysis topics – Ranked

Concepts	Percentage
datum	10.42%
news	6.72%
country	6.59%
business	6.20%
government	5.68%
medium	4.91%
consumer	4.74%
internet	4.08%
arrow	3.53%
community	3.21%
Citizen	3.01%
Privacy	2.64%
Impact	2.37%
Group	2.17%
Science	2.15%
development	2.03%

Table 57: UoL concepts and sub-concepts

Concept sets	Percent	Concept sets	Percent	Concept sets	Percent
arrow	**5.01%**	**datum**	**14.79%**	**medium**	**6.98%**
change	0.67%	default	1.30%	newspaper	1.93%
group	1.02%	ecosystem	2.84%	penetration	0.88%
internet	1.02%	embodiment	0.74%	routine	1.82%
level	1.23%	passport	0.39%	sentiment	0.88%
user	1.09%	preservation	2.59%	tablet	0.74%

business	**8.80%**	publisher	2.59%	texture	0.74%
competence	2.59%	repository	3.54%	**news**	**9.53%**
construct	0.77%	selfhood	0.81%	one-off	1.23%
manager	1.72%	**development**	**2.87%**	payment	1.26%
partnership	1.54%	ecosystem	1.16%	quarter	0.56%
professional	2.17%	programme	1.72%	rank	0.95%
citizen	**4.28%**	**government**	**8.06%**	revenue	0.91%
government	4.28%	organisation	1.93%	storey	1.19%
community	**4.56%**	sector	2.66%	tablet	1.12%
connexion	0.95%	shift	1.44%	television	1.33%
planning	1.96%	spot	2.03%	usage	0.98%
resident	1.65%	**group**	**3.08%**	**privacy**	**3.75%**
consumer	**6.73%**	male	0.95%	springer	0.60%
customization	1.51%	receptivity	1.16%	stakeholder	2.07%
delay	0.67%	reliability	0.98%	tag	1.09%
effect	3.05%	**impact**	**3.36%**	**science**	**3.05%**
enforcement	0.88%	sector	1.86%	sheila	1.33%
tag	0.63%	surveillance	1.51%	war	1.72%
country	**9.36%**	**internet**	**5.78%**		
fuel	0.39%	male	0.84%		
nation	1.26%	self-service	0.91%		
news	2.03%	shopping	2.07%		
organisation	0.91%	store	1.96%		
pollution	0.70%				
price	0.95%				
resource	3.12%				

8.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat. Wordstat identified 14 topics which are presented in Table 58. These map closely to the topics identified in the UoL analysis.

Table 58: Wordstat analysis of topics

Topic	KEYWORDS	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Social media	FACEBOOK; MEDIA; YOUTUB; CONTENT; SITE; PLATFORM; VIDEO; USER; SOCIAL; TWITTER; ONLIN; NETWORK	1.38	1.51	50989	561	98.42%
Science and methods	SCIENC; SCIENTI; SCIENTIST; KNOWLEDG; SOCIAL	1.64	1.14	27358	548	96.14%
Global and urban culture	GLOBAL; COSMOPOLITAN; CULTUR; URBAN; MEDIAT; LOCAL; MOBIL	8.84	1.11	13334	520	91.23%
Consumer services	CONSUM; MARKET; PRODUCT; CUSTOM; SERVIC	1.47	1.06	15804	520	91.23%
Big data	DATA; BIG; ALGORITHM	1.71	0.96	18512	510	89.47%
Ethics and impact	ASSESS; IMPACT; PRIVACI; PIA; ETHIC	1.45	0.97	14039	495	86.84%
Google	SEARCH; ENGIN; GOOGL; WEB	1.97	0.85	9168	493	86.49%
Health	HEALTH; MEDIC; PATIENT; MEDICIN; LUPTON; BODI	1.58	0.97	6913	410	71.93%
Law and hate speech	SUPRA; REV; SPEECH; AMEND; ID; HATE; LAW; COURT	1.81	1.09	7764	406	71.23%

Mobile	MOBIL; PHONE; DEVIC	1.40	0.83	4897	404	70.88%
Gender	WOMEN; MEN; GENDER; ADULT	1.53	0.87	4308	323	56.67%
Twitter and politics	TWEET; HASHTAG; ELECT; TWITTER; CAMPAIGN	2.31	0.91	4039	279	48.95%
Governance	PRIVAT; SECTOR; GOVERN; PUBLIC; CITIZEN; ENFORC EUROPEAN; COMMISS; EU; EUROP; HTTP; EGOVERN	2.68	1.01	890	138	24.21%
Cybercrime	WAR; CYBER; ATTACK; WARFAR; MILITARI; CYBERATTACK; MORAL; TERROR CKING; TRAF	2.20	1.15	749	113	19.82%

8.3.3 Overall topic analysis

Table 59 presents an analysis of the overlap between the concepts and topics analyses.

Table 59: Intersection of concepts and topic analyses

	Social media	Science and methods	Global and urban culture	Consumer services	Big data	Ethics and impact	Google	Health	Law and hate speech	Mobile	Gender	Twitter and politics	Governance	Cybercrime
datum														
news				■										
country													■	
business				■										
government													■	
medium	■													
consumer				■					■					■
internet				■							■			
arrow														
community	■													
Citizen			■										■	
Privacy						■								
Impact						■								■
Group	■										■			■
Science		■												
development		■												

Exploring that the underlying keywords in each analysis we would argue that the topics in the literature are split between 'data methods', 'data sources' and the social issues examined:

- Data methods
  - Science and methods
  - Big data
  - Google
- Data sources
  - Social media
  - Mobile

- Areas of focus
    - Global and urban culture
    - Consumer services
    - Health
    - Law and hate speech
    - Gender
    - Twitter and politics
    - Governance
    - Cybercrime
- Other topics
    - Ethics and impact

This is a very similar to the breakdown of research questions and challenges from the Delphi review.

8.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (70%) were inductive, either describing findings or building theory (Table 60). The papers were predominantly focused on reviews of prior work and secondary data (overall 73%) with only 27% undertaking primary data work (Table 61). Overall the literature is therefore far more reflective and commentary on the issues than that in the other six domains.

The main disciplines from which theory was used or for which theory was developed were:

- Sociology (62.5%)
- Psychology (17.5%)
- Communications and media (20%)

Only actual use for the purposes of design or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories applied from these disciplines thought there was no substantive clear preference the main specific theories were:

- Sociology (62.5)%
    - Sociomateriality (10%)
    - Structuration (Giddens) (5%)
    - Critical theory (5%)
- Communications and media (20%)
    - Uses and gratifications (55)

Where primary research was undertaken the main research methods were surveys (14%), interviews (14%), literature reviews (14%) and experiments (12%) (Table 62). The majority of the empirical work focused on case studies with a limited number of general population studies (Table 63), reflecting the review and commentary nature of the materials. Less than 2% of studies overtly stated that they were using a "big data" approach.

Table 60: Epistemological approach

Epistemology	Percentage
Deductive (Testing of existing theory)	29.63%
Inductive (Conclusions driven by data)	70.37%

Table 61: Empirical approach

Empirical approach	Percentage

Discursive/Descriptive-no new data or theory	37.20%
Primary empirical-data collected and analysed	27.44%
Secondary empirical-analysis of existing data	16.77%
Theoretical-synthesis of current or prior work	18.60%

Table 62: Research methods

Empirical approach	Percentage
Discourse (Textual - Linguistic-Discourse)	2.08%
Not applicable	53.13%
Qualitative (Textual - Non-Discourse)	26.04%
Statistical (Numerical)	18.75%

Table 63: Study population

Population	Percentage
Case study(ies)	40.44%
General population	22.79%
Specific group	36.76%

8.5 Reflections on the literature and the data

This was the most distinct data set with limited empirical studies in the literature. At the same time the topics and issues raised were far more clearly "born digital" in that they focused on what the consultation workshop termed the "datafication" of people and society. As noted above some of these questions are not new, having been asked of the impacts of ICT at home and work for much of the last 30 years. Yet, the intensity of the issues and the breadth and depth of the role of digital technologies adds considerable weight to making such questions mainstream in social research topics, methods and approaches.

This was the only area where an overt discussion of the "social construction" of digital technologies, data and algorithms clearly surfaced. The team saw this as a foundational question for all the domains as it cuts to the heart of questions of technological determinism that shadow research on society and technology. It was felt that such issues should underpin any research within the other six domains. This domain also clearly had the closest connection to debates on the uses and impacts of the digital tools in research – though it presented very few papers using these! We would argue that a key element of future research deploying digital tools should be robust reflection on their efficacy and also clear documentation of the practical steps required for their use.

8.6 Conclusions

Contemporary research in the Data and Representation domain studied here appears to have focused on:

- Data methods
  - Science and methods
  - Big data
  - Google
- Data sources
  - Social media
  - Mobile
- Areas of focus
  - Global and urban culture
  - Consumer services

    - Health
    - Law and hate speech
    - Gender
    - Twitter and politics
    - Governance
    - Cybercrime
- Other topics
    - Ethics and impact

Which closely matches the areas identified by the Delphi process:

- Social research questions:
    - Citizen and community use of data
    - Citizen interaction with data and algorithms
    - Data literacy
    - Power and accountability for data and algorithms
    - Social construction of data and algorithms
    - Social implications of data and automation
- Social research topics and challenges:
    - Social impacts of data
    - Privacy and surveillance
    - Citizens/Everyday life experiences and uses of data
    - Understanding Open data/Algorithm transparency/Accountability
    - Data Exclusion/Inclusion/Divides
    - Digital identity and data
    - Data visualization/Representation/Social construction of data
    - Economic impacts
- Methods challenges:
    - Interdisciplinarity
    - Analytics and measurement
    - Combining old and new social research methods
    - Concepts
    - Social measures
    - Understanding and developing new research methods

What is missing from this domain are substantive empirical studies of either the the research questions, or of the implementation of digital methods. We would argue that this domain therefore needs to develop a set of robust studies addressing the key research questions identified by the Delphi process.

9 Economy and sustainability

This part of the report provides an overview of the analyses of the Delphi process, literature and any relevant workshops for the Economy and Sustainability domain. The part first sets out the results of the Delphi Process (section 9.2) concluding with the key questions, topics and challenges identified by the process (section 9.2.4). The part (section 9.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 9.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 9.6. As a reminder, the initial ESRC scoping question for this area of work was:

- How do we construct the digital to be open to all, sustainable and secure?
- What impacts might the automation of the future workforce bring?

9.1 Initial comments

This domain proved the most difficult for which to collect data. Response rates to the Delphi process were poor and the data provided were more limited than in other domains. Having said this one of the major current concerns for this area is the impact of augmentation and automation. This topic was extensively addressed by a dedicated workshop jointly funded by the ESRC and DSTL. Details of the workshop outcomes can be found in the separate Automation Workshop report. We have reported the Delphi data in full but we would caution that this is not as large or robust a data set as that provided for the other six domains. As a result the data sets used for the consultation workshop were more limited and the workshop participants therefore provided additional commentary. Though very useful this makes the results here dependent on a smaller set of mainly UK expertise.

9.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 21. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 9.2.1)
- Key topics to address within these questions (section 9.2.2)
- Key challenges to researching these questions (section 9.2.3)

9.2.1 Scoping questions

The Delphi review responses indicated that the two ESRC scoping questions were deemed appropriate for the domain:

- How do we construct the digital to be open to all, sustainable and secure?
- What impacts might the automation of the future workforce bring?

Only a limited number of additional questions were provided and they were therefore not grouped or coded. These were:

- How is the digital economy constructed through economic, cultural and political processes, and how could it be constructed to enable greater participation and sustainability?
- How to guide and assist all participating actors in the digital economy to ensure it is open to all stakeholders, sustainable and secure?
- How can the digital and society be shaped in order to be sustainable, participatory and fostering co-operation and inclusion?

- What interventions are feasible and desirable in order to shape the digital according to any set of preferences. How should those preferences be established? How should those preferences be negotiated, taking into account the global nature of digital?
- Under which conditions and in what contexts is it desirable to construct a digital world that maximizes openness and in which contexts is it desirable to construct a relatively closed digital environment?
- What conditions and problems can hinder the establishment of a participatory co-operative, sustainable, inclusive information society and digital society?
- In a given context, which approaches to openness are sustainable from a variety of stakeholder points of view? What issues of security arise in each of these contexts which then limit the openness of the digital world?

The confirmatory survey asked respondents to select the most important of these and the results are presented in Table 64.

Table 64: Scoping questions ranking by Importance

Question	Percentage
How is the digital economy constructed through economic, cultural and political processes, and how could it be constructed to enable greater participation and sustainability?	23.8%
How can the digital and society be shaped in order to be sustainable, participatory and fostering co-operation and inclusion?	23.8%
What conditions and problems can hinder the establishment of a participatory co-operative, sustainable, inclusive information society and digital society?	19%
What interventions are feasible and desirable in order to shape the digital according to any set of preferences. How should those preferences be established? How should those preferences be negotiated, taking into account the global nature of digital?	14.3%
Under which conditions and in what contexts is it desirable to construct a digital world that maximizes openness and in which contexts is it desirable to construct a relatively closed digital environment?	9.5%
In a given context, which approaches to openness are sustainable from a variety of stakeholder points of view? What issues of security arise in each of these contexts which then limit the openness of the digital world?	9.5%
How to guide and assist all participating actors in the digital economy to ensure it is open to all stakeholders, sustainable and secure?	0%

9.2.1.1 Consultation workshop review

The consultation workshop noted potential gaps in the suggested scoping questions and offered the following reworking:

- How do specific digital technologies impact:
  - SMES, entrepreneurship, business opportunities and collaborations
  - Labour markets, work, productivity
  - Nature of employment, gig economy, self-employment, job insecurity, cyber crime
  - Taxation
  - Gig economy (Uber), Amazon, eBay, and online selling
  - Rural and informal economy
  - Regional or geographical implications (e.g. specialist regions)

9.2.2 Key research topics

The topics identified in the Delphi review were coded into 14 categories as detailed in Table 65. The ranked importance of these from the confirmatory survey are presented in Table 66 which closely matches the initial Delphi list.

Table 65: Key topics ranked by number of items

Topics	Percentage
Role and impact of major corporate platforms	31%
Disruptive technology	12%
Environment and sustainability	8%
Forms of digital labour	8%
Governance	8%
Digital divides	4%
Digital literacy	4%
Finance and capital	4%
Methods	4%
Politics	4%
Productivity	4%
Public vs private	4%
Surveillance	4%
Theory	4%

Table 66: Key topics Ranked by importance

Topic/Percentage	Very important	Important	Neutral	Unimportant	Very unimportant
Role and impact of major corporate platforms	85.7%	14.3%	0.0%	0.0%	0.0%
Forms of digital labour	71.4%	28.6%	0.0%	0.0%	0.0%
Environment and sustainability	71.4%	0.0%	28.6%	0.0%	0.0%
Disruptive technology	57.1%	14.3%	28.6%	0.0%	0.0%
Governance of digital economy	42.9%	42.9%	14.3%	0.0%	0.0%

9.2.2.1 Consultation workshop review

The consultation workshop offered up a number of additional topics, some of which overlap with those above:

- Impacts of digital labour on people's life experience
- Impacts on firms of digital platforms
- Technology adoption in organisations
- Role of digital monopolies and large corporations
- Digital impacts on the state: taxation, feedback to society
- Inequality and justice, social divides
- Financing, investment, crowd funding, lending
- Implications of the digital for energy/resource use (i.e. increased paper consumption)
- Enabling of sustainability through digital means through new platforms and apps
- Regional urban/rural development

9.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into six categories. These categories are detailed in Table 67 and ranked by the number of coded items, with those deemed to be domain specific by the consultation workshop marked

in bold. The ranking of these by the confirmation survey are presented in Table 68.. There is an inverse relationship here between these lists and given the low response rates we should not infer too much from this.

Table 67: Domains challenges - ranking by number of cases

Challenges	Percentage
New methods and tools to study digital economy	**47%**
Access to data on the digital economy	**13%**
Ethics	13%
Representativeness of data	13%
Sustainability and digital technologies	7%
Understanding impact and development of algorithms	7%

Table 68: Domain challenges - ranking by importance

	Very important	Important	Neutral	Unimportant	Very unimportant
Sustainability and digital technologies	57.1%	42.9%	0.0%	0.0%	0.0%
Understanding the impact and development of algorithms	42.9%	42.9%	14.3%	0.0%	0.0%
Access to data on the digital economy	42.9%	14.3%	42.9%	0.0%	0.0%
Ethics	28.6%	28.6%	42.9%	0.0%	0.0%
New methods and tools to study digital economy	14.3%	42.9%	28.6%	14.3%	0.0%
Representativeness of big data on digital economy and society	14.3%	42.9%	28.6%	14.3%	0.0%

9.2.3.1 Consultation workshop review

The consultation workshop offered up a set of father challenges some of which overlap with those above. A number of these are reflected in the cross-cutting challenges discusses in Part 12. The challenges are listed below with domain specific ones in bold:

- Social sciences needs to take place within a more technology oriented area.
- Funding landscape inevitably shaped by the status quo/current economic modes - making it harder for radically different modes to be researched?
- Concerns over the allure of 'novelty'? Whereas some 'older topics' may also be highly needed.
- **Measuring overall impact of a digital technology on a business very difficult.**
- Bias towards quantitative data?
- **Similarly measuring scale/scope of new ways of working and consuming.**
- **Fluctuating/differentiation of prices makes certain qualifications challenging (e.g CPI)**
- Challenges around interdisciplinary/cross-sector working
- Incorporating new forms of data, limited resources, extracting information

9.2.4 Conclusion

Given the more limited data making both broad and in-depth conclusion is harder than it is for the other domains. We would argue that the data here point to two clear areas for future work around "ways of being":

- Role and impact of major corporate digital platforms
    - Impacts on firms of digital platforms
    - Role of digital monopolies and large corporations
- Forms of digital labour
    - Impacts of digital labour on people's life experience
    - Gig economy (linked to platforms)

9.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches. Despite the lower number of Delphi responses the recommended literature was of a comparable size to the other domains.

9.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 10 most common topics identified by the UoS team in the Round 1 literature are listed in Table 69. These represent the topics covering 2% or more of the identified cases. Table 70 lists the sub-topics within these groups.

Table 69: UoL analysis topics – Ranked

Concepts	Percentage
information	13.38%
knowledge	10.27%
computer	9.20%
internet	6.59%
communication	5.99%
work	5.09%
datum	4.92%
medium	3.14%
chain	2.11%
organization	2.01%

Table 70: UoL topics and sub-topics

Concept/Sub-concept	Percent	Concept/Sub-concept	Percent	Concept/Sub-concept	Percent
chain	**3.36%**	**datum**	**7.84%**	**knowledge**	**16.38%**
datum	1.92%	industry	1.60%	likelihood	1.33%
system	1.44%	mortgage	1.23%	work	0.85%
communication	**9.55%**	observation	0.91%	seeker	4.22%
competence	3.36%	work	1.07%	task	2.72%
equipment	1.28%	standard	3.04%	technician	1.07%
sage	1.12%	**information**	**21.34%**	transfer	5.02%
spectrum	1.71%	literacy	2.77%	uncertainty	1.17%
stress	2.08%	mickey	0.91%	**medium**	5.02%
computer	**14.67%**	producer	2.61%	narcissism	0.69%
construct	0.80%	production	7.74%	newspaper	1.01%
course	2.13%	proposition	1.28%	outlet	0.69%
education	2.45%	sale	1.23%	platform	1.87%

female	0.96%	supply	1.97%	story	0.75%
measurement	1.01%	technician	0.85%	**organization**	3.20%
personality	1.23%	visibility	1.97%	production	2.24%
student	3.79%	**internet**	10.51%	property	0.96%
teacher	0.96%	literacy	2.35%	**work**	**8.11%**
trait	0.96%	servant	1.44%	technology	2.19%
van	0.37%	skill	5.76%	time	2.29%
		telecommunication	0.96%	work	3.63%

9.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat. Wordstat identified 13 topics which are presented in Table 71. These map closely to the topics identified in the UoL analysis.

Table 71: Wordstat analysis of topics

Topic	KEYWORDS	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Product and technology development	DEVELOP; PRODUCT; TECHNOLOGI; KNOWLEDG; DESIGN; COLLABOR; AR; PRACTIC; SOFTWAR; THI	1.63	1.7	69507	555	97.71%
Social capital	SUPPORT; MEMBER; GROUP; SOCIAL; MEDIAT; COMMUN	10.64	1.14	30941	546	96.13%
Facebook and internet use	FACEBOOK; USER; ONLIN; SITE; WEB; INTERNET; GOOGL; NETWORK	1.96	1.15	27056	537	94.54%
Democracy and public sphere	DEMOCRACI; SPHERE; POLIT; DEMOCRAT; CIVIC; CITIZEN; PUBLIC; MEDIA	2.36	1.16	17342	529	93.13%
Economic growth	MARKET; NATION; GROWTH; INDUSTRI; COMPETIT	2.81	1.4	15685	521	91.73%
Intellectual property	PROPERTI; INTELLECTU; LAW; GOVERN; PRIVAT	1.57	0.97	9190	507	89.26%
Digital education and skills	EDUC; SKILL; CHILDREN; ADULT; HOUSEHOLD; LITERACI; GENDER; INTERNET; SURVEI	1.91	1.15	7928	478	84.15%
Supply chains	SUPPLI; JURISDICT; SUPPLIER; INTANG; CUSTOM; TAXAT; CHAIN; VAT; BUSI	3.6	1.35	9442	454	79.93%
Smart energy	STRENGER; YOLAND; ENERGI; SMART; EVERYDAI; LIFE	3.27	1.4	6168	446	78.52%
Urban migration and mobile	MIGRANT; CHINA; URBAN; MOBIL; CHINES; PHONE; CITI; CLASS; ICT THRIFT; LEYSHON; FINANCI; GEOGRAPHI; SPACE	2.13	1.06	4169	401	70.60%

Marxist analysis	MARX; CAPIT; CAPITALIST; LABOUR; FUCH	1.75	1	6447	388	68.31%
Twitter	TWEET; HASHTAG; TWITTER	1.66	0.74	1478	109	19.19%
Taxation	TAX; OECD; BEP; TAXAT; DIGIT; ECONOMI; JURISDICT GST; VAT	1.55	0.95	692	47	8.27%

9.3.3 Overall topic analysis

In this case the two analyses do not strongly overlap except in the areas of digital skills and product development. This may reflect substantive differences in the round 1 and round 2 data sets, but as noted in Part 4, these are new and to an extent experimental methods. Further research work is needed to explore the different representations that alternate concept and topic modelling tools provide. We would also note that the idea of "sustainability" was predominantly interpreted as "technologies to support environmental sustainability" such as smart meters. Finally, it is clear that our round 2 respondents took a broader "political economy" definition into account and a considerable number of identified texts overlapped with the Citizenship and Politics, Communities and Identities, and Governance and Security literature. Looking that the underlying keywords in each analysis, the key topics within the literature are as follows with the most common ones in bold:

- Product and technology development
- Social capital
- Use of social media and internet platforms (Facebook, Twitter, Google)
- Democracy and public sphere
- Economic growth
- Intellectual property
- Digital education and skills
- Digital supply chains

9.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (59%) were inductive, either describing findings or building theory. The remainder were deductive undertaking theory testing or assessment (Table 72). Only 30% of the papers undertook primary data collection with 55% being discursive reviews of, or reflective on, existing research (Table 73).

The majority of papers (76%) did not utilise theory in the analysis of data. The main discipline from which theory was sociology (72% of all theory used). Only actual use for the purposes of design or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories applied from any disciplines and no clear preference. No one theory appeared more than three times. The main research method was literature reviews (36%) (Table 74). The majority of the empirical work focused on specific groups with a limited number of general population studies (Table 75). No papers were based om the use of big data.

Table 72: Epistemological approach

Epistemology	Column %
Deductive (Testing of existing theory)	41.3%
Inductive (Conclusions driven by data)	58.6%

Table 73: Empirical approach

Empirical Approach	Column %
Discursive/Descriptive-no new data or theory	28.9%
Primary empirical-data collected and analysed	30.4%
Secondary empirical-analysis of existing data	14.4%
Theoretical-synthesis of current or prior work	26.4%

Table 74: Research methods

Methods	Percent
Content Analysis	5.83%
Ethnography	6.13%
Experiment	1.23%
Focus Groups	3.99%
Interview(s)	9.20%
Literature Review (General or Narrative)	36.20%
None	8.28%
Other	6.75%
Social Network Analysis	0.31%
Survey	11.04%
Theory Building	11.04%

Table 75: Study population

Study population	Percent
Case study(ies)	1.5%
General population	8.0%
Specific group	34.8%
No study group	56.0%
Grand Total	44.3%

9.5 Reflections on the literature and the data

As noted above this domain may have the least reliable Delphi data set. Though the identified literature data set is of a similar scale to all the other domains (500+ articles). The literature appears to be predominantly reflective and review based as opposed to being based on empirical data collection. It also appears to be strongly sociological as reflected in the strong political economy aspects of the topic analysis. Selecting areas for future work is therefore more problematic here, especially as the issue of the automation of work has been addressed separately.

We would therefore like to introduce some themes from the stakeholder workshops (Digital Leader Salons) run during the project and before. In these SME and corporate and government stakeholders have predominantly raised issues with regard to:

- Product and technology development
- Use of social media and internet platforms (Facebook, Twitter, Google)
- Economic growth
- Intellectual property
- Digital education and skills

This would therefore look to reinforce the relevance of topics identified in the literature and the Delphi review. There may of course be some circularity here as stakeholders in the Digital sector are noted as keeping track of academic and more rigorous popular accounts of digital

innovation and challenges. Those attending the Salons are likely self-selecting as they have an interest in keeping up to date on research and policy developments.

9.6 Conclusions

Overall we would argue that further work may need to be done to explore the specifically Economic disciplinary issues that digital technologies engender. Within the context of this review we would argue, caveats around the representativeness of the data notwithstanding, that the workshops, Delphi results and stakeholder input have defined the following key areas for future research:

- Role and impact of major corporate digital platforms
    - Impacts on firms of digital platforms
    - Role of digital monopolies and large corporations
- Forms of digital labour
    - Impacts of digital labour on people's life experience
    - Gig economy (linked to platforms)

Key challenges that cross cut these are:

- New methods and tools to study digital economy
- Access to data on the digital economy

This leaves three areas for separate consideration:

- Automation and augmentation of work. This has been addressed by a separate report provided alongside this report. This work would clearly cross over with the ESRC Productivity theme and the Macro-economy theme.
- Specific economic issues such as: intellectual property; digital education and skills; digital supply chains; financing, investment, crowd funding, lending; regional urban/rural development. Further work may be needed to assess these issues. Again, this work would clearly cross over with the ESRC Productivity theme.
- Broader questions of environmental sustainability and digital technology use and the role of digital in supporting a sustainable economy. This work would most likely better fit under the EPSRC Digital Economy programme.

10 Governance and security

This part of the report provides an overview of the analyses of the literature, Delphi process and any relevant workshops for the Governance and Security domain. The part first sets out the results of the Delphi Process (section 10.2). The Delphi process did not provide a clear set of ideas by the close of the second round. In this case we have therefore held off concluding key on key topics and questions until after the literature analysis. The part (section 10.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 10.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 10.6. As a reminder, the initial ESRC scoping questions for this area of work were:

- What are the challenges of ethics, trust and consent in the digital age
- How we define responsibility and accountability in the digital age How our relationships are being shaped and sustained in and between various domains, including family and work

10.1 Initial comments

The naming of this domain as "Governance and Security" has broadened out responses to a wider range of topics than these initial scoping questions. Thus, these were questioned in the Delphi review. In the broader set of responses issues of family and work have been lost, and there is a greater emphasis on issues of privacy law and governance. Having said this the topics and concepts of family and work are extensively covered in the Communication and Relationships, Community and Identity and Economy and Sustainability domains. Trust, accountability and responsibility and their governance are covered by the Delphi and literature work below.

Within the area of governance, a key issue was brought up by team members and by stakeholders in Digital Leader salon events – namely the relative success of some but more often the well documented failure of government to successfully deploy digital technologies for governance. There is an extent literature, which is largely missing from this review, that empirically documents the failure over the last quarter century of successive governments, both here and abroad, to exploit the particular communicative and networking affordances of digital technology in the interests of more equitable, inclusive and cost-effective government. As will be discussed later, the absence from the Delphi review and the literature of detailed work on success and failure factors may indicate a key area for future work. We should also note that this domain had a low response rate for the Delphi process with a limited number of multiple responses to questions. But as was noted earlier much of this domain is very close to the Citizenship and Politics domain that was the most strongly responded to.

10.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 22. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 10.2.1)
- Key topics to address within these questions (section 10.2.2)
- Key challenges to researching these questions (section 10.2.3)

10.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the eight categories detailed in Table 76. Their ranked importance from the confirmatory survey is given in Table 77. It is important to note that ranked importance is almost the inverse of the number of questions allocated to the category. As will be discussed in section 12 there are a number of areas identified in the scoping question and challenges analysis that are cross cutting. A key one of these being ethics.

Table 76: Scoping questions

Question category	Example questions
Privacy and access to work of government and public bodies	• How do we manage privacy in the age of WikiLeaks? Can any email or digital communication be considered private or should all Government officials, including University Professors, assume their email is open for the public to read?
Fake news	• How do we separate fact from fiction? Once claim being made in the current US Electoral campaign is that WikiLeaks and other hackers are trying to influence the US election by not only revealing but also manipulating the information they leak. How does the public know that leaked information is accurate?
Accountability for digital systems and their impacts	• In addition to regulatory oversight, how do we encourage organisations, especially companies, to recognise and accept responsibility and accountability for their actions?
Transnational governance of digital economy	• How do we go about making rules in the digital economy? It may be worthwhile to explore how the TPP (let's call it TPP2) might be negotiated using processes for the digital economy.
Algorithms and the law	• What are the risks to modern norms and practices of law as more and more of our interactions and data are defined by algorithms we do not understand or have access to, as well as by monetization processes - as these and related phenomena undermine basic conceptions of transparency, agency, autonomy, respect for the human person, etc.?
Human factors in cyber security	• On security, it's been said that the weakest link in security is the human element. Yet, a lot of the work seems to be in the technical/technological area. What can be done to improve the human element in security? It would like some research here would pay dividends.
Ethics	• How will ethics - especially the virtue ethics question of what is the good life, the good life worth living, both individually and collectively - proceed as our technological future becomes ever less predictable as it simultaneously threatens all but unthinkable outcomes? (So Shannon Vallor in her 2016 book, _Technology and the Virtues_ (Oxford University Press).
Agency and autonomy in digital age	• What will happen to our sense of human identity, agency, and capacities for intimate relationships, ranging from friendship through long-term relationships and parenting as AIs and social robots become increasingly human-like, thereby calling into question core notions of agency and autonomy, affection and love, etc. (Cf. the Foundation for Responsible Robotics for a much more extensive list of questions.)

Table 77: Scoping questions ranking by Importance

Scoping question category	Percentage
Accountability for digital systems and their impacts	16.7
Algorithms and the law	16.7%
Human factors in cyber security	16.7%
Ethics	16.7%
Fake news	11.1%
Agency and autonomy in digital age	11.1%
Privacy and access to work of government and public bodies	5.6%
Transnational governance of digital economy	5.6%

10.2.1.1 Consultation workshop review

The consultation workshop identified a set of scoping areas that it was felt the Delphi process had missed:

- Include and understand government levels (international, national, regional, local)
- Role of key decision makers within government
- Cultural differences in governance
- Legalisation is behind users, uses and technology developments
- Public services: surveillance as normal
- Don't start with the technology – the lens should be policy
- How do you view digital technologies in very different socio-economic areas?

It should be noted that these issues are far more focused on aspects of governance than on the more personal issues of trust and accountability in the original scoping questions.

10.2.2 Key research topics

The topics identified in the Delphi review were coded into ten categories as detailed in Table 78. The ranked importance of these from the confirmatory survey are presented in Table 1Table 79. As with the scoping questions those topics that were most commonly cited in the Delphi workshop were not those deemed most important in the

Table 78: Key topics ranked by number of items

Topics	Percentage
Cyber security	37%
Governance of digital economy	11%
Government digitization	11%
Privacy	11%
Education	5%
Ethics	5%
Legal issues	5%
Methods	5%
Political communication	5%
Transnational governance	5%

Table 79: Key topics Ranked by importance

	Very important	Important	Neutral	Unimportant	Very unimportant
Privacy	83.3%	16.7%	0.0%	0.0%	0.0%
Cyber security	66.7%	33.3%	0.0%	0.0%	0.0%
Governance of digital economy	33.3%	50.0%	16.7%	0.0%	0.0%
Government digitization	16.7%	50.0%	33.3%	0.0%	0.0%

10.2.2.1 Consultation workshop review

The consultation workshop highlighted the following additional topics or modifications to topics:

- Access to data. Who owns it?
- Re-combining data needs to be included in privacy
- Competition legislation in governing the digital economy
- Governance of digital economy
- Advantages / disadvantages of moving to US type law – post Brexit
- Peoples attitude to digital technology governance and links with actual behaviour
- Cyber security broadened out to be more relevant to people and society – what exactly are the dangers?

10.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 8 categories. These categories are detailed in Table 80 and ranked by the number of coded items, with those deemed to be domain specific by the consultation workshop marked in bold. The ranking of these by the confirmation survey are presented in Table 81.

Table 80: Domains challenges - ranking by number of cases

Challenges	Percentage
Ethics	31%
Big data and analytics	23%
Cross-cultural engagement	8%
Cybersecurity	8%
Digital divide	8%
Disruptive change	8%
Governance	8%
Transnational governance	8%

Table 81: Domain challenges - ranking by importance

	Very important	Important	Neutral	Unimportant	Very unimportant
Big data and analytics - both methods and use by government	66.7%	16.7%	16.7%	0.0%	0.0%
Detecting cyber attacks	50.0%	33.3%	16.7%	0.0%	0.0%
Ethics for digital research	16.7%	66.7%	16.7%	0.0%	0.0%
Transnational governance of digital economy	16.7%	66.7%	0.0%	16.7%	0.0%
Understanding disruptive change	16.7%	50.0%	33.3%	0.0%	0.0%
Understanding digital divides	0.0%	66.7%	33.3%	0.0%	0.0%
Understanding cross-cultural engagement via digital technologies	0.0%	33.3%	66.7%	0.0%	0.0%

10.2.3.1 Consultation workshop review

The consultation workshop highlighted a set of challenges not covered in the Delphi returns:

- Governance based on values, culture, beliefs and evidence
- Future proofing governance for the digital age – too big a task?
- Big data

- Reconstituting labour contacts
- People centric NOT technology driven.
- How do people benefit - governance that gets best trade-off between human need and economic need?

10.2.4 Conclusions

Given the considerable breadth of ideas and responses in the Delphi responses and the consultation workshop responses we hold form concluding on key questions and topics at this stage. Combining this broad range of ideas with the material in the literature provides a clearer picture. Section 10.5 undertakes this reflection.

10.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

10.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 10 most common topics identified by the UoS team in the Round 1 literature are listed in Table 82. These represent the topics covering 2% or more of the identified cases. Table 83 lists the sub-topics within these groups.

Table 82: UoL analysis topics – Ranked

Concepts	Percent
child	11.10%
datum	7.34%
privacy	6.80%
law	4.98%
internet	4.65%
information	4.37%
parent	4.04%
governance	3.94%
protection	3.02%
innovation	2.88%
health	2.81%
government	2.22%
inspectorate	2.13%
code	2.03%

Table 83: UoL topics and sub-topics

Concept	Percent	Concept	Percent	Concept	Percent
child	**19.15%**	**health**	**4.85%**	**law**	**8.60%**
childhood	1.47%	item	1.47%	principle	1.92%
harm	3.10%	locus	1.14%	protection	2.89%
literacy	1.87%	score	1.10%	rule	2.81%
parent	5.42%	topic	1.14%	weber	0.98%
pornography	3.55%	**innovation**	**4.97%**	**parent**	**6.97%**
robot	3.75%	logic	1.10%	quality	1.92%
code	**3.50%**	meaning	1.87%	restriction	0.73%
regulation	2.16%	police	2.00%	school	3.63%
zip	1.34%	**inspectorate**	**3.67%**	visit	0.69%
datum	**12.67%**	parent	1.79%	**privacy**	**11.74%**

directive	2.57%	school	1.87%	protection	6.60%
inspectorate	1.02%	**internet**	**8.03%**	regulator	1.55%
protection	6.40%	legitimacy	1.83%	rev	0.61%
regulator	1.34%	para	0.65%	security	2.97%
request	1.34%	protocol	2.53%	**protection**	**5.22%**
governance	**6.81%**	religion	0.90%	regulation	1.55%
internet	5.75%	religiosity	1.06%	right	3.67%
security	1.06%	self-regulation	1.06%		
government	**3.83%**				
probability	0.98%				
regulation	1.67%				
th	1.18%				

10.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat. Wordstat identified 15 topics which are presented in Table 84. These map closely to the topics identified in the UoL analysis.

Table 84: Wordstat analysis of topics

Topics	Keywords	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Social movements and protest communication	SOCIAL; COMMUN; SOCIETI; POLIT; MEDIA; ORGAN; PROTEST; MOVEMENT; THEORI	1.8	1.39	40072	592	97.85%
Internet governance	GOVERN; SECTOR; PRIVAT; SERVIC; PUBLIC; POLICI; INTERNET; REGUL; BUSI	1.53	1.53	35868	578	95.54%
Measurement	VARIABL; WA; MEASUR; TEST; RATE; PARTICIP; AVERAG; EFFECT	3.31	1.29	23554	572	94.55%
Automation	HUMAN; AUTONOM; AGENT; ROBOT; COMPUT; SYSTEM	1.58	0.9	16711	565	93.39%
EU commission and privacy	EUROPEAN; PRIVACI; COMMISS; PROTECT; EU; DATA; IMPACT; ASSESS	1.72	0.95	22750	562	92.89%
Urban migration mobile	CHINA; MIGRANT; CHINES; URBAN; CITI; PHONE; MOBIL; CLASS; LABOR; ICT	2.95	1.21	9095	522	86.28%
Social media	FACEBOOK; SITE; TWITTER; USER; GOOGL	2.13	0.96	8508	504	83.31%
Law enforcement	LAW; LEGAL; COURT; ENFORC; REGUL; RULE; PROTECT; CRIMIN	9.67	1.08	15647	497	82.15%
Marxist analysis	CAPIT; CAPITALIST; MARX; LABOUR; ECONOMI; FUCH; PRODUCT	2.35	1.04	7147	493	81.49%
Education	TEACHER; LEARNER; STUDENT; CLASSROOM; LEARN; EDUC	1.83	0.89	6712	484	80.00%
Children's internet use	CHILDREN; PARENT; CHILD; LIVINGSTON; RISK	2.49	1.03	7451	436	72.07%
Voting	ELECT; VOTE; PARTI; DEMOCRAT	1.92	0.79	3525	383	63.31%
Employment	EMPLOY; EMPLOYE; WORKER	1.98	0.74	2481	262	43.31%

Deception	DECEPT; DECEIV; TRUTH; DETECT; BURGOON	1.68	0.91	2871	256	42.31%
Surveillance	VEILLANC; SUR	1.93	0.79	1218	90	14.88%

10.3.3 Overall topic analysis

There is a much stronger correlation between the concept and topic mapping for this domain (see Table 85). We would argue that there appear to be five major topics in this literature:

- State use of digital media – especially with regard to surveillance of social movements and protest
- Internet regulation and governance – both national and international
- Children's use of digital media – both protection and regulation
- Regulation and governance of automated systems
- Deception in digital media

Table 85: Comparison of topics and concepts

	Social movements and protest communication	Internet governance	Measurement	Automation	EU commission and privacy	Urban migration mobile	Social media	Law enforcement	Marxist analysis	Education	Children's internet use	Voting	Employment	Deception	Surveillance
Child											■				
Datum					■										
Privacy														■	■
Law								■							
Internet		■			■										
Information															
Parent											■				
Governance															
Protection					■										
Innovation								■							
Health			■												
Government												■			
Inspectorate										■	■				
Code		■													

10.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (60%) were inductive, either describing findings or building theory. Only 24% of the papers undertook primary data collection with 63% being discursive reviews of or reflective on existing research (Table 87).

The main disciplines from which theory was used or for which theory was developed were:

- Sociology (52%)
- Psychology (17%)
- Communication and media (12%)
- Politics (9%)
- Economics (5%)
- Philosophy (3%)

Only actual use for the purposes of deign or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories

applied from these discipline. Theories of the Information or Networked society prevailed in the sociology discipline (12% of total) and theories of identity within psychology (3%). For those items that undertook empirical research the main research methods were literature reviews (38%), surveys (26%), interviews (16%) (Table 88). The majority of the empirical work focused on specific groups with a limited number of general population studies (Table 90). None of the work used a "big data" approach.

Table 86: Epistemological approach

Epistemology	Percent
Deductive (Testing of existing theory)	40.45%
Inductive (Conclusions driven by data)	59.55%

Table 87: Empirical approach

Empirical approach	Percent
Theoretical-synthesis of current or prior work	33.46%
Discursive/Descriptive-no new data or theory	29.92%
Primary empirical-data collected and analysed	23.62%
Secondary empirical-analysis of existing data	12.99%

Table 88: Research methods

Methods	Count of Research methods
Literature Review (General or Narrative)	38.00%
Survey	26.67%
Interview(s)	16.00%
Content Analysis	6.67%
Focus Groups	4.00%
Ethnography	4.00%
Textual-Linguistic-Discourse Analysis	2.00%
Experiment	1.33%
Other	1.33%

Table 89: Analytic approach

Analytic approach	Percent
Qualitative (Textual - Non-Discourse)	60.39%
Statistical (Numerical)	38.96%
Discourse (Textual - Linguistic-Discourse)	0.65%

Table 90: Study population

Population	Percent
Case study(ies)	16.36%
General population	16.36%
Specific group	67.27%

10.5 Reflections on the literature and the data

In reviewing the materials, the team noted that of the theories that were explored, either empirically or discursively, it was those pertaining to the informational or network society that proved most popular followed by those that examined:

- Privacy
- Public/private sphere
- Political economy.

Surprisingly little attention appears to have been paid to exploring issues of trust between government and the governed, public participation in the government decision-making process or, indeed uses of technology to improve the governance of our communities.

We also noted that there is little account of how government, at either national or local level, has managed and responded to the ensuing social media and big data revolution. It is a surprising omission given the recent emphasis on the centrality of government, particularly local government, to implementing the smart city agenda. This may be a feature of the selected literature as much of the recent work on smart cities and digital government has been undertaken within the Information and Computer Science disciplines. That is papers reporting on building systems, with some social science input. Such work might fall more closely into the EPSRC Digital Economy programme or similar approaches.

The team also noted that there was limited discussion of how technology might be used to 'foster a civic well-being'. This would fit with arguments made in the Digital Leaders Salons with stakeholders where a 'public value' orientation for the administration of public services in place of the current New Public Management paradigm was put forward. It was argued that a public value governance approach to service delivery is more congruent with the information and communication affordances of digital technology, particularly those associated with the advent of the 'social web'. As such it may be more likely to usher in a smart governance process that can lever in the local democratic and economic opportunities long associated with digital media but which local government has hitherto failed to grasp. However, these emergent ideas do rest upon a number of assumptions, not least that there is a favourable local governance environment capable of sustaining this approach, that have received little empirical investigation.

10.6 Conclusions

As with the Economy and Sustainability domain the lower Delphi response rates limit some of the confidence we have in the results. Also it is clear that the Delphi responses that the identified literature present a broader brief than that in the initial ESRC scoping questions. There are two areas identified by the research that are important but which may already have substantive ongoing support:

- Cybersecurity
- Children's use of digital media

Both of these are clearly mature research areas with substantive empirical research behind them. We would argue that any support for these should target specific issues, potentially where they intersect with cross-cutting themes (see Part 12). For example, inequalities and divides in children's digital lives, or digital literacies and cyber security. We would argue that the following potentially overlapping areas need further work:

- Impact of social media on governance
- Success factors in digital governance at local, national and international level
- Privacy, citizenship, the state and surveillance in the digital age.
- Regulation and governance of automated systems

Especially as there appears from the literature review to be less empirical work in these areas. Having said that, these topics and the majority of questions and topics identified in the Delphi and workshop discussions crossover with the other domains. We would note that that they in particular cut across the Citizenship and Politics and Data and Representation domains. It is also the case that the challenges identified within this domain all fall within the cross-

cutting issues to be discussed in Part 12. We would therefore argue that these topics should be merged with other domains as appropriate, retaining the following two specific issues:

- Success factors in digital governance at local, national and international level
- Personal privacy in the digital age

11 Health and wellbeing

This part of the report provides an overview of the analyses of the Delphi process, literature and any relevant workshops for the Health and Wellbeing domain. The part first sets out the results of the Delphi Process (section 11.2). The part (section 11.3) then explores the results of the various digital humanities analyses of the literature and the review of methods and theory (section 11.4). These results are then compared to the results of the Delphi process. The recommendations for areas of future study are presented in section 11.6. As a reminder, the initial ESRC scoping question for this area of work was:

- Whether technology makes us healthier, better educated and more productive?

11.1 Initial comments

This domain generated the largest set of literature of all. This appears to reflect disciplinary differences. Much of the literature was within health studies and health research journals. There was a stronger tendency to report experimental and empirical findings and there were far fewer general reviews. The responses to the Delphi process focused on health and mainly health based wellbeing issues. The education element was poorly responded to. We have also bracketed off the productivity issue as this was extensively addressed in the Automation Workshop and accompanying report. Stakeholder based Digital Leaders Salons focused on:

- Health inequalities and access to digital technologies
- Privatisation of health delivery through digitisation

11.2 Delphi review

The full details of the Delphi review process outcomes can be found in Appendix, Part 23. The following sections details the results of the Delphi process for the Communication and Relationship domain covering:

- Suggested scoping or research questions (section 11.2.1)
- Key topics to address within these questions (section 11.2.2)
- Key challenges to researching these questions (section 11.2.3)

11.2.1 Scoping questions

The Delphi review identified a set of scoping questions for the domain these were coded into the five categories detailed in Table 91. T]Their ranked importance from the confirmatory survey is given in Table 92. It is important to note that ranked importance is almost the inverse of the number of questions allocated to the category.

Table 91: Scoping questions

Question category	Example questions
Design for positive health impacts of digital technology use	• What types and amounts of technology make us healthier, better educated and more secure? • How can we design technology assist in making us healthier, better educated and more secure? • How can we design technology to support us being healthier and thrive psychologically? • What are the best practices/processes in the design of technology that will make us healthier, better educated and more secure?

Health behaviour and using digital technologies	• How do people engage with technology to improve health and wellbeing? • You could extend well-being to personal and social well-being • What motivates people to be healthier, better educated and more secure, and how can these motivational drivers be incorporated into technology?
Health user needs	• What are the factors that lead to development of health information technology programs that meet the needs and capacities of different users? • How can research be used to guide the strategic development of health information technology programs that meet the needs of different users? • How can we engage different technology users in developing and implementing strategic health information systems that will meet their health information and support needs?
Negative health impacts of digital technology use	• What isn't asked here though is if technology is also hurting health. I.e. is it replacing going to the doctor, moving around (i.e. not just sitting in front of a computer all the time), too much sitting, lack of social ties, etc.? • Does the use of digital technology contribute positively to our health and well-being?

Table 92: Scoping questions ranking by Importance

Scoping question category	Percentage
Design for positive health impacts of digital technology use	30.8%
Health behaviour and using digital technologies	30.8%
Negative health impacts of digital technology use	20.5%
Health user needs	17.9%

11.2.1.1 Consultation workshop review

The consultation workshop found these scoping areas too broad and noted that the issue of "design" created a focus on devices and away from a more holistic view of societal health and wellbeing. The workshop suggested other scoping areas or questions:

- Understanding the role of digital technologies in health inequalities – do they help to alleviate, reproduce or deepen these inequalities?
- To link educational technology and health – to think about learning about wellbeing and the role of digital technology in this.
- Understanding and addressing the governance of digital health technologies.
- Need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g. fit bits).
- Broader socio-economic and technical challenges of 'joining up' health providers and services through digital technologies.
- Questions of health and wellbeing in the digital workplace.

11.2.2 Key research topics

The topics identified in the Delphi review were coded into 11 categories as detailed in Table 93. The ranked importance of these from the confirmatory survey are presented in Table 94. As with the scoping questions those topics that were most commonly cited in the Delphi workshop were not those deemed most important in the

Table 93: Key topics ranked by number of items

Topics	Percentage
Device, environment and service design	31%

Benefits and harm from digital technology use	15%
Health communication	15%
Education	10%
Device and service design	5%
Digital literacy	5%
Other	5%
Preventative and long term condition support	5%
Digital divide	3%
Organizational change	3%
Privacy	3%

Table 94: Key topics Ranked by importance

Topics	Very important	Important	Neutral	Unimportant	Very unimportant
Benefits and harm from digital technology use	76.9%	23.1%	0.0%	0.0%	0.0%
Health communication	46.2%	46.2%	7.7%	0.0%	0.0%
Privacy	46.2%	38.5%	7.7%	7.7%	0.0%
Device, environment and service design	38.5%	53.8%	7.7%	0.0%	0.0%
Preventative and long term condition support	38.5%	46.2%	15.4%	0.0%	0.0%
Digital divide	38.5%	30.8%	15.4%	15.4%	0.0%
Digital literacy	30.8%	38.5%	23.1%	7.7%	0.0%
Organizational change	7.7%	76.9%	15.4%	0.0%	0.0%

11.2.2.1 Consultation workshop review

The consultation workshop identified a set of additional potential topics within the health care domain:

- What are "healthy" environments or "lifeworlds" and what role digital technologies in these?
- How do or can digital technologies help people to generate their own definition of a healthy "lifeworld"?
- Understanding the impact of major digital platforms on behaviour, perception of health and wellbeing and routes to health information.

11.2.3 Domain specific challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into 8 categories. These categories are detailed in Table 95 and ranked by the number of coded items, with those deemed to be domain specific by the consultation workshop marked in bold. The ranking of these by the confirmation survey are presented in Table 96.

Table 95: Domains challenges - ranking by number of cases

Challenges	Percentage
Methods	46%
Co-design	21%
Collecting and accessing data	14%
Rapid change	7%
Big data	4%
Education	4%
Interdisciplinarity	4%

Table 96: Domain challenges - ranking by importance

Challenges	Very important	Important	Neutral	Unimportant	Very unimportant
Methods to analyse digital health	61.5%	30.8%	7.7%	0.0%	0.0%
Rapid change in digital and health technology	38.5%	61.5%	0.0%	0.0%	0.0%
Big data for health	38.5%	46.2%	15.4%	0.0%	0.0%
Interdisciplinary	38.5%	46.2%	15.4%	0.0%	0.0%
Collecting and accessing data on digital health	30.8%	61.5%	7.7%	0.0%	0.0%
Processes of co-design	30.8%	46.2%	15.4%	7.7%	0.0%

11.2.3.1 Consultation workshop review

The consultation workshop agreed with the challenges identified by the Delphi process in particular focusing on:

- "Big" health data
- Personal and commercial uses of health data
- Linking personal and clinical health data with wellbeing outcomes
- Governance in digital health care
- Digital technologies role in the rich pathways of health and social care

11.2.4 Conclusions

Given the considerable breadth of ideas and responses in the Delphi responses and the consultation workshop responses we hold form concluding on key questions and topics at this stage. Combining this broad range of ideas with the material in the literature provides a clearer picture. Section 10.5 undertakes this reflection.

11.3 Literature analysis

The literature analysis is designed to identify two sets of data. First, key topics within the existing literature. This will allow the comparison with areas of importance identified by the Delphi review. Second, a content analysis of the literature to explore the predominance of specific, theory, methods and approaches.

11.3.1 Method 1: Concept mapping analysis UoS Digital Humanities

The 11 most common topics identified by the UoS team in the Round 1 literature are listed in Table 97. These represent the topics covering 2% or more of the identified cases. Table 98 lists the sub-topics within these groups.

Table 97: UoL analysis topics – Ranked

Concept	Percent
disease	7.31%
body	4.59%
care	4.03%
health	3.80%
behaviour	3.68%
loss	3.33%
activity	3.21%
network	2.58%
communication	2.41%
child	2.23%

intervention	2.13%

Table 98: UoL topics and sub-topics

Row Labels	Count of Part-ii	Row Labels	Count of Part-ii	Row Labels	Count of Part-ii
disease	**18.60%**	**health**	**9.66%**	**communication**	**6.14%**
outbreak	6.26%	promotion	9.66%	conflict	1.91%
prevention	4.59%	**loss**	**8.47%**	mail	0.95%
sufferer	1.07%	weight	8.47%	stress	3.28%
surveillance	6.68%	**activity**	**8.17%**	**behaviour**	**9.36%**
body	**11.69%**	conduct	2.09%	counselling	3.10%
device	2.44%	isolation	1.25%	recycling	2.03%
embodiment	2.15%	leisure	1.13%	smoking	3.58%
mass	3.22%	pedometer	1.31%	taxonomy	0.66%
mother	0.95%	sport	2.39%	**child**	**5.66%**
object	1.91%	**network**	**6.56%**	donation	1.13%
self	1.01%	outbreak	1.43%	mother	4.53%
care	**10.26%**	rice	0.89%	**intervention**	**5.43%**
caregiver	3.22%	stress	2.92%	mo	1.91%
clinic	2.74%	vaccination	1.31%	vegetable	3.52%
follow-up	4.29%				

11.3.2 Method 3: Wordstat

All the literature collected from both rounds was analysed using Wordstat. Wordstat identified 18 topics which are presented in Table 99. These map closely to the topics identified in the UoL analysis.

Table 99: Wordstat analysis of topics

Topic	Keywords	EIGENVALUE	% VAR	FREQ	CASES	% CASES
Healthcare	CARE; HEALTH; PATIENT; MEDIC; INFORM; PRACTIC; PROFESSION	2.97	1.28	54753	775	95.56%
Activity	ACTIV; TECHNIQU; AR	1.45	1.14	22405	764	94.20%
Measures	ITEM; SCALE; MEASUR; SCORE; WA; QUESTIONNAIR; ASSESS	2.35	0.9	25758	759	93.59%
Educational technology	LEARN; STUDENT; TEACHER; LEARNER; EDUC; COLLABOR; TECHNOLOGI	9.38	0.96	21504	752	92.73%
Social media	FACEBOOK; MEDIA; TWITTER; SOCIAL; SITE; BLOG; POST; SHARE; CONTENT	1.54	1.03	23283	746	91.99%
Social support network analysis	WEAK; TIE; TI; NETWORK; SUPPORT	2.26	0.96	13485	739	91.12%
Mobile devices	MOBIL; DEVIC; PHONE; APP; DIGIT; MONITOR; TRACK	2.11	0.89	11251	680	83.85%
Controlled trial	TRIAL; INTERVENT; RANDOM; CONTROL	1.42	0.93	17838	677	83.48%
Ethnicity and gender	ETHNIC; GENDER; AG; STATU; BLACK	1.88	1	7575	640	78.91%
Product quality	HEDON; BEAUTI; USABL; PRODUCT; QUALITI	1.61	0.7	5776	634	78.18%
Family	MOTHER; INFANT; PARENT; CHILDREN; BODI	1.66	0.71	3764	537	66.21%

Disease outbreak surveillance	OUTBREAK; SURVEIL; DISEAS; INFECT; INFLUENZA; VACCIN; UENZA	1.86	0.76	6349	469	57.83%
Chronic diseases	CHRONIC; PAIN; DISEAS; ILL	1.48	0.81	3190	452	55.73%
Weight loss	WEIGHT; LOSS; OBES	2	0.89	4616	419	51.66%
Efficacy	EF; CACI; FECT	1.68	0.73	2798	304	37.48%
Hypertension	PRESSUR; BLOOD	1.52	0.68	1537	269	33.17%
Stopping smoking	SMOKE; CESSAT; SMOKER	1.71	0.71	2363	183	22.56%
Palliative care	PALLI; TELECONSULT	1.46	0.6	510	25	3.08%

11.3.3 Overall topic analysis

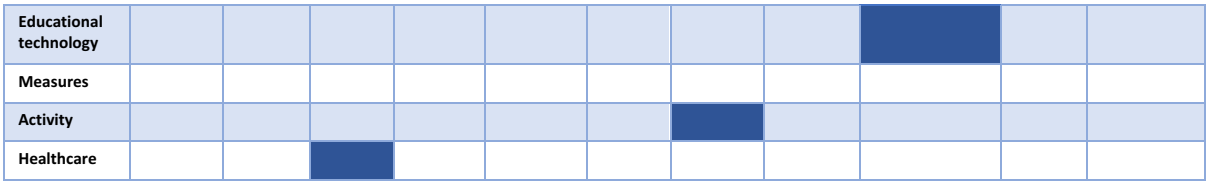
There is a good overlap between the two analyses (see Table 100). We would argue that the analyses point to literature that is focused on the use of digital technologies and social media in three main areas:

- Monitoring and supporting individuals in changing health behaviours (such as weight loss or stopping smoking)
- Using digital technologies to monitor and support patients with chronic illness (e.g. hypotension)
- Using digital technologies to support health communication or as part of health support communities

Separate from this the literature is focused on the measurement and evaluation of the efficacy of such interventions. This evaluation fits with the content analysis on methods and theory below. A section of the literature included work on educational technology with some crossover to technologies to support health education.

Table 100: Topic and concept comparison

	disease	body	care	health	behaviour	loss	activity	network	communication	child	intervention
Palliative care	■		■								
Stopping smoking				■	■						
Hypertension				■							
Efficacy											
Weight loss		■				■					
Chronic diseases	■										
Disease outbreak surveillance								■			
Family										■	
Product quality		■									
Ethnicity and gender											
Controlled trial											
Mobile devices		■									■
Social support network analysis								■			
Social media									■		



11.4 Theory, method and approach

This analysis builds on Borah (2015). Most the analysed papers (52%) were deductive, applying existing theory. The majority of papers undertook primary data collection (48%) 24% of the papers undertook primary data collection with the remainder predominantly using secondary data (Table 32).

The main disciplines from which theory was used or for which theory was developed were:

- Sociology (19%)
- Psychology (50%)
- Health studies (8%)
- Communication and media (8%)
- Information studies (5%)

Only actual use for the purposes of deign or analysis were coded. General reference to prior work and theory were not coded. There was considerable variety in the specific theories applied from these disciplines. Theories of Behaviour Change, Social Cognition and Planned Behaviour (8% each of total) where the main theories in Psychology and social network analysis (2% of total) in Sociology. For those items that undertook empirical research the main research methods were predominantly quantitative: experiments (19%), surveys (11%), social network analysis (3%) and meta-analysis (4%) (Table 103). The majority of the empirical work focused on specific groups with a larger proportion of general population studies than in the other domains (Table 105). Less than 2% of the work described itself as using a "big data" approach.

Table 101: Epistemological approach

Epistemology	Percent
Deductive (Testing of existing theory)	51.5%
Inductive (Conclusions driven by data)	48.5%

Table 102: Empirical approach

Empirical approach	Percent
Primary empirical-data collected and analysed	47.96%
Secondary empirical-analysis of existing data	43.41%
Discursive/Descriptive-no new data or theory	8.17%
Theoretical-synthesis of current or prior work	0.47%

Table 103: Research methods

Method	Percent
Literature Review (General or Narrative)	28.56%
Other	22.02%
Experiment	18.76%
Survey	10.75%
Interview(s)	6.64%
Content Analysis	4.53%
Meta-analysis or Systematic review	3.27%
Social Network Analysis	2.63%

Focus Groups	2.00%
Textual-Linguistic-Discourse Analysis	0.42%
Ethnography	0.42%

Table 104: Analytic approach

Approach	Percent
Qualitative (Textual - Non-Discourse)	48.39%
Statistical (Numerical)	42.57%
Not applicable	8.32%
Discourse (Textual - Linguistic-Discourse)	0.71%

Table 105: Study population

Population	Percent
Specific group	53.80%
General population	31.54%
Not applicable	12.80%
Case study(ies)	1.86%

11.5 Reflections on the literature and the data

As noted in the initial comments on this Part the issue of education has been put to one side. This domain is notably different that the others in two clear respects. First, the number of published papers by identified authors was much higher, and second, the majority of these reported quantitative empirical studies. Much of the work was broadly psychological and focused on the role of digital technologies in supporting or driving health behaviour changes. This is reflected in the main theories identified in the literature. Unlike the other domains there is a limited amount of reflection on the broader social or health impacts of digital media. Having said this, much like the Communication and Relationships and the Communities and Identities domains much of the work appears to be focused on specific technologies. In this case the use of bespoke or platform technologies to impact health behaviour. There are few if any examples of cross-platform or holistic assessments examining broad everyday digital technology use on the health and wellbeing.

The team noted that there were also clear cross-overs with the Communication and Relationships and the Communities and Identities domains. Much of the work involved aspects of health communication supported by digital technologies, or at least interaction with digital technologies that afforded aspects of patient-carer-doctor-service interactions. There were also a good number of cases focused on the role of online health support communities. Health and Wellbeing may therefore be a context for applied communications and community research.

11.6 Conclusions

It is clear that the majority of the literature is focused on the evaluation of digital health technologies. There appears to be a limited literature on the broader question of the impacts of digital lifestyles on health and wellbeing. There appears to be limited work on the negative impacts of the digital technologies. Given the ESRC focus here we suggest that work on the following areas may fall out of scope:

- Device, environment and service design.
- Preventative and long term condition support.
- Design for positive health impacts of digital technology use.
- Negative health impacts of digital technology use.

- Health user needs.
- Technical challenges of 'joining up' health providers and services through digital technologies.

These topics area likely to overlap with MRC, AHRC and EPSRC concerns over the design and evaluation of health care devices. Such work would necessarily involve social science research but may likely be medical or medical engineering led.

The broader social questions identified in the Delphi work and consultation workshops that appear to go beyond the literature appear to be:

- Understanding and addressing the governance of digital health technologies.
- Need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g. fit bits).
- Questions of health and wellbeing in the digital workplace.
- Digital technologies and health communication and health behaviour change.
- Broader socio-economic challenges and issues in 'joining up' health providers and services through digital technologies.

12 Cross-cutting topics and challenges

As has been noted throughout the discussion in Parts 5 to 12 above, we have identified a number of questions, topics and challenges that cross-cut the seven domains. Table 106 details the most common topics and Table 107 the most common challenges we have identified. To create these lists the topics and challenges were recoded into a standard format for all domains. Those topics that cross more than three domains are in bold. The highest ranked cross-cutting challenges are common to all the domains.

Table 106: Cross-cutting topics

Topics	Percent
Digital divide	**8.04%**
Privacy	**6.75%**
Data access and literacy	**6.11%**
Citizenship	**4.50%**
Device, environment and service design	4.50%
Participation	**3.22%**
Methods	**3.22%**
Governance	**2.89%**
Education	2.57%
Role and impact of major corporate platforms	**2.57%**
Mobilisation	2.57%
Talk	2.25%
Cyber security	2.25%

Table 107: Cross-cutting challenges

Row Labels	Percent
Methods	**38.02%**
Theory	**11.98%**
Ethics	**9.50%**
Big data	**8.68%**
Co-design	4.96%
Multi platform studies	**3.31%**
Holistic understanding	**2.89%**
Digital divide	**2.48%**
Education	**2.07%**
Data access	**2.07%**
Interdisciplinarity	**2.07%**

12.1 Implications of cross-cutting topics and challenges

We would argue that the cross-cutting topics can be dealt with in two ways. Etiher as domains to be addressed in themselves or as key features or requirements for projects within the seven domains. Two topics which we feel warrant separate consideration are:

- Digital divides and digital inequalities – including the two-way interaction between digital inequities and other areas of social inequity
- Data and digital literacy

Methods issues are addressed below. The remaining cross cutting topics are:

- Governance, regulation and legislation
- Role and impact of major corporate platforms

There may be an argument for including these as key aspects in relation to any specific project.

With regard to cross-cutting challenges we would argue that all projects supported by the programme should seek to examine or address each of the following:

- **Methods innovation.** This should include reflection on and evaluation of: digital tools, analytic approaches and the digital representation of results. This could and should include risk taking with the efficacy of new tools and methods as they are tried out and tested.
- **Theory testing and evaluation, with theory development were needed.** In all the domains, we have found a great variety of theory, but also theory used as a general backdrop without operationalisation or evaluation. For example, many of the sociology based items reference "Network Society" theory without operationalising this in any clear manner. In contrast, much of the psychology work directly applies theory but there is an extensive variety. We would caution about the need to develop new theory for its own sake. As was noted in the consultation workshop – just because digital technologies are new they ***may*** not need new social science to understand their impacts. This makes theory testing, new and old, essential.
- **Ethics.** Ethics, especially around the use of publicly visible social media data remain a challenge for researchers, though clearer guidance is being provided by professional organisations (e.g. BPS, AOIR). There are also considerable ethical questions around what government, businesses and organisations do with citizens data. We would argue that projects will need to have an element or work package that assesses the ethical challenges faced to help build a knowledge base of best practice and key concerns.
- **Big data.** All the research councils are currently supporting initiatives that address big data (however that is understood in their disciplines). We do not suggest focusing specifically on this issue. Separate from methods innovation we would argue that projects which seek to use "big data" should include a robust element of reflection and evaluation on the usefulness, limitations, tools used to analyse and representativeness of the big data sets examined.
- **Multi platform/Holistic studies.** The analyses of the literature clearly point out a trend in which research is undertaken relative to new technologies and platforms, or is focused on one technology or platform. Such work is necessary to understand the specifics of technologies or socio-technical contexts. Though there may be a trend to follow accessible data sources. But the Delphi and workshop results highlight a contemporary need to "reverse the telescope" and focus on the breadth and depth of citizens' digital worlds, as they navigate among multiple technologies and platforms. This puts social science questions to the fore within which a mix of digital technologies may play a part.

13 Missing areas

During the project it became clear that two substantive areas were missing from the scope of the project:

- Impact and policy implications
- Digital culture

The project therefore undertook two additional workshops in collaboration with:

- Media, Communication and Cultural Studies Association: Policy Network
- Department of Culture Media and Sport Digital Culture Team (of which the PI is a member)

13.1 Policy

The policy workshop brought together scholars form across the disciplines covered by this review as well as from Ofcom, the ICT sector, DCMS and DWP. The workshop identified the following areas where digital facing research may inform policy:

- Digital policies
    - Digital Inclusion and exclusion
    - CDI sector policy/regulation
    - Digital and social policy
    - Arts and culture policy
- Digital tools in policy making
    - Tools that support policy making
    - Methods of policy making – rise of 'agile' policy making
- Digital in policy delivery
    - Digital communication
    - Big data and evaluation

A full report on the workshop is currently under development. Elements of the discussions clearly fall under the governance issues identified in the review. We would also argue that further work may need to be undertaken by funded projects within the programme to identify how the projects or routes to impact might address these three areas.

13.2 Culture

In the week before the writing of this report the joint workshop with DCMS examined four areas:

- Access and participation - including digital and cultural participation
- Digitisation of cultural content
- Culture and technology innovation
- Skills, IP and business models

The materials form the workshop are still being assessed and written up. We can draw some conclusions from the discussions. First, these topics clearly overlap with AHRC priorities but there may be dangers in issues falling between research councils. Second, cultural inclusion, like social inclusion is becoming bound up with aspects of digital inclusion. Digital and cultural capital are becoming intertwined – if they are not in fact the same thing? Third, digital skills for culture, especially around cultural production, may be a route to digital, educational and economic inclusion. Digital literacies may therefore be better developed through cultural engagements with digital technologies.

14 Conclusions and recommendations

In this final part we put forward out recommendations for the cores areas to be addressed by the Ways of Being in a Digital Age theme. In proposing these areas we have tried to take into account the following assumptions:

- This is to be an ESRC programme. The work should therefore have a strongly social science focus, even where it is inter and cross-disciplinary.
- The topics should avoid areas that are already well researched or have been supported by recent or current research council programmes. We have therefore sought to avoid areas served by programmes such as:
    - EPSRC Digital Economy
    - AHRC Connected Communities and Digital Transformations
    - AHRC/MRC medical device design and evaluation
- The title of the programme is "ways of being" and we have taken this as an indication that areas need to look more holistically at the social, economic, political, cultural and community impacts and roles of digital technologies.

14.1 Mergers and acquisitions

First we would argue that the 'domains' used in this review should be reduced from seven. We would propose two substantive board areas combing:

- Communication and Relationships with Communities and Identities
- Citizenship and Politics with Governance and Security

We would then suggest four smaller focused areas that could stand alone or cross cut the two main areas:

- Economy with a focus on the impact of major platforms
- Data and digital literacies
- Health and wellbeing focused on workplace, every day and governance issues
- Digital divides and digital inequalities, including the two-way interaction between digital inequities and other areas of social inequity

We would expect any project to address one or more of the cross-cutting challenges identified in Part 12. We would strongly emphasise the need for projects that address:

- Multi platform/Holistic studies

The review of the literature to date indicates that much good work has already been done exploring specific technologies – Twitter, Facebook, Google, Uber, Mobiles, Smart phones, Bloggs, specific government systems, etc. The Delphi responses have strongly argued for the need to look at digital technology use in the round. To ask broad social science questions and then explore which technologies are relevant to citizens actual practice and in what ways. To develop a more holistic picture of the integration of digital into their lives (or not in the case of digital inequalities). This does not preclude single technology studies where this has relevance, but such decisions should have a strong social science basis – not simply one of the utility of available data. For example, there appear to be class differences in the uses of different social media platforms. If this is a case could be made that a project focused on a specific community may explore one technology use more than others. The one area where this may be more acceptable would be the case of the economic domain as the study of the impact of a platform on a sector might be limited to one technology (e.g. Uber).

Overall projects should address:

- Methods innovation
    - Including risk taking on digital tools – with a strong methoids evaluation component
- Theory testing and evaluation, with theory development were needed
    - We are agnostic on the need to inherently develop new theory to understand the everyday uses and impacts of digital technologies. The literature content analysis has found little evidence of consistent dominant theory in the area. There may be a need for greater clarity on 'most relevant' theory and on incremental theory development as opposed to a need for 'digital specific' theory development.
- Ethics
    - This needs to cover both ethics with regard to methods, but also wider social ethics around social, commercial and government use of data, systems automation and human augmentation.

The one area where we would not argue for substantive additional investment is in "big data". Not only could we not find consensus on what is "big" in "big data" – nearly all the research councils have substantial investments in big data initiatives. There are substantive ESRC investments in big data and methods (e.g. Consumer Data Research Centre, various PGR training programmes) as well as substantive STFC investment in the necessary computing facilities. We would argue that the programme should be positively open to projects that have a "big data" component but the focus should be on the use of such methods for social science - with a robust element of reflection and evaluation on the usefulness, limitations, tools used to analyse and representativeness of the big data sets examined.

14.2 Proposed ways of being in a digital age domains and topics

We propose the following 6 areas for the ways of being programme. For each we hav=e identified research topics from the Delphi and literature work.

14.3 Ways of being in a digital age – Communication, community and identity

We propose the following potential topics:

- The norms and values of digital communication and relationships
- The 'affordances' different platforms provide for digital communication and relationships
- The quality of relationships and communication supported by digital media and technologies
- The management of relationships via digital media and technologies
- Social and community aspects of everyday digital technology use
- Digital Community Exclusion/Inclusion
- Digital community participation, action and social change
- Power in online communities
- Understanding global diaspora as digital communities
- Understanding function of aspects of identity online (Gender/Race/Ethnicity/Sexuality)

14.4 Ways of being in a digital age – Citizens politics and governance

We propose the following potential topics:

- Digital technologies, radicalisation, mobilisation and political action

- Digital technologies and the disruption of current political institutions
- Digital technologies and new forms of citizenship
- Digital technologies, political communication, debate and media
- Digital technologies and state control – especially in non-democratic regimes
- Impact of social media on governance
- Success factors in digital governance at local, national and international level
- Privacy, citizenship, the state and surveillance in the digital age.
- Regulation and governance of automated systems

14.5 Ways of being in a digital age – Understanding the platform economy

We propose the following potential topics:

- Role and impact of major corporate digital platforms
    - Impacts on firms of digital platforms
    - Role of digital monopolies and large corporations
- Forms of digital labour
    - Impacts of digital labour on people's life experience
    - Gig economy (linked to platforms)

14.6 Ways of being in a digital age - Data and digital literacies for engaged and included citizens

We propose the following potential topics:

- Citizen and community use of data
- Citizen interaction with data and algorithms
- Data literacy in everyday life
- Power and accountability for data and algorithms
- Social construction of data and algorithms
- Citizens/Everyday life experiences and uses of data
- Understanding Open data/Algorithm transparency/Accountability
- Digital identity and data
- Data Exclusion/Inclusion/Divides

14.7 Ways of being in a digital age – Everyday digital health and wellbeing

We propose the following potential topics:

- Understanding and addressing the governance of digital health technologies.
- Need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g. fit bits).
- Questions of health and wellbeing in the digital workplace.
- Digital technologies and health communication and health behaviour change.

14.8 Ways of being in a digital age – Digital inequalities

We propose the following potential topics:

- Digital Community Exclusion/Inclusion
- The two-way interaction between digital inequities and other areas of social inequity
- Data Exclusion/Inclusion/Divides
- Digital cultural capital and cultural exclusion/inclusion
- Digital governance, policy and inclusion

- Digital health inequalities

14.9 Funding models

The consultation workshop informally reflected on the potential finding models for the programme. Though no overall consensus was obtained the following elements were suggested:

- Strong support for ECRS – opportunity for those "born digital" to lead digital research projects
- Need for several large projects in the substantive areas identified by the review
- Need for smaller projects (maybe for ECRS) to explore specific facets of the topics
- Need for a co-ordinating network to link the projects and build on the networks created by the review

Two options that were not strongly supported were:

- Single national centre/project
- Sandpits

Appendices

15 Project team

The project team represents 16 universities from across the UK, EU, USA and Singapore and will be led by the University of Liverpool. The core team co investigators from eight UK universities will provide expertise across a range of social science, arts, engineering and science backgrounds (see Table 108). Co-investigators provided operational support to the work of the PDRAs and participate in project board meetings. The team also includes a broader international steering group (see Table 108). The key technical partner for this project was be the Digital Humanities Institute (DHI) at the University of Sheffield. The DHI is a leading centre for Digital Humanities research and practice, that supports international cross-disciplinary collaborations across arts and humanities. In this project the DHI, led by Pidd, provided the technical and analytical skills to undertake the concept modelling work needed to explore the full range of work covered by the review. The project team and steering group included three generations of international research experience in the area of digital media and society, including some of the first social research on the internet (Dutton), online interactions (Baron/Yates), mobile devices (Ling) and e-government systems (Weerakkody), as well as contemporary work on issues of identity, inequality, data analytics, security, and digital culture. The steering group includes public sector input from Ofcom and private sector input from Cisco, currently the largest global digital networking company. The project included ECRs as Co-Is and PDRAs.

Table 108: Steering group

Title	Name	Surname	Co-I	Steering group member	Institution	Discipline	Research
Prof.	Simeon	Yates	PI	Chair SG	University of Liverpool	Social science	Digital culture
Dr.	Michael	Pidd	Co-I	SG	University of Sheffield	History	Digital humanities
Prof.	Adam	Joinson	Co-I	SG	University of Bath	Psychology	Computer-mediated communication
Prof.	Ann	Light	Co-I	SG	University of Sussex	HCI and design	Human computer interaction and design
Prof.	Simon	Maskell	Co-I	SG	University of Liverpool	Computer science	Data analytics
Prof.	Claire	Taylor	Co-I	SG	University of Liverpool	Modern languages	Digital culture and community
Dr.	Leanne	Townsend	Co-I	SG	University of Aberdeen	Sociology	Communities and digital
Prof.	Vishanth	Weerakkody	Co-I	SG	Brunel University	Information studies	e-Government
Prof.	Bridgette	Wessels	Co-I	SG	University of Newcastle	Sociology	Internet studies
Prof.	Monica	Whitty	Co-I	SG	University of Leicester	Psychology	Identity and security online
Prof	Naomi	Baron		SG	American University, Washington DC	Linguistics	Computer-mediated communication

Prof.	Catherine	Brookes		SG	University of Arizona, USA	Information studies	Identity online
Prof.	Bill	Dutton		SG	Michigan State University, USA	Communication studies	Internet studies
Dr.	Alex	Frame		SG	University of Bourgogne, France	Linguistics	Digital media and politics
Dr.	Ellen	Helsper		SG	London School of Economics	Communication studies	Digital inclusion
Dr.	Laura	Robinson		SG	Santa Clara University/University of California Berkley	Sociology	Digital exclusion
Prof.	Rich	Ling		SG	Nanyang Technological University, Singapore	Sociology	Media Technology
Prof.	Ron	Rice		SG	University of California, Santa Barbara	Communication studies	Social Effects of Mass Communication
Dr.	Alison	Preston		SG	Ofcom	Media policy	Head of Media Literacy Research
Ms.	Alison	Vincent		SG	Cisco	CDI sector	Chief Technology Officer for Cisco

16 Workshop attendees

17 Citizenship and politics: Delphi results

17.1 Key Questions

17.1.1 "Digital technologies", radicalisation, mobilisation and political action

- Does digital media increase the likelihood of demonstrations?
- How does digital technology facilitate political radicalism and affective engagement?
- In what ways do digital technologies impact traditional forms of mobilization, collective action, and/or political participation?
- To what extent have people experienced 'negative' online behaviours such as trolling and flaming? How, if at all, has this impacted their civic and political activity?

17.1.2 "Digital technologies", emancipation, agency and control

- How and in what ways are digital technologies challenging or reinforcing existing power relations?
- How does digital technology and our uses of it impact on our autonomy, agency and privacy (as illustrated by the paradox of emancipation and control)?
- What do you think is desirable or undesirable about the future direction of technology development when it comes to autonomy, agency, dignity and privacy?
- Who or what exercises control over how digital technology can be emancipating or controlling? In whose interest?

17.1.3 "Digital technologies" and the disruption of current political institutions

- How do digital technologies enable the growth of knowledge among large-scale populations; and what role do they play in the formation of new knowledge-making groups and hence new ideas?
- How do digital technologies enable creativity to extend beyond the realm of proprietary expertise (of firm and state) towards an open system of innovation?
- How do new technologies disrupt and challenge incumbent institutions, and how does such 'creative destruction' drive dynamism and adaptation in large-scale systems (commercial, social, communicative)?
- How do social media affect the quality of democracy?
- How do political elites use digital media? How do old and new parties use new technologies and with what consequences? Does new media promote populism?
- What are the normative principles of democratic citizenship in the digital age?
- What are the opportunities and challenges facing democracy in an age of digital participation?

17.1.4 "Digital technologies", political identity, emotion and empowerment

- Does access to digital technologies have a positive emotional impact on citizens, making them feel empowered, with a voice and potential influence?
- How are notions of identity and belonging changing with digital technologies?
- How can social scientists use big data alongside traditional methodologies to get to the heart of fundamental questions regarding the impact of digital technology on human behaviour and how citizens feel within the digital environment?

17.1.5 "Digital technologies", groups and elites

- How are youth engaging with digital technologies and online politics?
- How do emerging media platforms impact the ongoing digital divide?
- How does digital technology shape and impact society per group?

17.1.6 "Digital technologies" and new forms of citizenship

- How does technology enlarge or change our understanding of, and interaction with, citizens outside of our own national borders?
- What constitutes citizenship? Is it meaningful to talk about digital citizenship? Does digital expand the notion or simply provide a new space for the exercising of citizenship rights and duties?
- What is novel about citizenship practices on social media media platforms?

17.1.7 "Digital technologies" and governance

- How does technology improve governance (i.e., government's responsiveness to citizen concerns and ability to effectively manage competing interests)?
- Does electronic governance transform relationships between states and citizens and the nature of politics?

17.1.8 "Digital technologies", political communication and debate

- How does digital media interact with traditional media in shaping public opinion?
- How do people perceive 'success' in online political participation?
- How does the "self" that is presented in digital arenas differ from that which is presented in offline spaces (e.g. people may present themselves as performing a wide range of citizenship activities online without ever doing anything for those issues in offline spaces)?

- Is there a polarisation of debate, and a ghettoing of ideological strands, which prevents access to a pluralist and deliberative environment which can foster and nurture democratic engagement?
- What new ecosystem of information is there for citizens in the digital age?
- Where, why and how do people talk about, and participate in, politics online?

17.2 Key Topics

Topics	Percent
Divides	8%
Mobilisation	8%
Talk	7%
Control	6%
Data	6%
Media	6%
Other	6%
Participation	6%
Citizenship	5%
Engagement	4%
Governance	4%
Privacy	4%
Identity	3%
Methods	3%
Technologies	3%
Civic	2%
Commercial	2%
Cultural	2%
Direct democracy	2%
Empowerment	2%
Geopolitics	2%
Policy	2%
Trust	2%
Young people	2%
Contestation	1%
Parties	1%
Populism	1%
State	1%
Technology	1%

17.2.1 Digital divides

- How does the ongoing evolution of emerging media platforms impact the various socioeconomic, political and cultural divides in democratic societies? How do adoption, sophistication and utility of the relevant cutting-edge platforms disperse, segment or concentrate?
- How do you reach the most excluded citizens who are most dependent on government policies?
- How do digital citizenship practices either lead to equity or exacerbate existing inequalities?
- How are the boundaries and contours of "haves" and "have-nots" shifting as a result of the adoption and institutionalization of digital media platforms with respect to opportunities for housing, employment, education, health and wellness, entrepreneurship and general social mobility?
- We need to look at difference more as practiced on digital platforms
- Can digital technology help bridge the gap of civic/political participation, encouraging, for instance, young people, women, or citizens with lower education to get engaged?
- Are we at the point where we can consider the digital divide a thing of the past? Or is it still a concern and how is it affecting participation?

17.2.2 Political mobilisation via digital media

- Do social media facilitate mobilizations and/or create new kinds of mobilization?
- Social media platforms and other technologies have changed the nature of **who** participates, **what** participation looks like (i.e., what constitutes a contribution), and **how** participation takes place.
- The relationship between digital media and protest and social movements.
- Support for causes online and how this translates to offline support.
- Need more investigation of whether new media create new possibilities for resistance and democratic movements.
- The debate about new forms of activism (e.g. connective action, organisational hybridity), particularly crowd-enabled has been one of the most important in recent years. This can focus on government-led e-petitions and non-gov platforms like change.org - but what is really needed is more on where this literally emerged from the bottom up - 'lone wolf' activism, etc.
- Do digital technologies facilitate public expressions of radical opinions?
- Are candidates, parties and campaigns using the Internet to reach out to often ignored parts of the electorate or are they just focusing on their base?
- How does digital (or online) mobilization work together with offline mobilization? Or do they largely inhabit separate spheres?

17.2.3 Online debate and interaction

- Can political institutions cope for dialogical/interactive relationships?
- Most research focuses on formal politics such as elections, candidate social media use - with a disproportionate focus on Twitter. It's the 'easy' route - but misses the vast majority of online political activity and talk. I would strongly encourage studies that look in 'non-political' spaces e.g. online sports, food or gardening forums and groups. These have the potential to overcome many of the issues identified with online deliberation.
- Is social media discussion a factor in increased polarization among the electorate?
- Do digital technologies lead people to join self-reinforcing ghettoes consisting of individuals with identical viewpoints, so undermining access to a pluralist public sphere?
- How does the ongoing evolution of emerging media platforms impact the rhetoric, discourse and reception of the processes related to campaigns and elections among democratic populations? What is the impact of any such shifts in perceptions of the quality of democracy in terms of interest, engagement or general institutional solvency in the long run?
- There's significant issues in the online public sphere, with trolling, abuse, flaming, curbing, incivility. See for examples the Guardian's 'web we want' series. Research on journalism comment fields is needed, but this section does not need to be limited to this.
- Do digital technologies allow rumours, half-truths and beliefs to flourish at the expense of facts (links to polarisation to an extent)?

17.2.4 Digital and state control

- What does control mean to you?
- Both state and corporate intrusion into private lives of citizens is of utmost importance. Digital technology makes these more pervasive, and insufficient safeguards are in place to protect future abuses - a society where citizenship is dramatically eroded because people are unable to express dissent or publicly debate freely. Understanding the underlying technology, who controls what and ethical considerations of communication security are all of importance.
- Who is collecting data from wearables and mobile accessories and how are those data commodified and protected?
- What does security mean to you?
- Who are the stakeholders in the digital age, and who are the controllers?
- Rights to privacy, how does this occur in a largely corporate social media environment? Who regulates platforms?

17.2.5 Data - big, small and citizen

- Just as humanities questions can no longer be asked without 'big data', so scientific questions can no longer ignore meaning, identity, relationship, context, power: each can explain the other.
- Address the management of worldwide information, including its creation, storage, distribution, and protection, and how this impacts citizenship. How is power exercised through information policy?
- Datafication: Evidence policy-making is driven by data.
- States have acted as collectors and managers of vast amounts of information since their inception. How do new digital technologies change the ways in which the State acts as an information database? What has changed; what has not changed? What information remains secret; what information is shared with citizens?
- How do big data strategies help us to understand the workings of the digital society? How can established methodologies complement this data to develop better and more scientific understandings?
- Commodified information. To what extent do new digital technologies blur the public/private divide? How is private power exercised through the control of information? -- e.g., most top Fortune 500 companies are really owners/managers of information, rather than producers of traditional products.

17.2.6 Political media, old and new

- The relationship between digital media and other media in coverage of political issues.
- How are the new communication technologies altering the relationship between media, citizens and political actors?
- Research confirms that journalists are increasingly relying on information from social networking sites. Are the politicians and other public actors (pressure groups, unions, NGOs etc.) gaining more control over news media agenda due to this dependence of mainstream media on SNSs as triggers of news?
- Investment in news and journalism is declining, which has profound implications for its ability to hold power to account and continued functioning as the Fourth Estate. Being Digital must also uncover in what ways citizens can most effectively be informed about current affairs and contribute to public debates - and crucially how this can be diversified and funded in a rapidly changing media landscape.
- How do journalists and media organizations account for this increasingly popular platform for getting news? Is the quality or the quantity of the content shaped by the rise of the mobile platform? What are the larger implications for the news environment? The 2nd question: ... in terms of engagement, cognition, attitude formation, exposure to alternative views, etc.
- How digital media interact with traditional media in shaping public opinion. Both in theory of democracy and in social science research, media play an important role for citizenship to link candidates or rulers and voters or governed. How the new way to consume news at the digital age impact the traditional way to learn? What kind of new ecosystem of information emerge?

17.2.7 Political participation and engagement

- What political engagement and participation means in a digital age and whether social scientists should view clicks and shares as part of a suite of participatory behaviour.
- The emerging paradigm of participatory citizenship /semi-direct democracy is directly challenging the principles of delegation and democratic representation.
- Does the digital age enhance the quality of democratic participation? And if so, in what form(s)? i.e. activism and protest or conventional modes?
- Citizens are keen to get engaged in civic/political actions through digital technology. But it remains unknown whether and how these activities influence policy and decision making processes.
- Is the digital environment giving rise to a new form of participation? Or simply providing a new means to undertake existing traditional behaviours?
- Political participation today requires use of digital media. But what happens when that becomes the only or the primary link to politics - and citizens don't meet and cooperate face to face? Impact on citizenship, on political efficacy?
- What does engagement mean to you?
- It appears (on the face) that candidates are using the Internet to engage citizens. Is this actually an illusion? Is the interaction more controlled than it appears?
- Does the digital age draw in new and less engaged individuals to engage their rights as citizens?
- As individuals express their citizenship/participate in politics through digital technology--requiring often less resources--is engagement dispersed across more 'spaces' and thus less efficient?

17.2.8 Citizenship in a digital age

- How have our understandings of what constitutes 'citizenship' been impacted?
- What have been the main changes to our understanding of citizenship, the way in which it is created and enacted, and the rights and responsibilities of a citizen?
- What can digital media learn about promoting citizenship from old media?
- Why do we need citizenship to be tied to nation states? Where we pay our taxes is not where we make our (digital) selves. Civic action is global, e.g. environmental, climate activism; anti-corporate activism; gender-sexual-identity politics; affinity groups; fanship; neighbourliness.
- How can the political media by regulated with a view to serving citizenship?
- What will happen if digital citizenship disappoints people?

17.2.9 Governance in a digital age

- Need more investigation of policies and politics related to how nation states unilaterally or multilaterally govern the Internet itself and how this impacts citizens worldwide.
- Improving governance: the way in which technology provides governments access to better data, enables more responsiveness to citizen concerns, and allows governments to negotiate competing claims.
- Open government is about openness, accountability, engagement and fundamentally changing the relationship with the government.
- Citizenship is one side of the democratic coin; governance is the other one. How do current practices of citizenship affect/are affected by changes to structures of governance? How can the two be synced in more democratic ways?

17.2.10 Privacy in a digital age

- Privacy and transparency, these 2 aspects are related and influence each other.
- How have perceptions of privacy changed?
- What has been the impact of digital technology on how different groups perceive privacy? Related to government legislation, use of big data by companies, and citizen perceptions. What is the impact of online surveillance on political life?
- Are the citizens aware of the risks about their private life, their personal data, due to platforms and technologies of surveillance?
- The end of privacy on digital media and its implications for their democratic role?
- All the big commercial actors online gather personal data - either with our consent or by default. Governments, both our own and foreign, engage in surveillance. How does this affect digital media's democratic utility?

17.2.11 Political identity in a digital age

- How and under what conditions does collective identity form? What are the roles of digital technologies in this process?
- How does technology change our conception of our political identity and loyalty? Does it enlarge or diminish our sense of community and the collective?
- Citizenship refers to being a member of a specific community. What are the implications of digital culture/participatory politics in a multi-layered global public sphere for our sense of belonging and affective attachment?

17.3 Key challenges

Challenges	Percent
Methods	42%
Theory	14%
Big data	12%
Epistemology/Ontology	7%
Ethics	6%
Psychology	5%
Technology	4%
Exclusion	2%
Education	1%
Funding	1%
Impact	1%
Individualism	1%
Policy	1%
Training	1%

17.3.1 Big data

- All that is published on the internet (blogs, Facebook, Twitter ...) is a rich material for the social sciences. But there is still much work to do (in cooperation with IT ==> digital humanities) for providing tools for: capture, classify, analyse the content automatically. There is also the question of training future researchers in the social sciences deal with these technologies and address these mass treatment.
- Analysing political subjectivity
- One can via big data examine twitter storms, discussion threads, etc., but illuminating what citizens actually feel, their identities as citizens, is much harder. Requires detailed, extensive online interviews; most don't wish to become respondents.
- High quality qualitative analysis of pre-existing digital material in order to consider potential meaning that could be ascribed by readers
- Although sentiment analysis can be conducted using algorithms on large datasets, I feel that much of the subtleties of the online communication is lost when this approach is taken. I would advocate at least part of the sample is analysed by hand (e.g.: for discourse) in addition to any computerised coding.
- Getting access to data
- I am getting increasingly annoyed by the disproportionate focus on Twitter because we can get the data. Some Big Data studies (and I say this as someone who scrapes etc.) seem to be more interested in their methodological innovation than their findings. We need more research on Facebook, Snapchat, WeChat, WhatsApp, Instagram. But we also need more research on discussion forums, email and the like.
- Accessing corporate social media data
- Facebook and now Instagram are much harder to study/scrape API, leading to too many Twitter studies that are unrepresentative
- Capturing and storing or archiving the big data generated from individual's social media use. Allowing for replication of analyses.
- Data collection from online sites
- It is particularly difficult to collect data from online spaces because of the variety in accessibility on different sites, and also the additional need for access to compatible software when downloading, storing, or analysing the data.
- Measuring new media use with log data
- This is more accurate than self-reports, but the sample becomes skewed when researchers recruit participants who are willing to be tracked
- Big data studies often use accessible data without considering the social utility of studying that data source
- What is data and what does it tell us
- Can computers provide the answers required to understand the complexities of human emotion and behaviour?

17.3.2 Epistemology/Ontology

- I feel that at the moment more important than the technics to collect and deal with data is the discussion of common concepts to understand the topics we are dealing with
- Beyond immediate localities and the nation-state, what do we mean when we refer to 'democracy' and 'community'? How can we determine who belongs and who doesn't?
- Many researchers examine 'being digital' by comparing it to 'being offline'. This distinction may be theoretically justified. It appears, however, as if the digital and offline are strongly interwoven, and respondents often do not separate both spheres of civic and political life.
- How is political engagement impacted by digital technologies? What should be measured -- e.g., digital communications with government representatives, public comments on digital news stories, on-line political fundraising, etc.
- Specialism (together with massive increases in academic productivity) and funding regimes are not only separating disciplines but also preventing researchers from reflecting on their own fields. Where is the incentive for synthesis, integration, consilience (functions that have been largely outsourced to celebrity bloggers and commentators)?

17.3.3 Ethics

- Adapting ethics procedures
- Traditional ethics procedures rely on receiving participant consent. Existing guidelines need to be adapted to research methods that focus on secondary data or meta data analysis of digital traces.
- Use of online data
- The ethics of using online data that sits across the public/private divide, such as social media posts, are unclear.
- Digital traces
- our digital uses leave a considerable number of traces. He has the researcher the right to try to capture these traces at risk of violating the privacy of Internet users? If we cannot study the traces of volunteers, do not we risk missing out on some interesting digital practices?
- Big data analysis need to think more about ethics of data use
- Preserving privacy and confidentiality.

17.3.4 Methods

- Interviews: Qualitative research remains an undervalued approach, but is especially important to ensure we can make sense of the seemingly obvious and advance our critique. The rapid pace of change in relation to what constitutes Being Digital means this is even more important to capture.
- Measuring extent to which new digital technologies play a role in social/political protest.
- It is difficult to ascertain the degree to which social media, for example, foster or contribute to the emergence of social and political protest around the globe.
- Internationally comparative data
- Very difficult to get good data as to how people use technology across national borders. Surveys are typically national in scope, if that; and if they are broader, it is difficult to find truly comparative data.
- The need for richer qualitative data and analyses of such data
- Measuring new media use in surveys
- Problems of self-report are exacerbated when users are constantly checking their devices throughout the day. We may need to get away from traditional questions of "how much time do users spend...?"
- Sampling: Response rates to many survey tools have been steadily declining for decades. How can modern technologies a) increase the sample response of emergent survey tools; b) increase the response quality of emergent survey tools; or c) improve the quality and response rates of more traditional approaches.
- Sampling bias: This type of research could benefit more from Internet surveys but (while it is better than in the past), there are still issues regarding how to get representative samples.
- Authenticity of online information
- There is a growing uncertainty when conducting research online about the identity of actors and authenticity of information contained on the Internet and social networking sites ("bots", paid communicators/propagandists impersonating "authentic" citizens, etc.)
- Including room for despair.
- While we demand certain answers in our research design, the recent Pew studies were able to find that people had over-confidence or despair about the likelihood of positive outcomes -- this may be missed if we choose categories of responses too deterministically.
- Breaking through the barriers of anonymity
- Many online actors are not using their real identities - propagandists, hate mongers, etc., but also other less venal types. Need better methods to trace and track down who they are.
- Ascribing meaning to online content in isolation from discussion with authors
- To my knowledge, this is rarely being done. The principles of documentary analysis would suggest this is inappropriate, as the author's reason for writing should be considered during analysis.
- Textual analysis
- Qualitative research remains an undervalued approach, but is especially important to ensure we can make sense of the seemingly obvious and advance our critique. The rapid pace of change in relation to what constitutes Being Digital means this is even more important to capture.
- Biases: Latent attribute inference (e.g., determining gender or location from social media posts) is an exciting area that will develop greatly in the comes years. Understanding the issues/biases with these techniques is key to understanding the limitations and opportunities available.
- Variables: How to identify variables and causality
- Replicability: For an ambitious, broadly scoped series of questions, how can the project team best ensure that the methods in place allow for meaningful longitudinal inquiries moving forward?
- Identifying 'political talk' and 'political action': While we can get access to huge volumes of data these days, this does not solve basic problems such as how to (theoretically and empirically) define and measure politics. Machine learning is problematic in some of these areas, and we need investment in manual content analysis and working with messy data.
- Time series: If you are researching events such as elections, it becomes obvious that there are events that are unique to each and will influence findings. It is expensive, of course, but more time series or even panel studies are needed.
- Reaching out to hostile demographics: How can we reach and integrate in the body politic citizens who have no interest in engaging with the principles and values of democracy?
- Linking social media data to individual level characteristics and other attitudinal and survey type data.
- Semi-automated content analysis and machine learning: Too much emphasis - and indeed confidence - is being placed on automated content analysis (be that network / relationship analysis, sentiment analysis, keyword detection etc.). What we desperately need are methods for integrating human coding / interpretation with machine learning algorithms - thus enabling scaling of bespoke coding criteria.
- Avoiding English-centric: A large amount of content, users, and subsequently research is conducted in English. A key challenge is extending this work beyond English-language content and people.
- Data collection: Digital media allow to collect enormous amounts of information but this is not always the best strategy to understand how digital media work

	• Live/online ethnography: Two problems with ethnography online: (1) when doing 'live' ethnography the sheer volume of data and the rate of its disappearance can pose collection issues; (2) there are ethics involved in ethnographies of, for example, forums or online groups. Some problems overlap with real-world ethnographies, but some are specific to the digital environment such as use of data gleaned from 'lurking'. • Skills: I say it is relatively easy, but a lot of scholars still lack basic skills e.g. scraping. Renewed emphasis on this will help. This is linked to mixed methods. • Developing better measures: Currently, many reputable surveys such as the ANES and PEW use fairly blunt questions such as "do you own a smartphone", more detailed questions are needed. • Qualitative ethnographies: meaning and qualitative analysis still need to be matched with big data collection • Going beyond the textual: The bulk of research is still disproportionately textual. Our methodologies have not adjusted to the multimedia/multisensory realities of the digital culture • Analysis of unstructured data: When analysing digital content, researchers often end up taking the easy option of analysing objects that are already or contain structured data. We need further research into ways in which unstructured data can be refined, prepared, and examined on a larger scale. • Lack of interdisciplinary approaches: Not enough research is being undertaken across discipline. A lot of problems might be overcome using knowledge and skills from other fields of study. Computational social science could be used more often. • Getting access to people: I have found it hard to get interviews/surveys with participants from within specific websites. They (both the websites and to an extent the people) are surprisingly shy. • Gaining and sustaining open access to social media platforms API beyond Twitter. • Can methodologies be developed to complement big data to understand the motivations behind behaviour • Mixed Methods: Lots of research shows that there are a small number of highly frequent content creators with a long tail of infrequent posters. However, research on this and other topics is often quite limited. I really think that mixed methods are the way forward. This creates challenges (time, expense, skills) and even compressing it into journal length pieces. 17.3.5 Theory • Evolution: Research is either directed towards invention (tech) or the 'structure/agency' model of sociology. When will digital technology be an evolutionary science? • Impact of new digital technologies on traditional news media and how that in turn impacts citizenship. • In what ways are new media transforming the public sphere? • The importance of taking a systems approach (such as to deliberation) rather than relying upon mini-public deliberation • Nationalism • Consciousness of others is now global. What are national jurisdictions going to do about that? • Understanding political engagement • Should definitions be reconsidered in the age of the click - is politics being ghettoed ideologically - and a behaviour restricted to a minority. • The need to understand communicative competence - critically • Exogenous Inputs • How should any such study of these questions account for both common and unique macro-level events such as elections, geopolitical conflicts, shared economic market challenges, or unique domestic issues? • Security: Who will have a total access to the information of the digital age • Measuring changes in public participation within regulatory processes of rule-making. • Have new digital technologies impacted the degree to which the public participates in executive rule-making, i.e., are citizens now more likely to submit public comments on a proposed EPA rule because they can do so digitally? Do regulatory agencies respond differently to on-line vs. off-line public comments? • Questioning our assumptions and addressing fundamental questions of political theory/philosophy • Most studies of citizenship and technology do not question their own assumptions. Is civic empowerment a 'good' thing? Under which conditions/criteria? Does it make governance more or less effective (and under which conditions)? Is equality of participation more important than the quality of that participation? And what is ultimately our final goal? Participation for participation's sake? Better quality of life? More sustainable communities? • Policy and Politics: Politically motivated or citizen focused!

18 Communication and Relationships: Delphi results

18.1 Key Questions

18.2 Digital literacies

- What literacies are required for effective communication using digital technologies? Should these literacies be taught, or can we assume that they develop organically?
- To what extent does an individual's digital legacy and digital capability affect their interactions with others in work and leisure?

18.3 Norms and values

- What normative pressures do people experience related to relationships shaped and sustained by digital technologies?
- What is the new normal for relationships now they are shaped and sustained by digital technologies across multiple domains?

18.4 Platform affordances

- Can we isolate the role of digital technology from the ways that social relationships are constituted in and across various social domains?
- What are the Platform affordances of digital technology that construct or constrain relationships?
- How do particular platforms affect various kinds of relationships: social, sexual, familial, collegial, activism, fandom, etc.?
- What kinds of social relationships (between actors) and of what kind (then nature) are most different in what kinds of social domains?
- Can we gain proper, meaningful control over our digital selves and our digital interactions and do we really want such control?
- How is the prospect of platform convergence (a la China's WeChat) likely to affect various kinds of relationships?

18.5 Quality of relationships and communication

- What are the costs and benefits of functioning effectively in a digital world?
- How does communication via digital technologies facilitate the quantity and quality of our relationships?
- How does communication via digital technologies deteriorate the quality and quantity of our relationships, online as well as offline?
- How are our relationships being shaped, sustained and diminished by digital technologies, in and between the domains of work and family?

18.6 Relationship management

- How are our relationships being shaped, sustained and diminished by digital technologies, in and between the domains of work and family?
- How are our social relations being shaped and sustained by digital technologies in domains such as family, work, and personal relationships?"
- How are family, friend, and work relationships shaped by, and reshaping, the trajectories that new digital technologies are taking? (I realize this is awkwardly written but hopefully you get my meaning.)
- How are our friendships being shaped, sustained and diminished by digital technologies?
- How are our relationships for work, home, friendship and more being transformed by digital technologies?
- How is 'mate finding' being shaped, sustained and diminished by digital technologies?
- How is 'social support' being shaped, sustained and diminished by digital technologies?

18.7 Key Topics

Row Labels	Percent
Friendships and relationship formation	12%
Age	10%
Privacy and ethics	10%
Work and organisations	8%
Education	6%
Social and community support	6%
Bubbles	4%
Data and representation	4%
Exclusion	4%
Politics	4%
Social change	4%
Dependency	2%
Family	2%
Identity	2%
Integration	2%
Interpersonal	2%
Methods	2%
Other	2%
Place	2%
Platforms	2%
Psychology	2%
Quality and variety	2%
Sexuality	2%
Textuality	2%
Theory	2%

18.7.1 Age

- Generational changes Every generation shapes digital technologies in a different way. Today we observe a new, particular and specific combination of generational styles of communication.
- Investigation and co-design of technologies to improve the social, personal and cultural lives of older people. Much technology designed for older people tends to be medicalised and designed to cater for their biological needs. The digital transformations of the last few decades are leaving behind many older adults who, for reasons ranging from accessibility issues, to work biographies to personal preference, are less likely to engage with digital technologies. The powerful capacities of digital technologies for communications, archiving, and self-representation, are therefore under-used by this group; and their cultural histories and experiences are therefore less visible in the digital world.
- Youth How do peer cultures, youth cultures, civic participation, community (on and off-line) now function
- Youth, young people, teenagers, adolescents, How are children shaped, if at all, by the digital technologies they use as they grow and develop?
- Intergenerational relationships (how) can technology support us to enhance intergenerational relationships which are increasingly under stress? This might be at the level of the city - where new (technology based) mediating structures might be dropped into the city to encourage intergenerational encounter or at a community (even street) level where technologies might help us to bring people together in new and interesting ways. For instance, to share stories and counter negative discourses around intergenerational divides.

18.7.2 Bubbles

- The filter bubble in a world of information, we filter our information and often get our news from like-minded people. How is this homophily shaping attitudes and behaviours?
- Bifurcation and splintering of the internet and relationships It is being suggested that the new online landscape leads to increase self-selection into like-minded groups. Key questions are the extent to which this is true, whether this is different from former geographical divisions, what patterns of bifurcation or splintering are happening, and (where it is considered important to hear many voices) how to retain diversity in exposure and communication.

18.7.3 Data and representation

- Relatedness in data aggregation datasets can refer to one person, or involve lots of data about one person AND many people. What are useful frameworks for thinking about how social relationships cohere (or don't) in these aggregates? Who is related to whom, on what terms, and who gets to define or contest that relationship?
- Establishing meaning in data as it traverses contexts When data is created in one domain, for one purpose, but it travels across different domains and is repurposed, much meaning is lost, and new interpretations emerge. What are the mechanics of translation? Terms of translation? How might communities of interpretation cohering or dissolving, especially given that digital systems are increasingly dependent on complex, AI-driven inferencing where even their creators don't know how to interpret the inference made?

18.7.4 Education

- How formal and institutional structures of learning (access to teachers/resources) are now mediated
- Schooling
- Pedagogy This is a relationship and is being fundamentally recalibrate through all sorts of digital interactions

18.7.5 Exclusion

- Access and use of current and future technologies by/with groups of people who are digitally excluded. Example projects might involve exploring how citizens can be involved in thinking about and 'doing' smart cities? What digital literacies/learning might need to be developed in various communities to enable people to participate in new digital cultures/ digital worlds?
- Fear of missing out versus joy of missing out on digital communication

18.7.6 Friendships and relationship formation

- Friendship

- Sex, love, and relationship: The impact of new social platforms on intimate relationships. See e.g. the work by Ben Light and/or Jean Burgess on dating apps, and the growing diversity of such apps from conventional dating (e.g. eHarmony) to casual sex (Tinder, Grindr), as well as the concerns about sexting and revenge porn.
- Social Shaping and Social Construction Active ways people manage and shape their digital tools to accomplish their social goals
- Consciousness about digital media habits and mindfulness
- Social Affordances The social and material and technological arrangements that support the social actions through and with technology; how these are designed, recognized, and perceived.
- Online communication enhancement across relationships When and why is it more fun and rewarding to communicate with existing relationship partners in all relational contexts (family, work, etc.) using minimal-bandwidth technology, than in person?

18.7.7 Politics

- Social and political movements: The rise of new movements built around what Bennett & Segerberg call "connective action", in distinction from conventional political parties / labour unions / social activism. These are increasingly important political forces - see e.g. the Spanish Indignados, the Greek Aganaktismenoi, the Italian Cinque Stelle, or the Icelandic Pirate Party.
- Extremism and truthiness: The rise of politically extremist networks, e.g. the alt-right and identitarian movements in the U.S. and western Europe, and their development of counterfactual news networks peddling conspiracy theories that are disconnected from and inherently opposed to (cf. the German 'Lügenpresse' debate) the mainstream media.

18.7.8 Privacy and ethics

- Contextual Privacy Ways in which people work to maintain their relationships, front-stage and back stage sociality, and relationship management.
- Communicative obligations of being digital
- Online privacy and presence: As more evidence of individuals is found online, how does this affect relationships? Can you know too much about your family, friends, colleagues? How do you keep social worlds separate? What are the emergent norms and laws about use of online information for decision making for hiring, dating, eligibility for different positions, etc.?
- Ethical issues around increasing digital infrastructures overlaying our material world. What does it mean that our lives are increasingly being recorded and tracked through digital technologies? New digital technologies, such as the internet of things, are not designed with people's privacy in mind. What are the possible repercussions on our online and offline relationships? How can we support people to understand and learn about these issues at an individual and community level?
- How will our digital legacy be managed? An individual or community digital legacy is lost when an individual dies, becomes ill or simply when an update prevents access. How do we determine what to preserve and how to preserve it?

18.7.9 Social and community support

- Online social support How does digital communication facilitate social support, how prevalent is it, and why is it sometimes preferable to develop support relationships with strangers online that with offline acquaintances?
- Social Support How digital technologies are used for social support
- How can the digital be used to build social capital? Developments in peer to peer healthcare have shown us that the digital can be used to organise social support - but why is this not more effective in the workplace or in volunteering/helping?

18.7.10 Social change

- How and why do the media change, and under which conditions and constraints?
- Social change
- How are economy and politics, education and growing up, everyday life of the people and all other macro entities changing as a consequence of this developments?

18.7.11 Work and organisations

- How and why do institutions, enterprises, groups and other meso entities integrate the media or adapt to media related conditions?
- Work How do people use digital technology to manage the balance between work/personal space and time, in an environment of constant contact?

	• Gig work How does the new economy of gig work (Uber, etc.) shape work relationships? How is the lack of a persistent workplace and employer likely to affect orientation to work relationships? How will relationships form and be maintained in an ad hoc economy? • working, jobs, automation, sharing economy What does it mean to be a worker or have a job in an economy that allows for digital tools to mediate or replace human bodies doing work? How does this affect, mobility, family life?

18.8 Key challenges

Row Labels	Percentage
Multi platform studies	17%
Theory	17%
Co-design	13%
Big data	10%
Ethics and privacy	8%
Surveys	6%
Methods	4%
Multidisciplinary working	4%
Community	2%
Data access	2%
Exclusion	2%
Longitudinal studies	2%
New forms of publication	2%
Old media	2%
Other	2%
Uses and gratifications	2%

18.8.1 Big data

- Big data/little data
- The techniques used for analysis of big data (machine learning, social network analysis) and little data (qualitative analysis) don't seem to meet in the middle - there is a research gap here.
- Ethical and methodological considerations of social big data
- The ethical challenges and methodological considerations including generalization, reliability, and validity of data harvested from social media platforms.
- Big data, theory and comparative studies
- A large category of course, but the tools, methods, and theories associated with big data analysis are still emerging. Standardization is needed for comparison across research initiatives. At the same time that it is still too early to lock down standards.
- Combining "thick" and "big" data
- How to combine in-depth qualitative data with large scale computational data.
- getting hands-on with data for qualitative researchers
- Data is a part of social life now. We qualitative researchers need to better understand what the data scientists get up to, not to ape their God tricks (i.e., presuming a view from everywhere and nowhere at the same time) but in order to do something else qualitatively meaningful in ways that are more sophisticated about their techniques.

18.8.2 Co-design

- Co-designing technologies - how to work with and alongside communities that are often ignored to co-design technologies that are of use to them and in their lives - focussing on improving relationships rather than distancing ourselves from others.
- Technologies are often designed FOR communities with some 'user testing' but little engagement with people and their lives. Social scientists, working alongside designers and engineers, can use methodologies and approaches central to social science to work alongside communities to understand and communicate their needs and broker relationships.
- The gap between research and implementation
- New apps and software systems are released every day, but very few arise from considered research - how to fill the research-action gap?
- Revisualization
- One method I have been a proponent of is giving people their data back in a new way, so they can reflect on it. To do this, the researcher needs to understand what sorts of visualizations will be most beneficial to start a conversation, which is not necessarily the same thing as good infoviz practice one would learn in design school.
- Encouraging creative use of technologies for civic engagement in communities not used to using digital technologies.
- How can we work with communities who are not familiar with digital technologies to consider the creative use of technologies in their lives, to enable them to communicate and build better relationships at community level but also with those in more powerful positions e.g. potentially building social movements or use of technologies for civic change?
- Understanding data as practice
- Understanding how people make sense of their personal data in practice, how teams make decisions with data, how data create new opportunities and challenges for sense making
- Understanding and mapping the tensions of affordance and practice
- developing tools and methods for analysing the impact of design on online social behaviour to inform better more ethical design of public spaces for participation, including how to do design research that reduces online harassment and trolling

18.8.3 Ethics and privacy

- Human subjects' safety and privacy
- Expectations of participants
- Research with individuals in online spaces is often at odds with norms and expectations within those spaces. Even if something is ostensibly "public" that is not the lived experience or the norm of the space for many people interacting/communicating or seeking support in certain online domains.
- Relationship mining
- Whether for research or advertising, how will relationship mining affect our use, trust, or selection of digital technologies?
- Ethics and privacy issues

18.8.4 Methods

- Do methodologies capture what people do or politically correct answers?
- Social media research methods

- Overemphasis on Twitter (as the most openly accessible API), lack of comprehensive research on Facebook and more recent platforms (beyond valuable but limited interview- and survey-based studies). Problems with researching closed, non-public spaces such as Facebook groups).

18.8.5 Multi-platform studies

- Multimodal relationships
- How do we assess the influence of any one particular technological platform, when many important relationships involve so many platforms (incl. face to face, phone, text, social media, etc.)? How do we assess combinations?
- How to follow people' digital communication in their everyday lives?
- Making conclusions about relationships from single-media studies
- The ease of capturing social media is leading to a lot of single-media studies. However, little work makes the connection between these data and the whole of relationships. How representative are social media of general attitudes and behaviours? How do multi-media interactions (including ftf) support relationships, whether emergent, weak or strong, instrumental or intimate? How do digital media support non-co-located and distributed relationships for work, family, etc.?
- Connecting online behaviour to offline outcomes
- Prediction that expands notions of social theory and helps theorists create new and expanded theories for social life.
- Understanding communications platforms as mass media and hybrid media.
- Dynamic network analytics
- Useful network analytics methods are now available that might generate valuable new insights into the flows of information and communication across online and social media spaces, but they are often still used in a limited fashion that focusses on single-timeframe, single-issue, single-platform snapshots. More complex questions need to be asked here, especially with a focus on the dynamics of such activity over time.
- Acknowledging the embodied
- Understanding the physical and embodied use of the digital in communication activities and processes
- Are we too context specific?
- We see social media studies of young people at leisure; email studies of people at work and 'quantified health' studies of general fitness - but there is space to break down these contextual barriers.

18.8.6 Multidisciplinary working

- Multi/transdisciplinary working - how to work with computer scientists and designers on the large social and ethical issues that are emerging.
- Multi/transdisciplinary work with engineers and computer scientists is not easy and involves building new relationships, learning new languages for many social scientists. How can we learn to work in these transdisciplinary spaces? What new ways of working might we design?
- Transdisciplinary methods translation
- Too much large-scale quantitative analysis (e.g. textual and sentiment analysis of social media content) is done by computer scientists who make questionable assumptions about user behaviours or ask the wrong questions. Their methods urgently need to be translated into and utilised sensibly by media and communication research.

18.8.7 Surveys

- End of telephone surveying as a viable research methodology
- Telephone surveying as a methodology is beset by a series of ever-more difficult challenges - lower response rates, regulations, changing communication dynamics. What will replace it?
- Overreliance on surveys
- Surveys do not reveal content of communication and dynamic communication over time. Yet they seem to predominate research.
- Few options for nationally representative research in any country that are accurate, fast and cost-effective

18.8.8 Theory

- Process related methodology, mainly as qualitative research to develop new theories
- Inventing new non-normative models of interpretations
- The traditional models of description/interpretation of communicative situations are based on the description of the elements of communication. We have now to turn toward a complex analysis of the different practices and different situations (back to Wittgenstein's approach in Philosophical Researches)
- Discursive awareness of media habits
- including dialectic relations between things and processes
- Characterising the performative
- Developing a theory of speech act that can account for the performative, avatar, dramatic nature of much digital communication
- Creating new theoretical concepts on the base of empirical research

	• Avoiding digital exceptionalism. • including critical approaches, Marx, Gramsci, Hall, critical theory, Bourdieu, Foucault et al.

19 Community and Identity: Delphi results

19.1 Key questions

19.1.1 Community membership and processes

- What is the glue that binds members to these communities?
- What differences digital technologies have on communities?
- Do digital technologies enhance or limit people's sense of belonging in local, national and transnational communities?
- What are the net benefits of participation in online communities, considering both the positives (e.g., social support, information exchange) and the negatives (e.g., trolling, astroturfing) associated with online groups?
- what questions do we need to ask in relation to the reconfiguration of communities in a digital age that enable us to understand the politics and socio-technical dimensions at play?
- How has the definition of 'community' evolved since the inception of the digital age? (Relatedly: how do 'digital natives' -- people born since the mid-1980s who have never known a world without the internet -- define 'community')

19.1.2 Defining identity online

- What are the differences in how we define ourselves in a digital age by gender, class, age, etc.
- What does "identity" refer to in an online context and must it always be assumed there is a connection between identity and authenticity? What is an authentic identity these days anyway?
- what are the implications of the digital on questions of identity? how does the digital enable or disenable us to ask better questions of identity?
- How does personal identity evolve (or not) in the context of these communities?

19.1.3 Understanding remote relationships

- How are digital technologies being used to support interaction over distance?

19.2 Key topics

Topic	Percentage
Exclusion/Inclusion	17%
Participation, action and social change	17%
Diaspora	13%
Gender/Race/Ethnicity	13%
Power	8%
Citizenship	4%
Digital labour	4%
Ethics	4%
Legal	4%
Methods	4%
Norms	4%
Tolerance	4%
Urban	4%

19.2.1 Diaspora

- Digital transnationalism and diaspora
- How is the modern nation transformed into a more global transnational and diasporic community?
- Calls for investigation of cultural, social, and political configurations and transformations of diasporic communities through digital connectivity
- Connected migrants: Calls for investigation of the ways in which migrants and refugees use digital technologies to connect with others, to find their place in the world and to develop skills for employment and integration.

19.2.2 Exclusion/Inclusion

- In what ways are some people included and others excluded by digital processes, and how?
- We are not all the same, socially, culturally, politically and economically, so what do these differences look like in the digital realm, and what are the consequences in terms of inclusion and exclusion across the social, cultural... etc.
- Being digital is now an opt out rather than opt in - and at the same time there is an equivocation between platforms and apps in terms of communication media. this means those who are in but not in continue to be negated or disappeared. age, gender, ethnicity, language, etc.
- Inclusive and excluding digital communities: Calls for investigation of the emergence of diverse local and transnational communities online, but also investigation of who is excluded from the experience and benefits of community.
- Inequality: remains an important issue - locally, regionally, nationally, internationally. As a result, it remains important to understand dynamics of inequality relating to production and use of digital technologies.

19.2.3 Gender/Race/Ethnicity/Sexuality

- Intersectionality: Rather than reducing people to single demographic variable (e.g. age, gender, ethnicity, etc.) focus on how these combine - given we live them simultaneously
- Gender and online communities: Issues include women-centred and women-only communities (more generally: why are some communities "gendered", in the sense that they are preferred by one gender or the other); gender and (a)nonymity; creating communities that are safe from threats and harassment
- How does being digital relate to other analogue ways of being? There is an argument that the digital merely extends or amplifies already existing aspects of 'being', so things like gender inequality, racial difference and so on are not fundamentally changed by the digital, but can be enhanced or extended.

19.2.4 Participation, action and social change

- Mobilization: How does participation in digital communities influence how individuals mobilize and act in the physical world?
- Collective action: How does participation in digital communities' influence collective action, either from among members of that community, or members engaging collectively beyond those communities?
- How is the digital contributing to social change? What is the role of digital technologies, and being digital in social change - does it speed change up, or perhaps slow it down... in what fundamental ways does the digital relate to social change processes?
- Participation: critical analysis of participation - what it means for individuals, social groups, and society. Is it empowering, or exploitation, or both?

19.2.5 Power

- Power politics: there continue to be massive questions around what it means that the economic logic of social media is shaping communication, knowledge, friendship, understanding, expertise.
- Decision making: often we only face the system when it fails us, but we are always positioned within them: they are increasing and changing decision making

19.3 Key challenges

Challenges	Percentage
Holistic understanding	33%
Ethics	24%
Methods	24%
Big data	10%
Comparative historical (diachronic)	5%
Representation of outputs	5%

19.3.1 Big data

- Big data
- taking advantage of possibilities offered by big data, while remaining alert to the limitations (e.g. not universal, algorithms in big data analytics may introduce bias)
- These days we have plenty of "big data" and automated methods for analysing it, but such methods can be shallow. How to integrate quality (in-depth) analysis with automated methods is a major challenge, but one with exciting potential.

19.3.2 Comparative historical (diachronic)

- Diachronic approach
- Looking at the past as well as the present is important

19.3.3 Ethics

- Research on identities on social media
- Ethical challenges of studying semi-private or private communication
- Identity can be a sensitive subject
- Research subjects may be uncooperative in responding to interview requests or surveys, even if they are very public in their digital postings (often with shielded identity)
- ethics
- of using material found online - is it in the public domain, or do people have expectations of privacy that need to be respected?
- Negotiating with ethics committees
- Establishing informed consent in online spaces can been difficult and the intrusion of a research persona can seriously affect online dynamics.
- methodological ethics
- we haven't even begun to understand the ethical issues of doing digital research - we really need to think about privacy, trust, value, visibility, sharing as ethical and methodological together.

19.3.4 Holistic understanding

- Tracing participants' physical world behaviour
- This would require many personal interviews or surveys.
- Definitional challenge of what we consider "being digital"
- Searching for a common definition of "being digital" in their different realms -- socio-economic, political and cultural -- would be a good start
- Need for holistic understanding
- our digital selves are part of our larger selves, and digital technologies are part of older technological landscapes - we need to understand being digital within the context of being, so an holistic approach is essential.
- Scope challenge of "being digital"
- What is the scope of "being digital"? What are the boundaries between real life vs virtual/digital communities? Cybernetic communities?
- Transnational digital research
- Research across space and ability to map meaningful connections that represent key points of reference for individuals and communities.
- The scale of digital communication
- The mere scale of digital information and communication exchange - this is not just about keeping record through 'big data' analysis but also understanding the content and meaning of data for people.
- Critical
- It is important to factor in power, gender, class, race etc.

19.3.5 Methods

- Complexity
- no one method can answer the questions posed, as we are looking at something that is highly complex, therefore a complexity approach is essential
- Defining your corpus
- Capturing data in a field that is constantly updating and being transformed -- analysing the data and reporting on it before the issue goes stale or the platform is no longer so important.

	• what do we need to know? • how do we need to understand the digital to be able to ask better questions of it? it is not just an interface; many methods are not transferable from other disciplines and the boundaries are too narrow. • knowledge is framed by economics • to understand the digital, we probably need access to data, but this is unevenly wrought along economic lines as well as agreements between corporations. therefore, are there alternative ways of knowing? • Sharing challenge: open and free data • In a more globalized knowledge culture, there is a pressing need for sharing data among different stakeholders. Digital technologies can be a solution to this challenge

20 Data and Representation: Delphi results

20.1 Key questions

20.1.1 Citizen and community use of data

- Alternative: How do groups across society relate to, trust and experience datasets, algorithms and data analysis that impact directly and indirectly upon key features of contemporary life?
- How are citizens informed of the immediate and potential later uses of data that they provide in and of their uses of both commercial and public digital services?

20.1.2 Citizen interaction with data and algorithms

- What moments of intervention within digital life are programmed and expected? What range of motion is possible?
- Sub-question: to what extent is trust a feature of our relationships to data and algorithms?
- How do people feel (affectively) about algorithms and Big Data? After all this topic is called "ways of being"!

20.1.3 Data literacy

- What capacities of thought are necessary to recognize forms of algorithmic governance in everyday life?
- How do we live with the algorithms and data analysis used to shape key features of our lives, how do we determine and ensure their trustworthiness?
- How do we enhance data literacy to improve our collective abilities to interrogate, assess, understand, and communicate about the algorithms and data analysis increasingly shaping key features of our lives?
- To what extent do we understand the algorithms and data that shapes our lives?

20.1.4 Methods

- Moreover, which approaches should be developed or adopted for the study algorithmic culture?

20.1.5 Power and accountability

- How do we increase the accountability, transparency, and oversight of the algorithms and data analysis that influence key features of our lives?
- Based on Tony Benn's five questions on power: What power do specific datasets and algorithms have over the lives of citizens in contemporary life? Where does that power originate from? In whose interests is it exercised? How is it held to account? And how can it be avoided or removed?

20.1.6 Social construction of data and algorithms

- Who are the organizations and groups that create socially consequential algorithms?
- How to socially consequential algorithms (e.g. for social media news feeds and consumer recommendations) reflect the social backgrounds of their creators?
- How do representations and discourses produce consent or dissent about algorithms and Big Data?

20.1.7 Social implications of data and automation

- What are the possibilities that you see for identifying the social, economic, and political costs, as well as the benefits to be derived from expanded use of algorithms, artificial intelligence, and data analysis more generally?
- What kind of research needs to be done to understand the scope and impact of algorithms?
- What are the effects of algorithms and data analysis?
- How do we live with the algorithms and data that now shapes key features of our lives?
- How do we materialise data?
- What do you see as the most promising paths toward the assessment, evaluation, and minimization of the mal-distributed harms associated with expanded use of algorithms and massive data analysis?
- How do we make sense of these materialisations and incorporate them into our everyday lives?
- How to describe and analyse the consequences of datafication as well as algorithmisation?
- Relative to other determinants of social position, such as wealth, education, culture etc. what influence do specific algorithms and data analysis carried out by governments and private firms have on individual and collective social welfare?
- What prior forms of techno-social relations created foundational experiences for the speedy pervasiveness of digital life?
- How to account for the drive towards further quantification and metrification of everyday life?

20.2 Key topics

Topics	Percentage
Social impacts	20%
Privacy and surveillance	18%
Citizens/Everyday life	16%
Open data/Algorithm transparency/Accountability	16%
Exclusion/Inclusion/Divides	12%
Data visualization/Social construction	6%
Methods	6%
Digital identity	4%
Economics	4%

20.2.1 Citizens/Everyday life

- How does the datafication of everything affect citizens in their everyday lives?
- Data sense: How people make sense of data
- Data Harms: We need to better understand how various groups are disproportionately negatively affected by data driven decision making and processes. Some of these harms are becoming increasingly apparent in the U.S. as they are furthest ahead in integrating 'big data' into social services. A better appreciation of who is being harmed and why will lead to better uses of data going forward.
- What are the emotional dimensions of living with the datafication of everything, and what can these tell us about life in times of datafication?
- Data incorporation: How data are incorporated into everyday lives

20.2.2 Data Literacy and Rights

- There is a need to increase data literacy so that people can recognize when they have been negatively affected, and empowered to challenge problematic uses for data. For example, it will likely be important going forward that parents and students are aware of what data is being collected and how it might be used or shared. There is a pressing need for more people to better understand the promises but also the limits of data practices and processes, particularly as data analytics are introduced across fields. More people will need to understand how things work, to challenge the abstraction and myths circulating about big data.
- How can we ensure that citizens' voices are heard in debates about how to govern algorithms and other aspects of datafication?
- What are the most appropriate methods for ensuring that citizens' voices form a part of debates about datafication?

20.2.3 Data visualization/Social construction

- How do the influencing narratives evolve, interact and shape behaviour?
- Being digital is a cultural state that is influenced by the stories that we tell ourselves and others. How these stories evolve, what attracts people to share them, and related questions are key areas of focus.
- Data visualisation: The study of how data are visualised and to which ends.
- What role is played by the representational forms (e.g. data visualisations) through which many people encounter data in their everyday lives?

20.2.4 Digital identity

- the nature of identification and identity
- This topic is meant to invite consideration of the distinctions in policy and practice with regard to individual identification as a unique person, and the myriad other identifications based on classifications derived from analysis.
- Consequences for nationalism
- How has nationalism/national identity changed in the digital age?

20.2.5 Economics

- Attention economy: How has an industrial economy become reorganized around an attention economy?
- Property: Who owns the means for production?

20.2.6 Exclusion/Inclusion/Divides

- Second-level digital divide
- Differences across social groups and classes/class fragments in how they use internet technology.
- different lived experiences cross-cultural dimensions of data and algorithms
- socioeconomic consequences of the information revolution
- Has the information revolution led to greater socioeconomic inequality within and between nations? If so, through what mechanisms and processes has this occurred?
- Representation of minorities
- Past research has shown how algorithms are often trained on data with substantial biases in, and some statistical methods only work with large numbers. This has the potential to impact minority groups substantially - both in terms of negative targeting of minorities, and minorities missing out on potential benefits from algorithmic policy making and implementation.
- Representation: How are benefits organized under these emerging forms of representation?
- Digital divides.
- What are the geographies of digital divides at local, regional and transnational scales?

20.2.7 Methods

- Computational hermeneutics: The study of the interpretation of algorithmic and other software outputs.
- Digital methods: How to perform social research with web data?
- scale and lifecycle of data
- When is data 'big', 'small' and how do these articulate? when does data come alive, die, change?

20.2.8 Open data/Algorithm transparency/Accountability

- What are the limits of big data?
- Big data is being used extensively, and the government has invested millions of pounds in it. No one currently knows where its limits, what is capable of doing, what it can't do. There is no way to know if this money is being spent wisely or productively.
- Transparency and open government
- When government decisions are driven by use of large datasets of personally identifying information, and algorithms that process this data, existing mechanisms of transparency and accountability cannot easily operate. This raises key challenges for democratic governance.
- Whose data? certain people have data and certain people are the subject of 'data'
- Accountability, Transparency, Oversight
- What steps might be taken to ensure better data uses, specifically with a view to avoiding data harms in the future. A lot of this discussion is happening in the law literature at the moment.
- What research can administrative data be used for?
- Administrative data is collected by the government for many purposes and large amounts of it are being made public under various open data initiatives. Since it was collected for admin. purposes and not for research, it suffers from a variety of weaknesses. Many key variables are not available, and data quality is sometimes suspect. What kind of research is it good for? What research cannot use it?
- Establishing limits on manipulation
- The segmentation of individuals into idiosyncratically defined groups for the purpose of delivering targeted strategic communication in areas of economic, social and political decision-making will become increasingly problematic.
- Data rights: who has the 'right' to data? where/when is the discourse of rights and data articulated?
- Un black-boxing: How can we make algorithmic decision-making more transparent and comprehensible?

20.2.9 Privacy and surveillance

- Privacy: A classic since at least Warren & Brandeis (1890), the definition and administration of privacy has taken on new and evident importance in the digital media environment.
- The meaning of privacy in near future
- Privacy regulation is currently focused on "individual identification," when identification in the immediate future will be focused on an expanding number of categories to which one is assigned. It will be a great challenge to shift our focus toward identifying and protecting interests (to say nothing of rights) of persons whose opportunities are shaped on the basis of their classification into groups with no basis for political influence.
- Surveillance
- Big Brother is being replaced by little sisters, including those engaging in surveillance of the powers that be.
- Data privacy and security
- What people know and understand about where their data go and who uses them
- Privacy frameworks and risk to individuals
- How are potential risks to individuals from collection and disclosure of data about them balanced against potential collective benefits from large scale data analysis. For example, having access to large-scale health records might have public benefit, but create individual risks.
- Whose privacy? Privacy is understood differently from different positions (structural and otherwise) in society; it also is understood differently across different societies and cultures
- Surveillance and privacy.
- How can privacy be given value in the context of increasing surveillance?
- As data processes are introduced across fields to what extent are some groups 'under surveillance' more, have more data captured about them, and what are the long-term implications. To what extent do such processes create a "feedback loop of injustice" to quote Helen Margetts.
- Geolocational tracking.
- To what extent is consent garnered for this? How are data extracted from individuals and how is it exploited?

	20.2.10 Social impacts • Abrogation of human decision-making to algorithms and data. • Increasingly more decision-making that was done by humans is being performed by automated systems. • Transformation of the news • What have been the long-term consequences of the information revolution for journalism? How have evolving business models in the news industry changed the content of news for end-users? • The nature of political representation and influence in the future • It is not at all clear how group membership will serve as a basis for political mobilization in the future because the nature of individual and collective identity formation will be dramatically transformed. • Scope and impact of algorithms: Basic research has not been done. No one really knows what impact algorithms are having. • Metacommunication: While metadata is the common technical term for the bit trails that users leave behind when they speak into the system, the conceptual issues can be specified in terms of communication: Metacommunication refers to the many and mostly implicit features of social interaction that make communication possible: verbal and nonverbal indications of how communicators relate to each other, what the elements of their statements mean, and why they seek to communicate in the first place. • Intervention: How might intervention and redirection occur within digital life? • Elites and social movements: How have digital technologies changed the interaction dynamics between economic and political elites and social movements? • Disruption: What are the implications for disruption in infrastructure, service, and activity? • Metrification: The study of the consequences of metrics, including quantifying the self. • Social media: The study of social media and its impact on civic life and the public domain.

20.3 Key challenges

Note: the focus of the majority of responses were on methodological challenges. These have been broken down into groups in the analysis below.

Row Labels	Percentage
Access to data	**5.26%**
Access to data	5.26%
Data literacy	**5.26%**
Data literacy	5.26%
Education	**5.26%**
Education	5.26%
Ethics	**7.89%**
Ethics	7.89%
Inequality/Exclusion/Inclusion/Divides	**5.26%**
Inequality/Exclusion/Inclusion/Divides	5.26%
Interdisciplinary	**5.26%**
Interdisciplinary	5.26%
Methods	**57.89%**
Analytics and measurement	7.89%
Combining old and new social research methods	7.89%
Concepts	15.79%
Social measures	5.26%
Understanding and developing new research methods	21.05%
Social theory and social questions	**7.89%**
Social theory and social questions	7.89%

20.3.1 Access to data

- Access: Studying the ways that data analytics are used and the outcomes requires a certain level of awareness and access to researching very particular situated practices. In many cases the sites of use whether they be private or public have access barriers.
- Accessing corporate practices of algorithmic governance.
- Assessing value of algorithms depends on transparency but have so far been very difficult to access. Especially with regards to increasing corporatization of algorithmic decision-making (algorithmic governance). Can the algorithms be unpacked?

20.3.2 Data literacy

- Openness: How might scholars and the public begin to understand the extent of the digitalization of everyday life?
- Public understandings of digital data
- How publics understand and make sense of data

20.3.3 Higher education

- Curricular revision: What level and type of programming skills should be required in advanced social science degree programs? If new requirements are added, what current requirements can be eliminated? Do the social sciences have the human and financial resources to teach programming skills to graduate students?
- Marketability of social research methods
- The social sciences are challenged to evolve their research methods so that they provide students with marketable skills.

20.3.4 Ethics

- Development of empirical assessments of the nature and extent of the "informed consent" that consumers provide
- We expect to see an increase in the transactions and relationships in which the citizen/consumer is invited to "opt-in," providing use of transaction-generated-information for some other benefit. We need to be able to discover the extent to which these "choosers" have a meaningful appreciation of the risks associated with such choices.
- Development of empirical, rather than merely theoretical assessments of threats to privacy from algorithmic assessment
- It is essential that we move beyond models and proofs of the qualities of programs designed to protect the privacy of individuals and members of analytically derived groups, toward what geographers refer to as "ground truth"; what actually happens in the real world.
- Reproducibility: Much research is done on trace data which is usable only if the underlying data are never made public. No one but the original researchers have access, so no one else can re-analyse the data. We need a mechanism to make these datasets public.

20.3.5 Inequality/Exclusion/Inclusion/Divides

- Development of measures of inequality appropriate to the digital future
- We have a number of statistical measures of inequality applied at the population level, and at the level of widely varying sub-populations. We face a future in which the standard categories we have relied upon for comparisons in the past will be replaced. How will we know how well we are doing?
- Digital divides: How might we understand the shifting digital divides in access and expertise?

20.3.6 Interdisciplinarity

- Collaboration: There is often a divide between two groups. (1) substantive social scientists who understand important social problems and long-standing theoretical issues but lack relevant computer skills. (2) computer scientists who have valuable computer skills but are babes in the woods when it comes to understanding social theory and identifying important theoretical problems.

- Researchers need to have wide array of skills.
- Research on this socio-technological topic requires research that is informed both technically and theoretically. Need to build teams across disciplines.

20.3.7 Methods - Analytics and measurement

- Getting beyond association
- To move from associated variables to causation requires either experiments or longitudinal studies. Spaces in which good experiments can be performed, and retaining subjects within longitudinal studies are key methodological challenges.
- Meaningful metrics
- Which metrics can be developed to capture activity more meaningful than celebrity and influence?
- Measurement: Administrative and trace data was not collected using a process that is designed to produce valid and reliable research data. A key issue is how can we measure variables of interest that are not part of the data, at least not directly. We need to move beyond simple-minded ideas of positive or negative sentiment to measure much more complex concepts of theoretical or policy interest.

20.3.8 Methods - Combining old and new social research methods

- Found and made data: The social sciences have traditionally 'made' data through surveys, interviews, and experiments; the humanities have 'found' historical sources and aesthetic works. With partially self-documenting digital technologies, a growing mass of data about social, cultural, political, and economic issues can be found - even if other data still need to be made and conferred with found data.
- Small data: How might 'small data' be rethought under the rush within the social sciences toward big data?
- Small data in an age of big data How to safeguard and integrate qualitative forms of inquiry with other, quantitative and big-data approaches to the study of social life.

20.3.9 Methods - Concepts

- Context: how do we understand context, esp. as data scales
- Critical Big Data methods.
- How to operationalize the insights of critical Big Data, critical GIS and algorithmic governance scholars?
- Going beyond the obvious
- Using innovative methods to research not only understandings but also practices
- Scale: what is the unit of analysis? what is meaningful?
- Temporal: At what point in time is something data? when is it meaningful?
- Not enough (social scientific) understanding of the ways in which data visualisation software constructs data in particular ways, what the software constrains and enables.

20.3.10 Methods - Social measures

- Methods for assessing differential effects of algorithmic governance and Big Data.
- Effects are uneven at different scales (local, regional, national, transnational). Not just opportunities but negative effects (e.g.., environmental justice concerns).
- Methods for capturing spatial and social disparities.
- Spatial data analysis, geo-statistics, GIS, mapping skills needed to capture the different geographies at stake.

20.3.11 Methods - Understanding and developing new research methods

- Innovation: How might key social science inquiry grapple with the rapid pace of innovation and digital platform obsolescence?
- Interrogating algorithms
- How do you investigate algorithms given that they are often developed through an iterative process, and also that few possess the technical skill to do so?
- Methods for studying the App space

	• The App space produces a great deal of data to which academics have little access. Other, less data-driven methods for the study of the App space are needed. • Not enough (social scientific) understanding of digital methods like social media analytics, and their limits. • Unstructured data: The social sciences are challenged to devise ways to systematically acquire and analyse large volumes of unstructured textual and audio-visual data made available by the web. • Using social media for prediction: How and why to study social media as anticipatory? • One dataset is not like another: Too often research abstracts 'data' from the specific domains it belongs to. Data about health is very different from mobile phone data, from data about schools, from data about social media interactions. We need research to study data in context, and only to generalise based on a synthesis across cases. • Online data collection at the end of the Web 2.0 era: APIs are becoming increasingly restrictive in the data they supply, creating a data divide between corporate in-house researchers and publicly funded scientists 20.3.12 Social theory and social questions - Social theory and social questions • Mapping: How do you find out where big data systems are being introduced across government and business advice systems and service provision. • Social theory and social questions - Social theory and social questions • significance • How might we understand the fracturing of the significance of digital life across demographics? • The media formerly known as people: In an age where technological mediation has come to be considered the order of the day, it remains essential to consider and study all those forms of social interaction that still depend on face-to-face contact.

21 Economy and Sustainability

21.1 Key questions

Note: this domain had a lowest response rate but with extensive multiple responses to questions. This may indicate bias to specific topics but there was strong convergence in the responses. Suggested scoping questions were not coded.

- How is the digital economy constructed through economic, cultural and political processes, and how could it be constructed to enable greater participation and sustainability?
- How to guide and assist all participating actors in the digital economy to ensure it is open to all stakeholders, sustainable and secure?
- How can the digital and society be shaped in order to be sustainable, participatory and fostering co-operation and inclusion?
- What interventions are feasible and desirable in order to shape the digital according to any set of preferences. How should those preferences be established? How should those preferences be negotiated, taking into account the global nature of digital?
- Under which conditions and in what contexts is it desirable to construct a digital world that maximizes openness and in which contexts is it desirable to construct a relatively closed digital environment?
- What conditions and problems can hinder the establishment of a participatory co-operative, sustainable, inclusive information society and digital society?
- In a given context, which approaches to openness are sustainable from a variety of stakeholder points of view? What issues of security arise in each of these contexts which then limit the openness of the digital world?

21.2 Key topics

Topics	Percentage
Role and impact of major corporate platforms	31%
Disruptive technology	12%
Environment and sustainability	8%
Forms of digital labour	8%
Governance	8%
Digital divides	4%
Digital literacy	4%
Finance and capital	4%
Methods	4%
Politics	4%
Productivity	4%
Public vs private	4%
Surveillance	4%
Theory	4%

21.2.1 Disruptive technology

- Disruption: The key question for the digital economy, especially its sustainability, is whether it 'disrupts' traditional economies
- FinTech: One of the fastest growing sectors of the digital economy, including digital payments, peer-to-peer lending and crowdfunding
- Values and formalisation/modelling: Designers of social/intelligent machines must formalise values in order to develop sophisticated computational models. What are the limits and constraints; what is lost in translation; and what impacts on society are likely in the medium term.

21.2.2 Environment and sustainability

- The internet of things as driver of sustainability
- The deployment of IOT in transport, energy, agriculture and other areas looks like a promising route to automation of our better instincts concerning sustainability.
- Digital economy and environmental sustainability
- Which role does the increasing power consumption from data centres and the increasing resource needs for new digital devices play for global climate change? And how can one ensure (with technical and regulatory means) that the resource requirements will not grow indefinitely?
- Forms of digital labour
- Digital labour: Digital media have changed the world of labour, which poses both new opportunities and risks. The realm of digital labour, including phenomena such as Facebook usage as digital labour, crowdsourcing, labour in the sharing economy, the international division of digital labour, etc. has thus far not been thoroughly studied.
- Digital labour: How are work practices being transformed as a result of new digital technologies like Uber, but also increased workplace surveillance through these technologies?

21.2.3 Governance

- The politics of digital
- The history of global internet governance and its countless offshoots. Internet governance at the level of the international subset (e.g. the EU); the nation, the region, the locality, the community.
- Enforcing local accountability for global operations
- How to create a fair and sustainable system that allocates both profits and negative externalities between enterprises and countries in which they are a) based and b) operate?

21.2.4 Role and impact of major corporate platforms

- Platform monopolies: The increasing centralisation of data collection and analysis via large corporations, and what the economic and political effects of this are
- The digital economy is comprised of platform businesses that intermediate participation and exchanges, from Amazon to Zopa.
- Digital platform governance, regulation and accountability

	• To what extent does authority increasingly default to digital system designers and/or platform owners when technology is not transparent and market structures are increasingly complex • Infrastructure: The digital economy requires and runs on infrastructures, combining software and hardware • Digital economy and concentration of power/oligopolies • Despite allegedly low barriers to entry, very few players dominate the global digital economy (especially in the areas of social media and digital-based technology/ e-commerce like Facebook, Google, Amazon, etc.). Why have these players become so powerful so quickly and what needs to be done that small start-ups still have a chance to compete and that consumers still have a real choice which solution to use? • Public platforms: How can the government provide alternative platforms to those dominated by corporations? How does it maintain the privacy of citizens if it were to create these platforms? • Limitation of the free Internet by AppStores: The two dominant AppStore holders, Google and Apple, have a powerful gatekeeper function to block or promote certain applications. This becomes highly relevant now that more and more people (only) use their smartphones to navigate the digital world. This control is a fundamental change to the free/open Internet, where any site theoretically has the same change of being found and becoming successful. How can more competition be encouraged in the smartphone operating system and appstore market? • Alternative and public service social media/Internet: Social media is dominated by the likes of Google and Facebook, which are large transnational corporations based in California. Europe has without any success tried to imitate the Californian model, with the effect that there are no European platforms among the most important social media platforms. The reason is that Europe has a strong tradition in public service media and alternative media. It is time to explore and study how a different organisational model that foregrounds alternative and public service Internet platforms could look like.

21.3 Key challenges

Challenges	Percentage
Methods and tools	47%
Access to data	13%
Ethics	13%
Representativeness of data	13%
Sustainability	7%
Understanding impact and development of algorithms	7%

21.3.1 Access to data

- Access to data
- Some platforms have open APIs, but 'big data' is increasingly big business
- Interview access
- Many digital economy firms are regularly approached for interviews, but are small and stretched for time

21.3.2 Ethics

- Ethical and societal impact assessment of digital media
- The societal and ethical impacts of digital media are not well understood. Frameworks for how to assess such impacts are needed
- Confidentiality and anonymity - research ethics
- Guarantees are meaningless if data are made available for reanalysis when identification is increasingly possible even after it has been 'anonymised'.

21.3.3 Methods and tools

- Adequate databases for literature research
- Lead times in academic journals are too long for a fast-moving topic like digitization. Literature reviews in the top journals will therefore not find the most up-to-date developments. It may be necessary to supplement literature research in top journals with good journals or with more field data.
- Mainstream economic statistics are clearly missing the digital effect of misinterpreting it e.g. with regard to productivity, income and wealth levels. This is a massive issue.
- Large scale (big) data analytics
- Access to data, knowledge of how to clean data, sophisticated skills in modelling and statistics and, most important, understanding the limits of interpretation of patterns/correlations.
- Measuring the gig economy
- There is, as yet, no clear data on the extent of the gig economy (e.g. Uber) - how many people use it, how many drivers work for it, and so on. Measuring this is important for understanding broader changes in the labour market.
- Critical digital methods
- The study of the digital is dominated by big data analytics and computational methods that cannot answer how and why humans communicate online, what the consequences are for society, and how the power structures that frame digital media look like. We need alternative, critical methods, including e.g. frameworks for societal impact assessment.
- Data Interpretation: Conducting qualitative research on value-based issues concerning new digital applications
- Users cannot assess the benefits and risks of digital applications when they are unaware of how they operate or what decisions are being made for them. This creates major challenges for how qualitative data are treated.
- Policy analysis methods
- Complexity of legal, legislative and corporate policy/practice in principle and in practice makes comparative analysis (national, global) increasingly difficult.

21.3.4 Representativeness of data

- Globalisation and internationalisation
- Being digital is predominantly being studied in respect to Europe and the USA. There is a lack of funding for research that focuses on the role of digital media outside of the West, especially in developing countries.
- Representativeness of data
- Basing conclusions on the analysis of data sets that are inevitably partial in the sense that even large scale data excludes some data and under represents some segments of the population

21.3.5 Sustainability

- The concept of digital sustainability
- Sustainability is often understood in a narrow sense. A broad concept that is theoretically grounded is needed that can be related to digital society.

21.3.6 Understanding impact and development of algorithms

- Opening up black boxes

	• The algorithms which drive a lot of the digital sector are, for the most part, unable to be accessed and scrutinised. Yet they play an increasingly central role in our world. The challenge is figuring out ways to open them up to public scrutiny.

22 Governance and Security: Delphi results

22.1 Key questions

Note: this domain had a low response rate with a limited number of multiple responses to questions. Much of this is very close to the Citizenship and Politics domain that was the most strongly responded to.

22.1.1 Privacy and access to work of government and public bodies

- How do we manage privacy in the age of WikiLeaks? Can any email or digital communication be considered private or should all Government officials, including University Professors, assume their email is open for the public to read?

22.1.2 Fake news

- How do we separate fact from fiction? Once claim being made in the current US Electoral campaign is that WikiLeaks and other hackers are trying to influence the US election by not only revealing but also manipulating the information they leak. How does the public know that leaked information is accurate?

22.1.3 Accountability for digital systems and their impacts

- In addition to regulatory oversight, how do we encourage organisations, especially companies, to recognise and accept responsibility and accountability for their actions?

22.1.4 Transnational governance of digital economy

- How do we go about making rules in the digital economy? It may be worthwhile to explore how the TPP (let's call it TPP2) might be negotiated using processes for the digital economy.

22.1.5 Algorithms and the law

- What are the risks to modern norms and practices of law as more and more of our interactions and data are defined by algorithms we do not understand or have access to, as well as by monetization processes - as these and related phenomena undermine basic conceptions of transparency, agency, autonomy, respect for the human person, etc.?

22.1.6 Human factors in cyber security

- On security, it's been said that the weakest link in security is the human element. Yet, a lot of the work seems to be in the technical/technological area. What can be done to improve the human element in security? It would like some research here would pay dividends.

22.1.7 Ethics

- How will ethics - especially the virtue ethics question of what is the good life, the good life worth living, both individually and collectively - proceed as our technological future becomes ever less predictable as it simultaneously threatens all but unthinkable outcomes? (So Shannon Vallor in her 2016 book, _Technology and the Virtues_ (Oxford University Press).

22.1.8 Agency and autonomy in digital age

- What will happen to our sense of human identity, agency, and capacities for intimate relationships, ranging from friendship through long-term relationships and parenting as AIs and social robots become increasingly human-like, thereby calling into question core notions of agency and autonomy, affection and love, etc. (Cf. the Foundation for Responsible Robotics for a much more extensive list of questions.)

22.2 Key topics

Topics	Percentage
Cyber security	37%
Governance of digital economy	11%
Government digitization	11%
Privacy	11%
Education	5%
Ethics	5%
Legal issues	5%
Methods	5%
Political communication	5%
Transnational governance	5%

22.2.1 Cyber security

- Security: How to keep information secure and private that needs to be shielded?
- Fending off cyber-attacks: How can encourage or incentivize all organizations, especially SMEs, to take actions to detect and counter cyberattacks?
- Deception detection: How to determine what is accurate and inaccurate information? How can you tell when information is trustworthy?
- Responding to cyber-attacks: What measures should governments take in response to state-sponsored cyber-attacks?
- How to address issues such as stalking and bullying, especially with young users. Children are exposed to dangerous content at a very young age even with close parental supervision.
- What degree of surety or certainty do governments need that a state has engaged in cyber-attacks and cyber warfare?
- We need to better understand the human element in cybersecurity. We should aim to understand the characteristics of those who tend to fall prey to scams and also how we might minimize the factors that contribute to failures in the human element.

22.2.2 Governance of digital economy

- Regulating the sharing economy: The sharing economy is a disruptive approach to industry. Uber and Airbnb are illegal at the outset. They require governments to close an eye (or two) and then amend the laws. How do governments do it? A multinational comparison would be useful.
- Algorithmic or automated decision-making: What responsibility does government have to research and investigate and publish instances of automated decision-making that produce legal effects concerning the individual or groups of people?

22.2.3 Government digitization

- What are the drivers of successful government digitization?
- Which digitization programs are successful, and what types of policies do they enable, etc.
- Transparency in government
- Especially as more and more governmental functions and processes move online - ranging from data collection (e.g., health information) to benefit distribution (healthcare, pensions, etc.) to "open government" initiatives, including online voting - the more vulnerable all of these are to hacking and manipulation. At the same time, in order to be legitimate and thereby legitimate democratic societies, these processes must be as open and trustworthy as possible. How to establish transparency - and thereby trust - while defending both the individual and the state against hacking, manipulation, etc.?

22.2.4 Privacy

- Privacy-preserving data analysis technologies
- Privacy should be viewed as an opportunity for innovation, not a barrier to innovation. Providing both privacy and services will foster innovation.
- Privacy / personally identifiable information / sensitive information
- The advent of Big Data approaches coupled with the more or less complete data surveillance of everyone who has a smartphone, uses a computer, etc., makes privacy protection all but hopeless. What approaches, measures, processes can be developed to ensure personal privacy - and thereby autonomy - as the core presuppositions of democratic society?

22.3 Key challenges

Challenges	Percentage
Ethics	31%
Big data and analytics	23%
Cross-cultural engagement	8%
Cybersecurity	8%
Digital divide	8%
Disruptive change	8%
Governance	8%
Transnational governance	8%

22.3.1 Big data and analytics

- Volume
- The sheer number of messages and media channels out there is staggering. Most people use selective exposure to narrow it down but that leads to ideological divides that become intractable. There's simply too much for people to process.
- Better ways of relating observational data from social media networks to demographics
-
- Developing a methodology for determining when big data algorithms are making automated decisions with legal effects upon individuals or groups of individuals.
- Article 22.1 of the new General Data Protection Regulation states that "The data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her." However, having such a right is not enough to prevent the ill effects described in Cathy O'Neil's recent book "Weapons of Math Destruction". A methodology is needed to "sniff out" such algorithmic decision-making.

22.3.2 Cross-cultural engagement

- While globalization and the Internet have arguably brought members of diverse cultures into closer contact - it is by no means clear that the majority of those using Internet-facilitated technologies are any more cosmopolitan - i.e., possessed of a deep understanding of and respect for diverse cultures, languages, practices, and norms - than their pre-digital counterparts. I've been engaged with such cross-cultural research for nearly 20 years - it is striking how far so many researchers, despite best efforts and all the good faith in the world, remain unconsciously caught within the worldview and norms of their mother culture. Yet as the Internet continues to bind us all the more together, so we need cross-cultural research that is not hobbled by ethnocentric assumptions, etc.
- Corporate censorship and other forms of limitations on freedom of expression.

22.3.3 Cybersecurity

- Developing improved methodologies for detecting cyber-attacks.
- All organisations (governmental and private sector) need to be able to quickly detect cyber-attacks or anomalies that might indicate a cyber-attack.

22.3.4 Digital divide

- Digital inequality is more than computer illiteracy. Income inequality reinforces the digital divide.

22.3.5 Disruptive change

- The rate of change
- New technologies are emerging faster than most people can learn them. Entire segments of the population are being left behind. Children know more than their parents about technology which is very dangerous.

22.3.6 Ethics

- Developing a widely agreed, easy-to-use ethical impact assessment (EIA) methodology
- An EIA can be used to identify and assess the ethical risks and benefits of a new technology or service in consultation with stakeholders. As yet, there is no widely agreed methodology or standard for an EIA.
- Maintaining Human Subjects Protections - privacy, confidentiality, anonymity, informed consent - in the era of "Big Data" research
- Human Subjects Protections are the core of research ethics, including internet research ethics, at least so far as we are examining human interactions, not solely texts that might count as publications otherwise only subject to copyright protections, etc. As the Facebook study of 2012 demonstrated, it is trivially easy for such corporations to manipulate - without their knowledge, much less their consent - hundreds of thousands of persons in the name of "research". Allied problems also arise with so-called grey data (private / PII / sensitive information leaked into the public by a hack, thereby available to bona fide researchers.)
- Power: as research is increasingly driven by interested stakeholders - whether corporations or governments - how are academic researchers to maintain traditional commitments to objectivity, truthfulness, accuracy, etc., e.g., when the results contradict those desired by those paying for the research?
- Especially as traditional and relatively neutral sources of research funding become stretched thin, researchers are turning more and more to governments (including local governments) and/or corporations for support. This creates enormous power imbalances vis-a-vis the researchers and their disciplinary / scientific commitments to neutrality, objectivity, etc. Such imbalances thereby threaten to undermine trust in such research. Yet such research becomes all the more critical as our lives are increasingly interwoven with and defined by digital technologies and the interactions they make possible.
- Protecting the researchers.
- As researchers are increasingly "public" or at least discoverable - they and their research are ever more the target of those focused on by the research, e.g., right-wing and other violent extremists (so the VOXPOL project). Similarly, female researchers and journalists are increasingly targeted - e.g., as "Gamergate" researchers have discovered. At the

	same time, however, these more toxic if not violent and clearly dangerous "communities" and their participants are all the more important to understand if they are to be successfully countered, or at least contained, in the name of democratic processes and norms (including gender equality). How to do so? 22.3.7 Governance • Cross-national comparison in regulations of the sharing economy • A quick way to understand how something like the sharing economy might be regulated is to look at how various countries do it. Such cross-national comparisons, however, pose many challenges.

23 Health and Wellbeing: Delphi results

23.1 Key questions

23.1.1 Design for positive health impacts of digital technology use

- What types and amounts of technology make us healthier, better educated and more secure?
- How can we design technology assist in making us healthier, better educated and more secure?
- How can we design technology to support us being healthier and thrive psychologically?
- What are the best practices/processes in the design of technology that will make us healthier, better educated and more secure?

23.1.2 Health behaviour and using digital technologies

- How do people engage with technology to improve health and wellbeing?
- You could extend well-being to personal and social well-being
- What motivates people to be healthier, better educated and more secure, and how can these motivational drivers be incorporated into technology?

23.2 Health user needs

- What are the factors that lead to development of health information technology programs that meet the needs and capacities of different users?
- How can research be used to guide the strategic development of health information technology programs that meet the needs of different users?
- How can we engage different technology users in developing and implementing strategic health information systems that will meet their health information and support needs?

23.2.1 Negative health impacts of digital technology use

- What isn't asked here though is if technology is also hurting health. I.e. is it replacing going to the doctor, moving around (i.e. not just sitting in front of a computer all the time), too much sitting, lack of social ties, etc.?
- Does the use of digital technology contribute positively to our health and well-being?

Note: The ESRC scoping questions covered "education" but very few respondents focused on this. At the same time given the huge range of work in Educational Technology, the project did not include this data here as it was unrepresentative.

23.3 Key topics

Row Labels	Percentage
Device, environment and service design	31%
Benefits and harm from digital technology use	15%
Health communication	15%
Education	*10%*
Device and service design	5%
Digital literacy	5%
Other	5%
Preventative and long term condition support	5%
Digital divide	3%
Organizational change	3%
Privacy	3%

23.3.1 Benefits and harm from digital technology use

- Understanding the domains of well-being the five domains of social connectedness, stability, safety, mastery and meaningful access to relevant resources
- How can potential harms of using technologies be identified and minimized?
- Mental health: What makes a healthy or unhealthy digital environment?
- What are the social impacts of technologies are used in the context of health and wellbeing?
- What ethical issues arise when technologies are used in the context of health and wellbeing?
- What, if any, are the side effects of using technologies for health and wellbeing?

23.3.2 Device, environment and service design

- Development of Health devices
- How can devices that meet the needs of users (and potential) users be best developed
- Development of Health Services
- How does the delivery of healthcare need to change to accommodate 'being digital'?
- ethics and agency
- How do we design ethically? How can systems support user agency?
- How can technologies be harnessed to benefit health and wellbeing?
- How can we design our environment to support healthy living?
- How should we build towns, cities, neighbourhoods that encourage healthy practices?
- How can we engage health information technology users to provide feedback and guidance in the development and implementation of user-friendly and effective health information systems?
- How can we improve the quality of life of people with chronic and terminal disease?
- Important to adopt a holistic approach were mental health is also incorporated
- Human computer interaction
- How can we design technology so they support, at least not hinder, our psychological wellbeing?
- Mobile health devices and applications
- Mobile apps and tools for both individual health (e.g., exercise, behaviour management) and also for provider-delivered health care (medication management, etc.)
- Person-centric and community-based healthcare service model
- How can digital tech be designed to help support a more person-centric (where more control of one's health is with them) and community-based healthcare service model
- Telemedicine and electronic health records
- Tools primarily for provider-delivered health care, and communication among providers
- Usability of digital devices
- Wearable technology
- Does it make a difference for health to use wearable digital devices that monitor health, steps, heart rate etc.
- What are the future opportunities for implementing novel and effective health information technologies, such as mobile health applications? the use of Artificial Intelligence to guide adaptive human-computer interactions, the use of virtual reality applications, the use of digital gaming, and the integration of digital health information systems in everyday life (in homes, schools, businesses, churches, recreational activities, restaurants, and entertainment events/programs).

23.3.3 Digital divide

- The digital divide: the gulf between those who have ready access to computers and the Internet, and those who do not

23.3.4 Digital literacy

- Digital literacies
- Digital literacy
- Individual digital literacy: Physical and mental capacity, skills, training, and experience and inclination

	23.3.5 Health communication • Are physicians better able to communicate with their patients using portals and emails etc. • How does the health care system start allowing time for physicians to use websites, portals, and emails to help patients? • Health communication and information via online platforms and environments (e.g., social media) • Search and consumption of health information health-related communication and information sharing (including social support) in digital environments • How can we design health information technologies to communicate effectively with different audiences on both content and relational levels? • How can we use health information technologies to promote coordination, cooperation, and the sharing of relevant health information between different relevant participants in the health care system? • How do people decipher or sort good vs. bad health information? • for instance, while I would trust Mayo clinic, I know adolescents find pro-anorexia websites etc. How do people sift the information? • What are the best ways to reach and influence different audiences with health information technologies? 23.3.6 Organizational change • Reorganization of professions and institutions of health care delivery • Role of technology in potentially reshaping the professions and institutionalized structures and mechanisms of health care delivery 23.3.7 Preventative and long term condition support • Preventative health of non-communicable diseases • Need to focus on preventative heath to reduce the burden of chronic disease on individuals and economic burden of healthcare systems following an aging population • Support for people with long term conditions • What support in 'being digital' do people living with a long-term condition want? 23.3.8 Privacy • Information privacy and security • Across multiple levels, from doctor-patient to within health care settings (e.g., hospital) to across communities, and for privacy and security in so called "big data" applications and analysis

23.4 Key challenges

Challenges	Percentage
Methods	46%
Co-design	21%
Collecting and accessing data	14%
Rapid change	7%
Big data	4%
Education	4%
Interdisciplinarity	4%

23.4.1 Co-design

- Co-design and participatory design
- Design with service users as opposed for users. Can dramatically increase acceptance of healthcare services as users have a stake in its design.
- Prototyping
- Prototype different solutions quickly to be able to find which work the best and then dedicate development efforts on the one proven to be the most effective
- How can we engage technology users as research partners in evaluating and designing health information technologies that meet their needs?
- Service design
- Use service design methodologies to design services with service users and providers that take a holistic approach and identify barriers and solutions
- Design fiction and speculative design
- Help engage the public and service users in the development of preferred futures. The creation of design fiction prototypes help in generating critical debate and reveal insights with regards to the socio-ethical aspects of technology and services
- What are the key factors (variables) to use in designing tailored interactive health information systems that meet user needs and communicate sensitively, meaningfully, adaptively, and persuasively with different users?

23.4.2 Collecting and accessing data

- longitudinal data
- Pew is about the only data I know that provides great longitudinal data.
- user data access
- generally large user bases, and data about the impact of tech on users is available to large corps only
- De-identification and data anonymization methods
- Capturing data across multiple virtual and physical sites (mobile data)

23.4.3 Interdisciplinarity

- disciplinary differences
- different disciplines are needed but do not collaborate

23.5 Methods

- adopting a mixed methods approach
- incorporating both breadth and depth of phenomena
- Developing online research methods
- Being digital as researchers creates a need to develop new research approaches, including research ethics in digital worlds
- How can we unobtrusively track utilization of health information technologies?
- research methods that help us assess long term impact of tech designs
- Consumer use and behaviour around mobile devices and apps for health
- analysing quantitative and qualitative data
- How can we track the effects of using health information technologies on important health outcomes (cognitive, behavioural, physiological, and financial outcomes)?
- Technologies demand methodological innovation.
- Measurement of both intended and unintended consequences of technology use within health care settings
- Requires ethnographic and other qualitative data as well as more standard record data, and observational and survey type data.
- interviews
- qualitative research about how people find health communities online are fascinating, but there aren't many.
- interpreting the outcomes of the analysis
- Representing visual data
- How can we gather valid (unbiased) deep information about the personal influences of health information technology use on user beliefs, attitudes, values, intentions, and feelings of efficacy?

23.5.1 Rapid change

- timely information

	• data is quickly out of date because the digital world changes so quickly • Technologies are being developed faster than research, so timing and usefulness of answers to questions is an issue.