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JHEP

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Cultural Heritage and Global Change : a new challenge for Europe

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2 - Real-Time Delphi Study on the Future of Cultural Heritage Research

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PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Glossary

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CH	Cultural Heritage
DCH	Digital Cultural Heritage
JPI	Joint Programming Initiative
SRA	Strategic Research Agenda

Executive Summary

Foresight methods have been used by the JPI to provide a structured, forward-looking assessment of the possible landscape for cultural heritage research over the next decade and beyond. The Real-Time Delphi Study is one of the Foresight methods used to assess the potential changes in technologies, society, the environment and the economy

Views on key drivers

Around 100 participants from 16 countries in Europe provided their judgements and feedback on a range of technological, social, environmental and economic drivers of change that had been analysed in a previous part of the Foresight study. By asking the experts to comment and rank the group of 20 drivers included in the survey, a picture emerges of their potential impact and implications. Likert scale questions (1-10) were used to capture these judgements (and their self-assessed levels of expertise in these areas).

The two drivers/themes judged to have the greatest impact were Tourism and Transport, and Digitisation of Society. It should also be noted that these are the two drivers where participants expressed the highest levels of expertise (1st=digitisation of society; 2nd= tourism and transport). The other two drivers that make up the 'Top 4' – with average scores across the cohorts of above 7.0 – were Social Capital, Mutuality and Volunteering, and Global Migration and Mobility.

Future Impact of Drivers - Overall Scoring
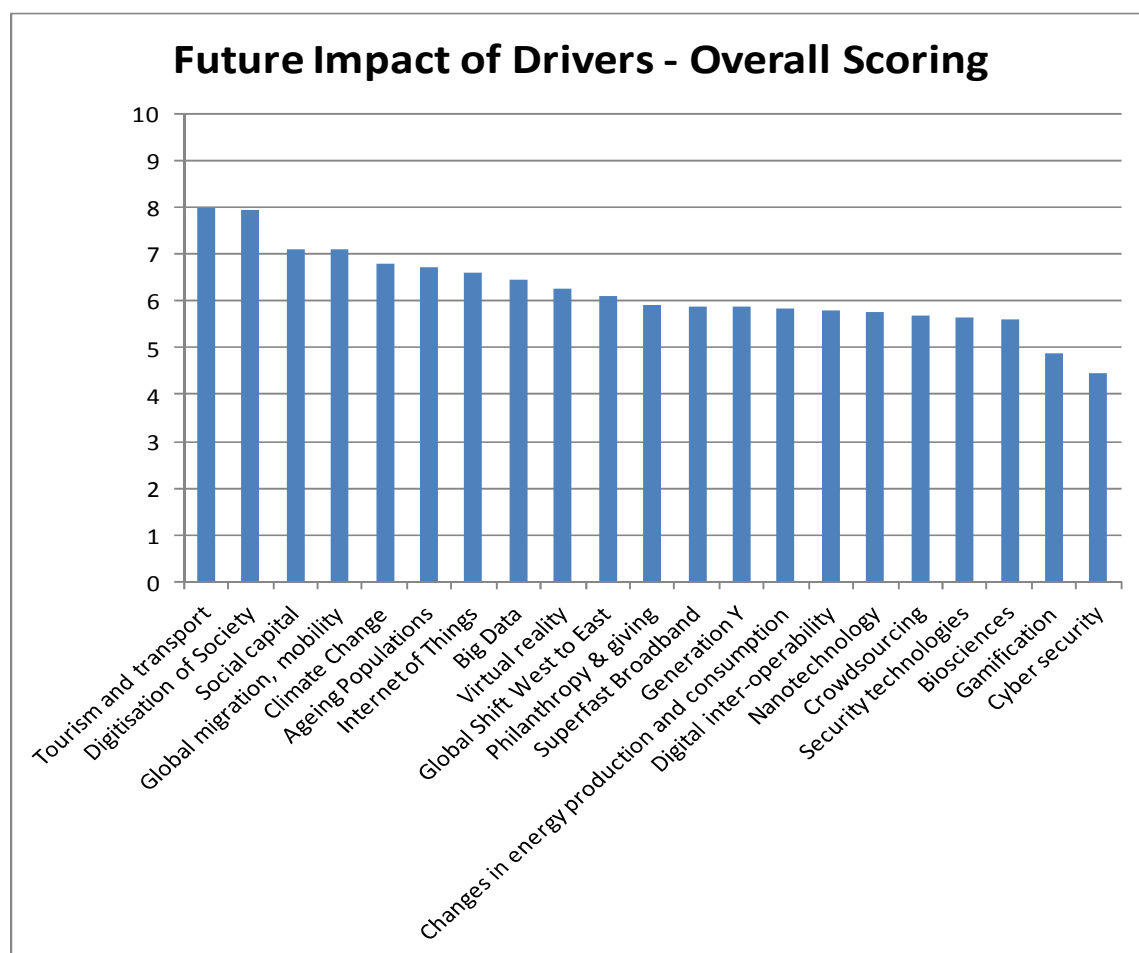
Views on the cultural heritage research environment

Participants were also asked to give their judgements on anticipated changes in the cultural heritage research environment. The key results are summarised below.

Movement towards cross-disciplinary research: there was a high level of consensus amongst respondents that cultural heritage research will become more cross-disciplinary. This is already an established approach which is likely to continue and become more significant in future.

Impact and instrumentality: participants thought that cultural heritage research would become increasingly linked to achieving economic and social goals. This view was stronger for economic goals for policy – where there would be economic or commercial returns for investment in research.

Europe to assume the mantle for funding cultural heritage research: Participants were asked to judge the significance of a range of identified funding sources for cultural heritage research – both the present/recent situation and that anticipated in future. The most significant funding sources at present for the group are, in order: national; regional/municipal; EU. Participants anticipated that national and regional/municipal funding would become proportionally less significant in the future, whilst the EU would become more significant than at present – and the most significant of all sources. They also thought that Private giving, Business and industry, and International Foundations would become significantly more important in future.

Involving users in research: respondents anticipated an increase in the involvement of users in cultural heritage research. Overall, this was regarded as a positive development

Concerns over education and training: it is clear from the scores provided that most respondent groups do not feel that there is an adequate supply of education and training for cultural heritage research. Some of the key factors identified are: lack of inter-disciplinarity/cross-disciplinarity; lack of dedicated programmes for cultural heritage researchers; and inadequate funding for participants to take up programmes available.

1. Introduction

The Joint Programming Initiative, *Cultural Heritage and Global Change: a new Challenge for Europe*, is developing a Strategic Research Agenda (SRA) for the field of cultural heritage, with a horizon of 10-20 years. Foresight and futures methods are widely used to support the process of developing research policies and strategies. One of the activities to inform and define the SRA is a Foresight Study on Cultural Heritage. This report presents the results of one of the elements of the Foresight Study: the Real-Time Delphi Study on the Future of Cultural Heritage Research.

Almost 100 experts from across Europe participated in the Real-Time Delphi. The participants were drawn from the three main dimensions of cultural heritage generally recognised in the field (tangible, intangible, and digital), and from a range of professional categories (Research, Government, Practitioner and Funding Agency).

The main aim of the Real Time Delphi Survey was to elicit the judgements of these experts on a range of possible drivers and changes that might impact on the field over the coming years, and factors shaping the cultural heritage research environment. Participants were presented with a series of questions to probe areas of significance for cultural heritage research – with a horizon of 10-20 years. Both numerical (Likert scale) and textual responses were included within the survey.

This report presents the results of the Real-Time Delphi Study and synthesises the textual responses made. A larger number of comments were made by respondents on the higher ranked drivers.

Within the text, comments made directly by respondents are reported in italics, whilst synthesised comments, inferred from responses, are presented in a normal font.

2. Methodology

This survey was completed using the Real Time Delphi method. Delphi studies are used to capture judgements on possible future developments. Originally developed in the 1960s, Delphi studies have been used to explore the possible trajectories of a wide range of topics, from technologies to health.

Real-Time Delphi uses the same principles as 'standard' Delphi – of collecting judgements, providing feedback, seeking explanations for variations in judgements, and so on. The main difference is that Real-Time Delphi is done in one, open round – rather than through several rounds. Participants are encouraged to re-visit the Real-Time Delphi when the survey is open – as it will collect and feedback new judgements on an ongoing basis.

Since 2006, the Millennium Project has used Real-Time Delphi in a number of applications, including decision-making (DARPA), and scenario construction (UNESCO).

Target participants were identified through the JPI consortium. A total of 208 invitations were sent to complete the survey. The maximum number of respondents for an individual question was 99 (on this basis a return of 48 per cent). Other individuals had registered on the system but had not submitted any responses. A small number of individuals reported technical difficulties and were not able to complete the survey.

The survey was run using the Millennium Project's Real-Time Delphi system. It was open from 26 October 2012 to 3 December 2012.

Two-thirds of the questions addressed economic, technological, social and environmental drivers. The format used for these questions were:
- Judgement on impact for cultural heritage (Likert scale)
- Time horizon where this would be most significant (ranking of time horizons)
- Implications for cultural heritage research (free text)
- Participant's level of expertise in this area (Likert scale)

The remaining questions addressed factors shaping the cultural heritage research environment. In many of these questions, participants were asked to distinguish between the current/recent situation and the anticipated future environment.

3. Profile of Participants

Work directly related to cultural heritage

The majority of participants (81 per cent) stated that their work was directly related to cultural heritage. The remainder (19 per cent) stated that their work did not relate directly to cultural heritage. Although the survey was intended primarily for experts working in the field of cultural heritage, the minority who did not identify themselves as such had been nominated because of knowledge that could be applied to the field
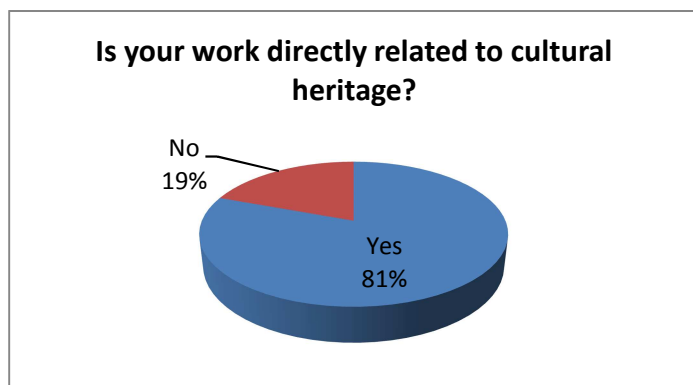

n=98

Primary area of cultural heritage

Three primary areas of cultural heritage were given as options to those that had answered 'yes' to the previous question (only one option was possible). A large percentage of respondents stated that their work was in 'Tangible' cultural heritage (68 per cent). This was followed by 'Intangible' (17 per cent) and 'Digital' (15 per cent).
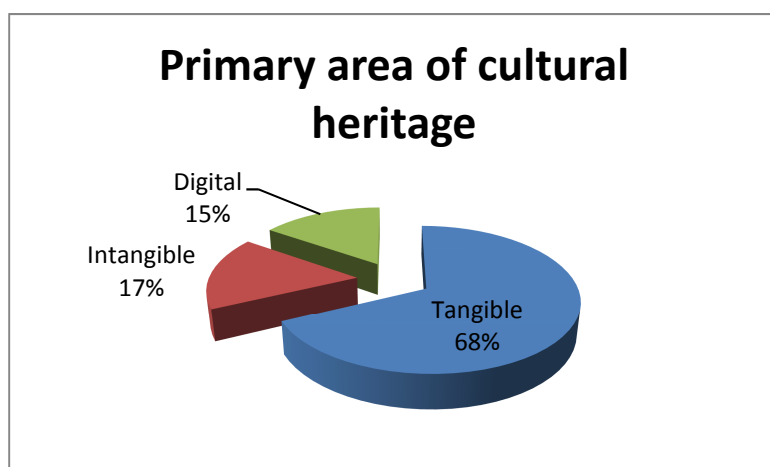
n=78

Primary profession

Respondents were asked to select a 'Primary profession' from a drop-down list. A sizeable majority came from a 'Research' background (72 per cent), followed by 'Government' (9 per cent), 'Practitioner' (8 per cent) and 'Funding Agency (2 per cent). A further 9 per cent came from 'Other' professions.
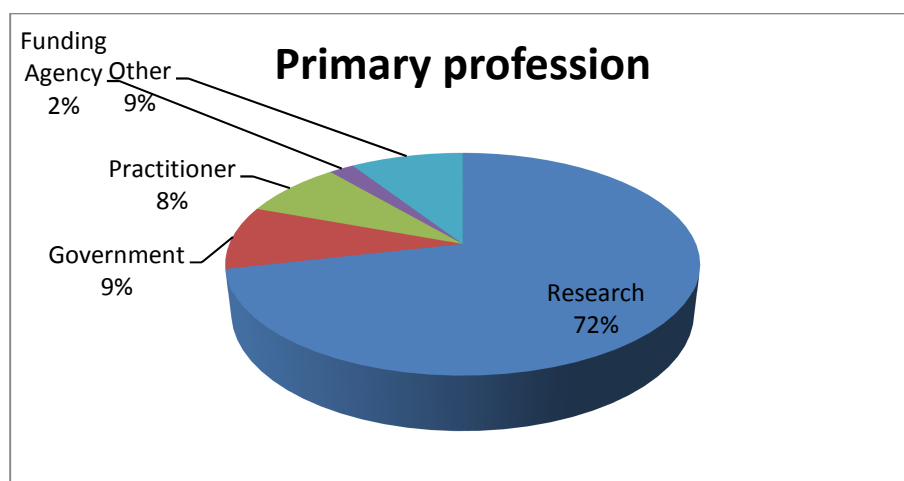
n=98

Country of participants

Participants from 16 countries responded to the Real-Time Delphi.
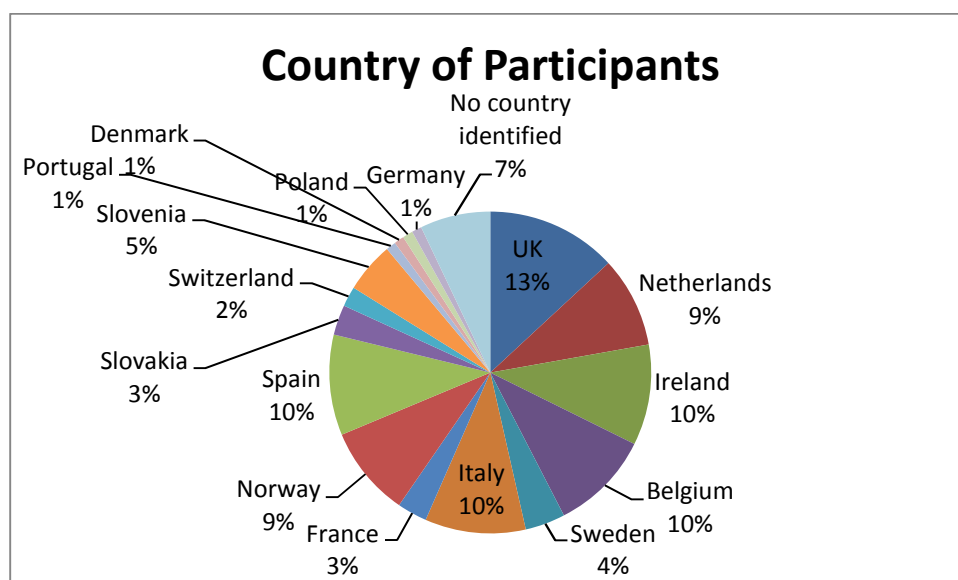

n=99

4. Overview of Results for Drivers

The two drivers/themes judged to have the greatest impact were tourism and transport, and digitisation of society. It should also be noted that these are the two drivers where participants expressed the highest levels of expertise (1st=digitisation of society; 2nd= tourism and transport).

Significance of Drivers - Overall Scoring
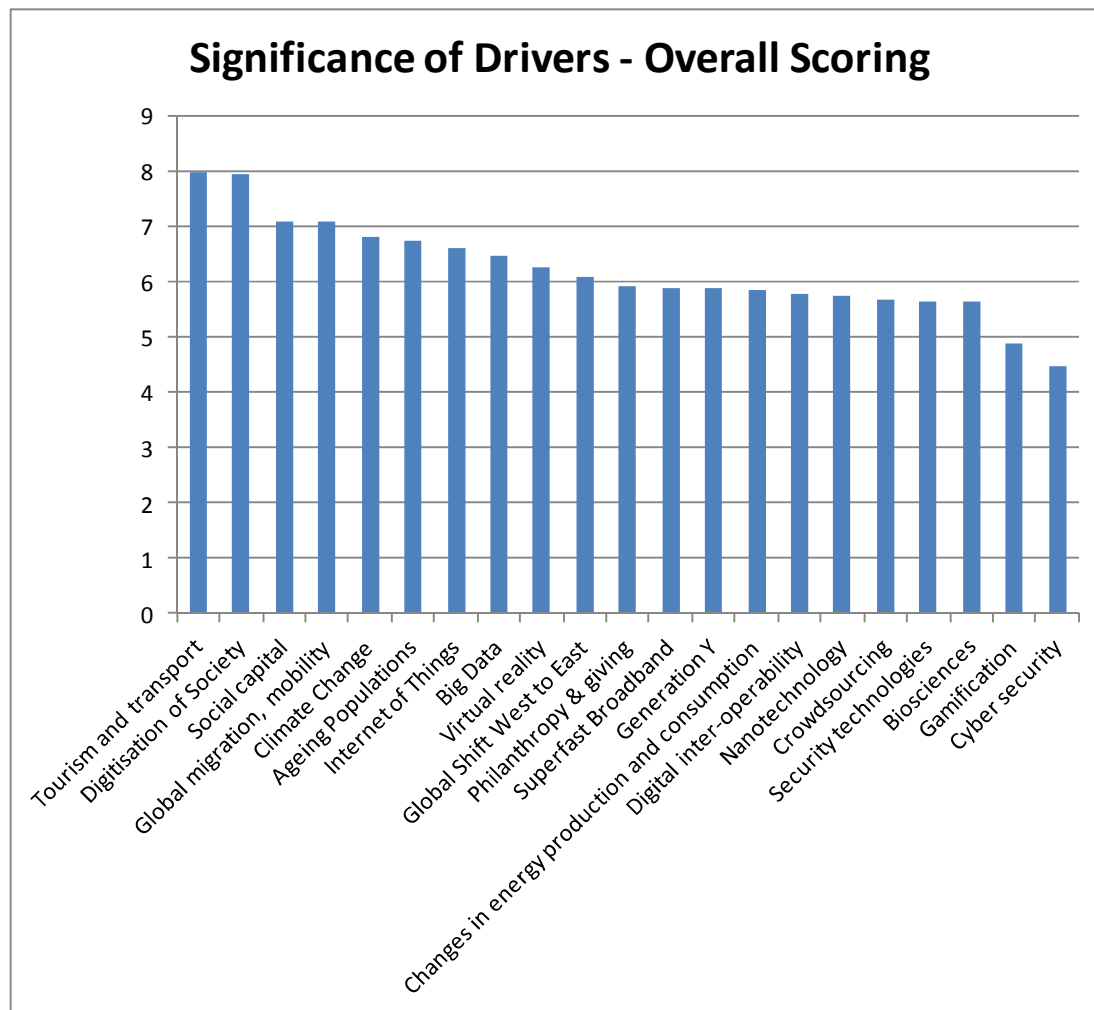
Top 10 Drivers – Future Impact for Cultural Heritage

		Impact	Expertise
1	Tourism and transport	7.97	6.03
2	Digitisation of Society	7.93	6.31
3	Social capital	7.08	5.55
4	Global migration, mobility	7.08	5.17
5	Climate Change	6.79	5.24
6	Ageing Populations	6.73	5.72
7	Internet of Things	6.61	5.53
8	Big Data	6.46	5.66
9	Virtual reality	6.26	5.1
10	Global Shift West to East	6.09	5.24
11	Superfast Broadband	5.89	4.82
12	Generation Y	5.87	5.24
13	Changes in energy production and consumption	5.83	4.81
14	Digital inter-operability	5.78	5.06
15	Nanotechnology	5.75	4.19
16	Crowdsourcing	5.67	4.73
17	Security technologies	5.63	4.88
18	Biosciences	5.62	4.32
19	Gamification	4.87	4.15
20	Cyber security	4.47	4.34

The two themes with the least perceived impact were cyber security and gamification. One element that is consistent in the results is that the participants' (self-rated) level of expertise in these areas was lower than the impact score that they provided for the drivers (see Radar chart 'Impacts of Drivers and Participants' Levels of Expertise').

Impact of Drivers and Participants' Levels of Expertise
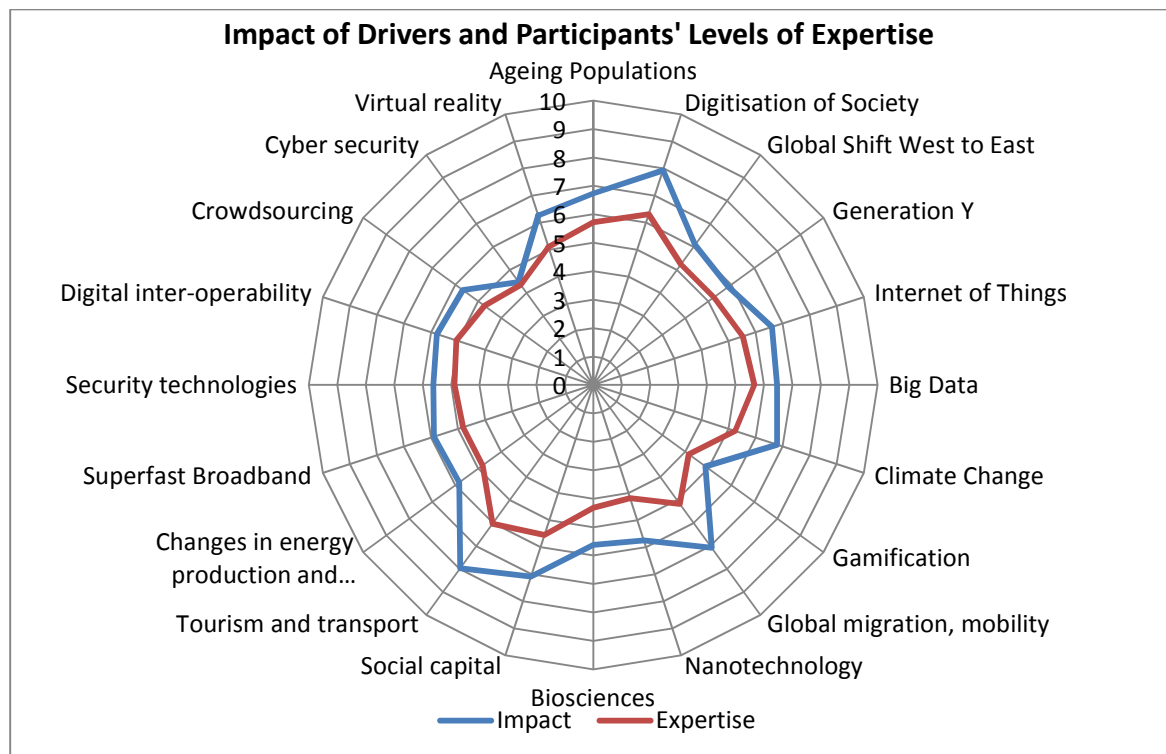
The highest level of expertise registered was for 'Digitisation of Society'(6.31) followed by 'Tourism and Transport' (6.03). The top 2 drivers were the same both for impact and level of expertise. This begs the question whether participants provide greater impact scores for drivers where they have higher levels of expertise. The results suggest that there is some association; participants gave lower impact ratings where driver themes in which they had lower levels of expertise.

Average impact and expertise scores for the Top 10 and Bottom 10 Drivers

	Top 10 Drivers – Impact	Bottom 10 Drivers - Impact
Average impact score	6.9	5.54
Average expertise score	5.56	4.66

5. Individual Drivers: results



Wordle: Digitisation of Society

Tourism and Transport (#1)
'Developments in tourism and transport will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
Tourism and transport is the highest-ranked driver for its anticipated future impact. The average future impact score for Tourism and Transport across respondent profiles was 7.97. The highest average ranking was given by the Practitioner group (9.0) whilst the lowest was given by the Digital group (7.15).

Many respondents emphasise the established links between cultural heritage tourism and transport. **Cultural heritage has been viewed as an economic driver of tourism and travel**. It is anticipated that this will continue to be the case over the coming years.

Impact of Tourism and Transport by Profile
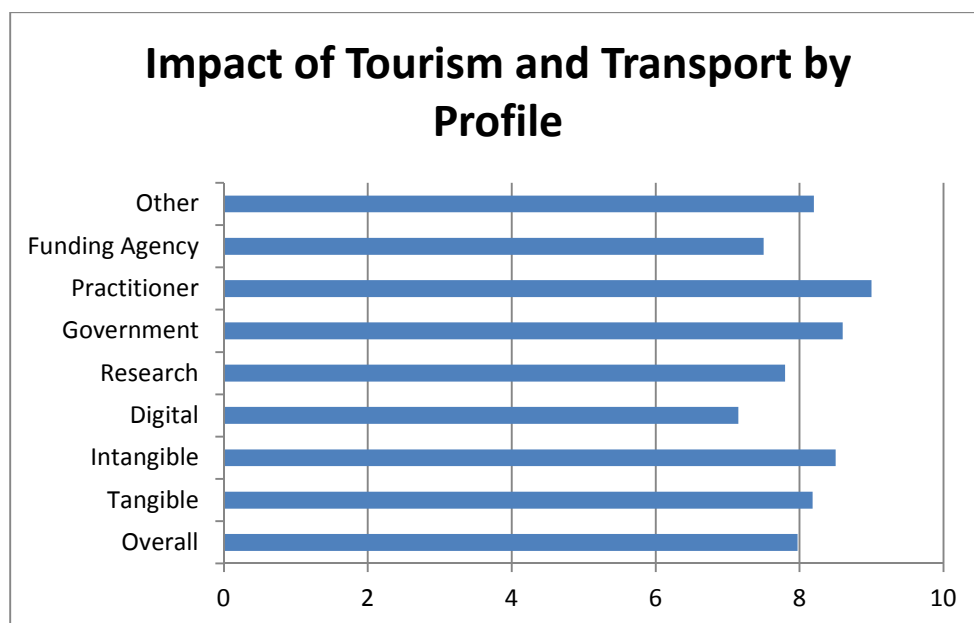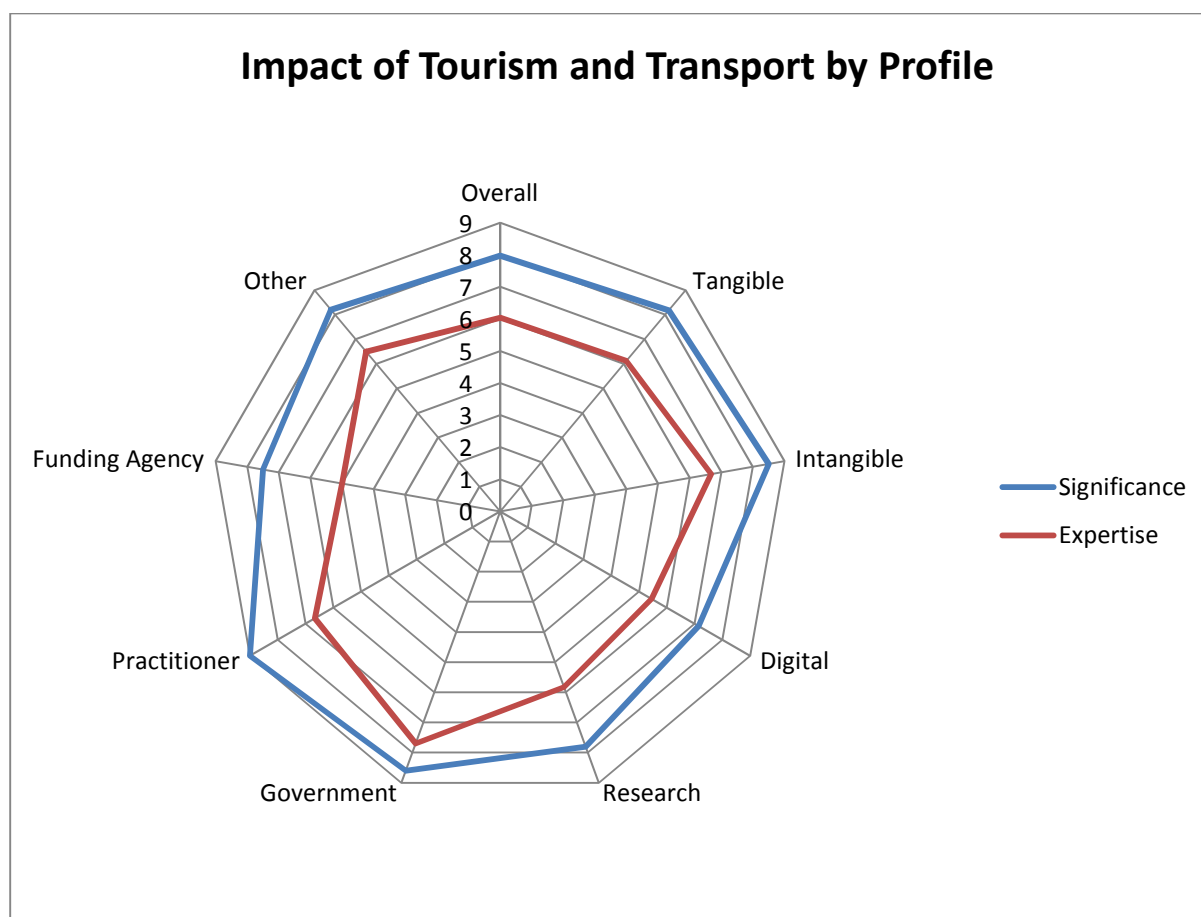
Mean	Min	Max	Median	Std<
7.97	4.5	10	8	0.205

Count: 67

One of the assumptions underpinning most of the responses is that travel will remain relatively cheap and affordable in the next decade or so (e.g. cheap air travel in the European context). Participants refer to increased demand for cultural heritage sites as a result. Whilst broadly supporting access to cultural heritage sites – promoting awareness and appreciation of cultural heritage – a common thread running through responses is the danger of physical stresses and degradation. A suggested response – cited frequently – is the constant monitoring and researching of cultural heritage sites. Another mechanism for avoiding congestion and degradation in cultural heritage 'hot spots' would be to encourage tourism around lesser known sites (libraries, archives, small museums) and '*to cities / towns / places other than the usual "art cities"*'.

Although the aggregate view of the group was that tourism and transport would have a very significant impact on cultural heritage, some alternatives were presented. With the advances in digital technologies and increases in energy prices, one participant stated that '*tele and virtual tourism will take the place of much physical travel'.*

Implications for cultural heritage research
  ▪ Physical and economic impacts of cultural heritage, e.g.

- *Research should include an examination of current problems with cost-effective, easily-implemented mitigating programmes followed by awareness campaigns for tourism and transport providers.*
- *More understanding of the tourism and transport sector is needed to develop sustainable cultural heritage strategies.*

- *Research on empowering local communities in dealing with heritage, not necessarily having "profit" from tourism is needed*
- *Research topic "Economy of Culture" should be one of the research priorities.*
- *In situ conservation and restoration of CH and open access to the public are crucial in this area*

Digitisation of Society (#2)
'The digitisation of society will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The digitisation of society was the second highest ranked-driver in terms of future significance. The average future impact score for Digitisation of Society across respondent profiles was 7.93. The highest average ranking was given by the Funding Agency group (9.0) whilst the lowest was given by the Intangible group (6.79).

Many participants point to the existing impact of digitisation on cultural heritage, and anticipate that this will continue, and become even stronger in future. This is summed up by one participant's response:
> *Digitization is already impacting upon all aspects of cultural heritage and will continue to do so.*

Impact of Digitisation of Society by Profile

Impact of Digitisation by Profile
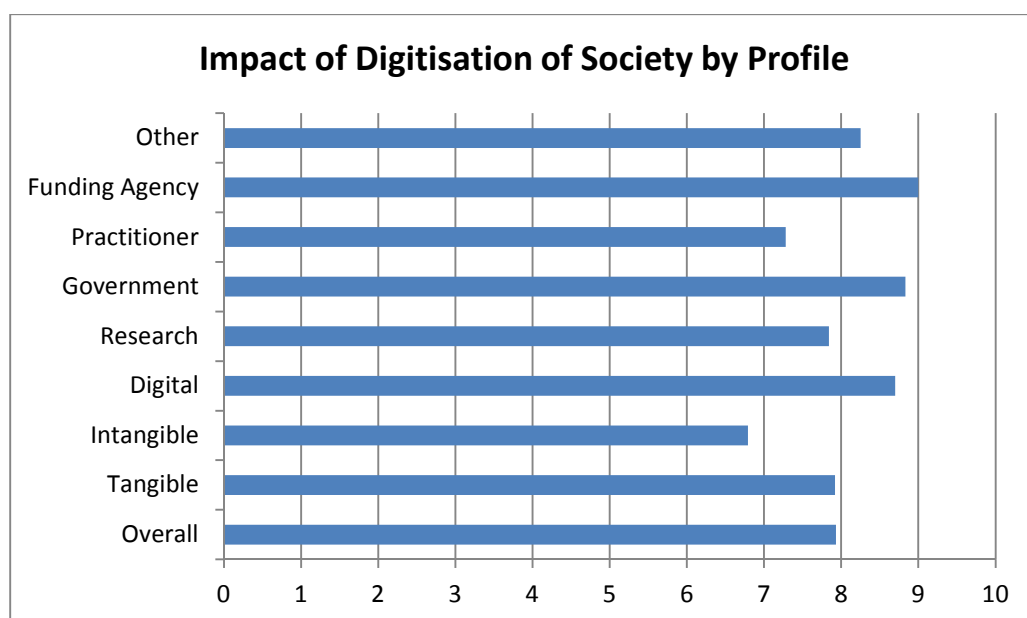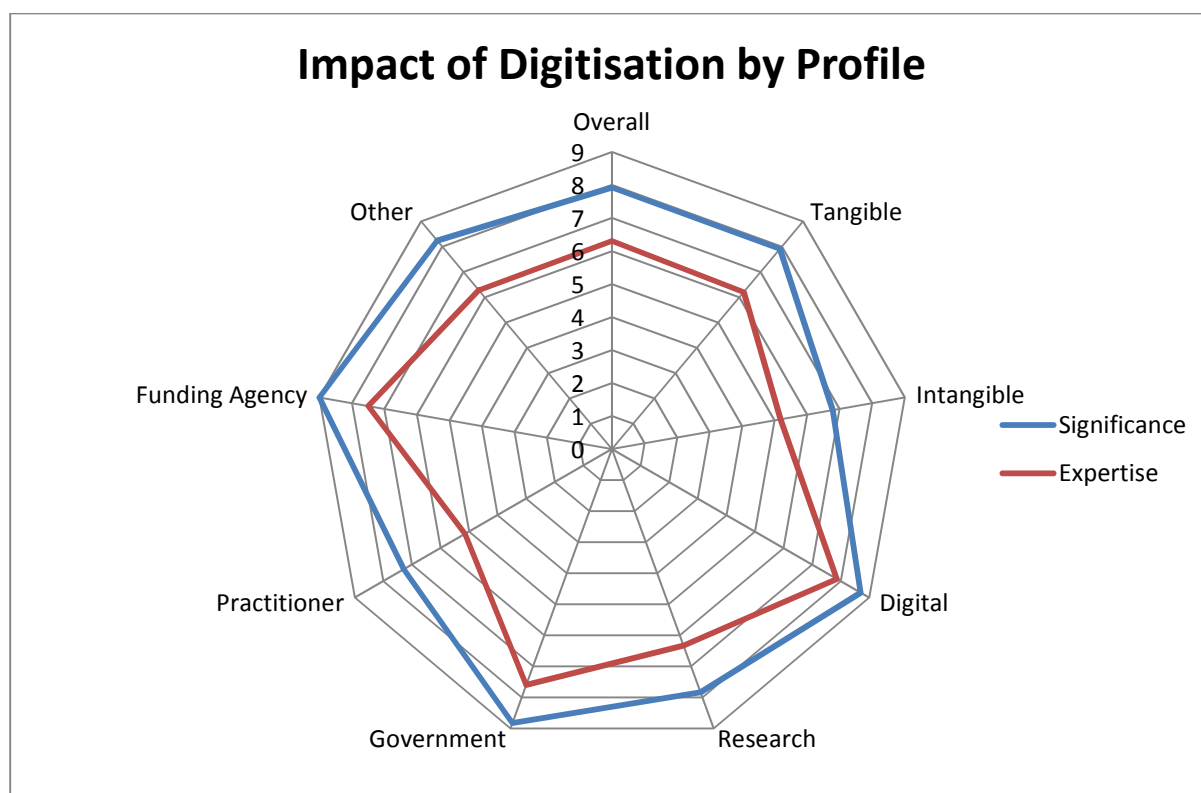
Count: 85

Mean	Min	Max	Median	Std<
7.93	2	10	8	0.188

The comments made on digitisation and its impact are broadly positive, but with some qualifying remarks. Participants cite a core set of significant issues for digitisation and cultural heritage. These have been clustered into three (related) themes:

Democratisation and access
Digitisation has a 'fundamental role in the democratisation of cultural heritage'. Participants pointed to the positive nature of democratisation as a principle. Some went further in suggesting that

> Digitisation may well be the saviour of many forms of cultural heritage'. In addition to the preservation and communication of cultural heritage, digital technologies have an important role in engaging users and 'audience participation'.

Sustainability and durability, archiving
There were some notes of caution in the broad welcoming and recognition of the democratisation effects of cultural heritage.

> It [digitisation] is inherently democratic but an assurance of sustainability will be essential'.

The point about the sustainability and durability of digitised cultural heritage was raised by several participants and 'the possibility of other imminent technological solutions to encoding and preservation of material culture should not be ruled out'.

The increasing number of 'born digital' project presents new challenges in accessing and archiving vast amounts of digital data.

Interpretation

The third main theme is the impact of digitisation on the way cultural heritage is interpreted.

> *The digital revolution will be reflected in all aspects of life, including what we perceive as heritage.*

> *The digital is already as much part of our cultural heritage as the physical.*

Timing of impacts

Several respondents thought that digitisation of cultural heritage is still in its early stages. One suggested that the impact would be much greater 10 years from now, including developments in virtual reality. Over this period, it is also anticipated that there will be a decrease in the proportion of people that are not computer literate.

> *The generations with increased digital literacy will hit museums post-2020.*

Other suggested that it was very difficult to look beyond 2020 given the potential (and uncertain) developments in technology.

Implications for cultural heritage research:

The main implications raised for research are summarised as follows:
- Increased efficiency, enabling large-scale projects and teamwork
- Emphasis on analyzing large data sets and answer big questions
- Stimulating and enabling new research areas and inter-disciplinary work
- Participation of users, enabling access and knowledge transfer
- Interdisciplinary research with living digital artists
- IPR and copyright issues related to the reuse of DCH;
  Technologies should be developed to protect the copyright with respect to duplication of works of art.
- Appropriate data management and storage strategies

Some responses flagged the strategic research responses that would be appropriate to address the digital agenda:

> *The perspective of how to utilize digital media should be more prominent on the research agenda of public and private funders, and in the strategic planning of heritage institutions.*

> *Digitisation is a heavy transformation of our approach and of our capacity to have a broad access to cultural heritage, but it underlines in the same time the importance of authenticity and originality: so, we cannot imagine that digitisation will be the only answer to heritage issues.*

> *Integration of digital resources from multiple CH organisations will enable new research questions to be addressed.*

A minority of respondents did not believe that digitisation had special implications for research, for example,

> *Less than many imagine. Since digitisation is relatively new, its impact is often overrated.*

Several respondents acknowledged the opportunities afforded by digitisation but emphasised the need for 'conventional' research. One noted:

> *Qualitative heritage research will remain important if we want to catch all cultural variations, impact of globalisation on localities, people, events or objects.*

Social Capital, Mutuality and Volunteering (#3)
'Social capital, mutuality and volunteering will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Social Capital, Mutuality and Volunteering across respondent profiles was 7.08. The highest average ranking was given by the Practitioner and Government groups (8.6) whilst the lowest was given by the Funding Agency group (6.5).

Impact of Social capital and Volunteerism by Profile

Impact of Social Capital and Volunteerism by Profile

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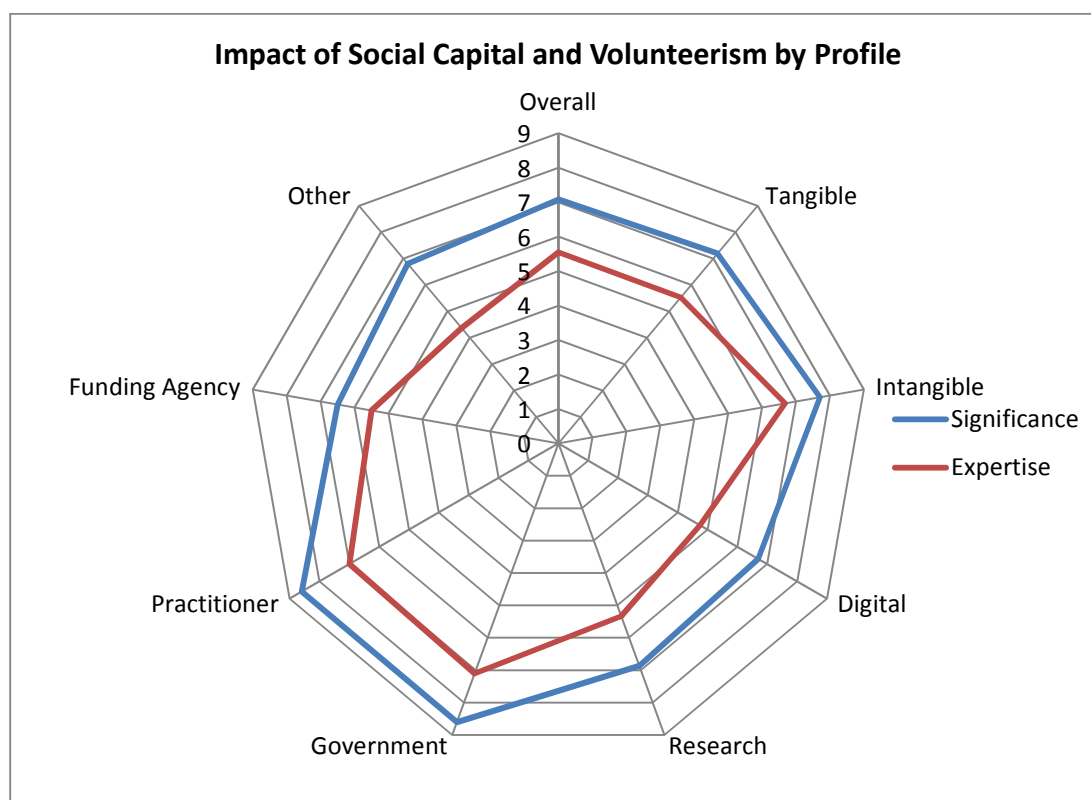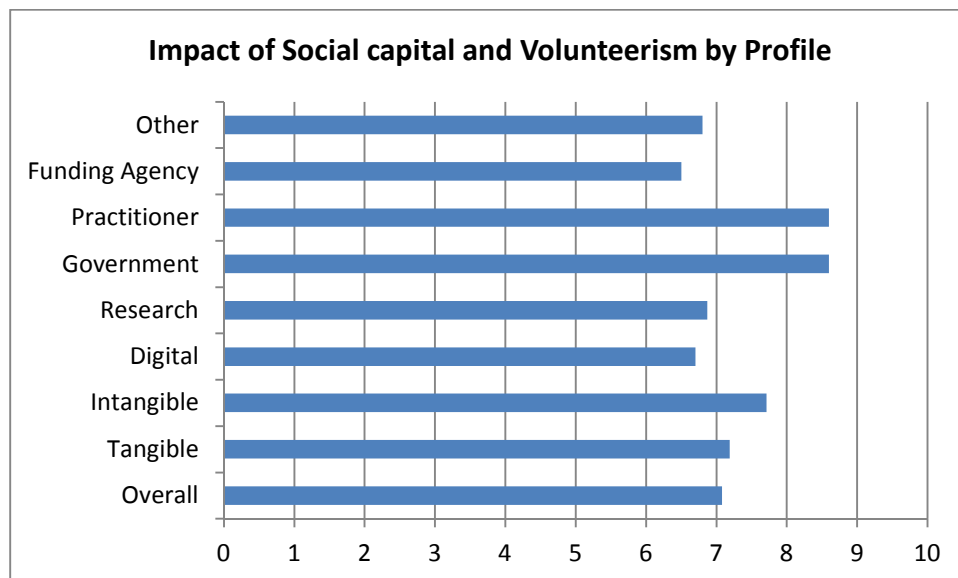
Count: 67

Mean	Min	Max	Median	Std<
7.08	2	10	8	0.264

The importance of social capital and volunteering is clearly articulated in the participants' responses. One stated that:

> *Social capital and volunteering has at most times in our history been a major factor in heritage preservation.*

Some participants conveyed the sense of an intrinsic relationship between social capital/volunteering and cultural heritage. It seen as a social embedding of cultural heritage in everyday life.

> *Volunteers and mutuality have always underpinned the valuation and conservation of heritage.*

With a future-oriented lens, participants anticipated a very significant role for social capital and volunteering. Beyond the historical associations and benefits, one of the assumptions that emerges in the responses is that there will be fewer Government resources for cultural heritage. One respondent commented:

> *This is a very important factor for example in Sweden, where there has been a huge dependency on the public financing. Public financing will most likely not increase in the future.*

Social capital and volunteering are expedient ways of filling the gap that will be left by real-terms public reduction of funding for cultural heritage. Some remarks were cynical or critical of the push towards volunteering (for example, the Big Society concept in the UK). It is unsurprising that this was an area of concern for many.

> *The sector is already reliant on volunteers to an alarming extent.*

> *Voluntary work varies a lot over Europe: sometimes it plays a very large role, sometimes it seems to be non-existent. The question is how long we will be able to maintain voluntary work, how we can give volunteers the impression we need them, how long our society can deliver work without pay.*

Whilst acknowledging the importance of social capital and volunteering, one respondent made the point that protection of and conservation of cultural heritage should:

> *Remain in the responsibility and supervision of the National/Regional/Municipal administration.*

Implications for cultural heritage research
Participants suggested some broad principles and more specific research needs for social capital and volunteering. The overall ethos and approach to research with communities was emphasised strongly by one respondent:

Research must be relevant, be context-based, in touch with communities, and collaborative as opposed to a top-down rules-based approach to communities and to all those who live with and care for cultural heritage on a daily basis.

The role of social capital was described by one participant as a
Huge blind spot in modern cultural heritage research.

This captures in one sense the broader comments that there should be a stronger research focus on social capital and civil society issues. Such research might include:

- Outreach skills;
- Understanding the motivation of volunteers – research on what makes people more engaged in heritage;
- Preventive conservation; and
- How professional and volunteer communities could work together more effectively.

Questions about "how to involve local communities" in the preservation of tangible CH (churches, monuments etc...) have to be researched in the context of interdisciplinary (psychology, sociology, behavioural sciences)...

With a general awareness of reduced Government spending on cultural heritage research, there is a need to understand how volunteering can function to support research.

Global Migration and Mobility (#4)

'Global migration and mobility will have a significant impact on cultural heritage'.

The average future impact score for Global Migration and Mobility across respondent profiles was 7.08. The highest average ranking was given by the Practitioner group (8.66) whilst the lowest was given by the Funding Agency group (5.5).

Future Impact Results by Respondent Profile

Impact of Global Migration, Mobility by Profile
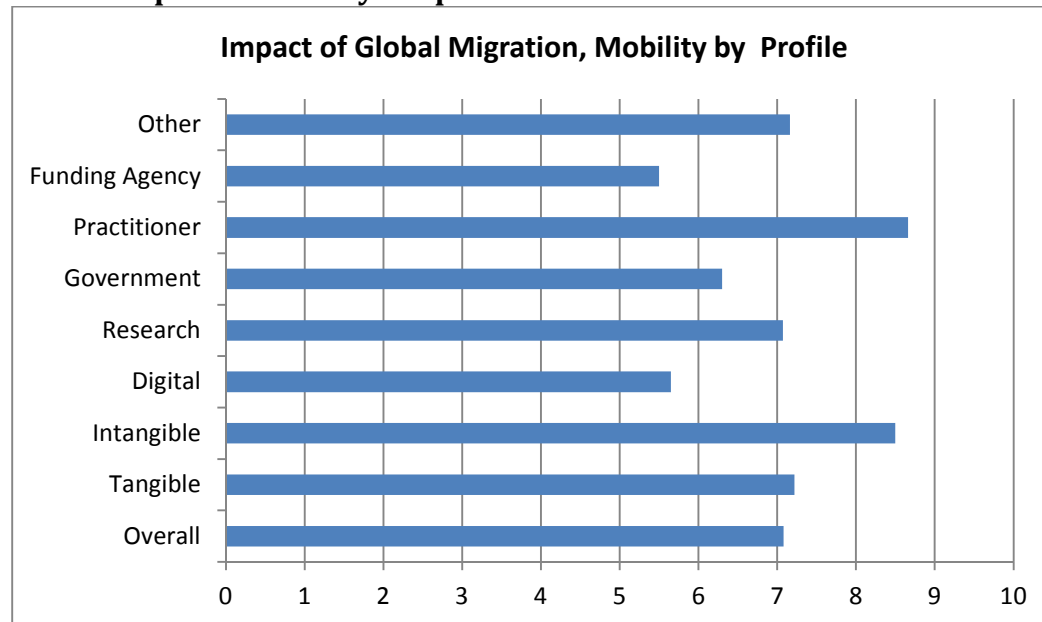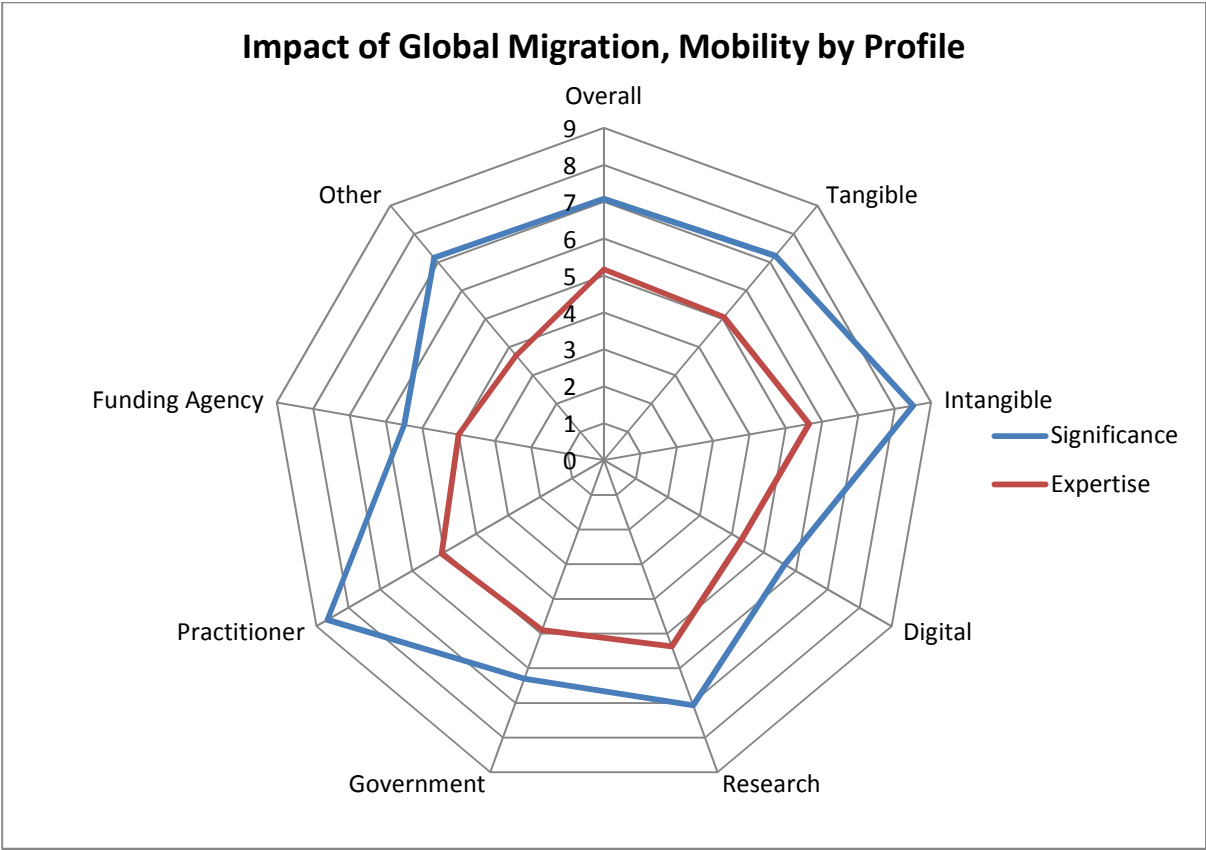
Count: 68

Mean	Min	Max	Median	Std<
7.08	3	10	8	0.25

This theme is strongly connected to the interpretations and representations of cultural heritage (whose cultural heritage is being represented?) There are some existing signals of change – which participants anticipate will be amplified in the decades ahead. Evidence of this includes the creation of heritage foundations based on people's places of origin, and the creation of migration museums. This is

> *Already an important area as heritage becomes detached from historic national boundaries.*

> *As the present migration becomes part of both, history and present citizenry, it also becomes part of heritage.*

One response summarised some of the key uncertainties and complexities regarding global migration and cultural heritage:

> *Less certain about this, as recent political developments have shown that cultures may be quite rigid and immovable. Also, global migration has always happened, so I am not sure that in the short term we are to expect any great changes, except if climate change drives migration due to food shortage in certain areas of the world. On the other hand, many EU countries are retrenching in terms of immigration*

laws, so the trends may reverse.

Several people referred to issues of inclusivity, identities and ownership. One respondent stated that it 'may lead to greater positive interest in the past of other culture' whilst another suggested that 'migration will have to make us think about shared values, new imported values'.

> *This will have major implications because it challenges notions of heritage and identity and dichotomies between us and them*

Implications for cultural heritage research

Global migration could have a very significant impact in setting agendas for cultural heritage research.

More international focus in cultural heritage research: respondents identified this as one of the key implications for the research agenda. Diversity and the interface between different cultures and peoples are likely to alter the meaning and practice of cultural heritage.

> *Migration and mobility will eventually change everything! The global becomes local and vice versa, so that dichotomy will need to be reviewed, and issues of 'ownership/belonging' and identity will need review: not only national but possibly sub-national claims of particular heritages will fade.*

Cultural heritage has been discussed as a social integrator – functioning as a bridge between cultures and traditions. Some suggested avenues for research include:

- *New skills needed to understand the role CH could play in intercultural* relationships and to understand how migration affects valuation of heritage
- *Need to become much more aware of the value and significance of cultural heritage for "new" citizens.*
- *New research fields will open up looking at migration of culture across lands*
- *Challenge to develop research into different cultural uses and interpretations of heritage & different ways to make heritage available.*
- *Need for better heritage policies for 'new' groups in societies.*

The majority view expressed by the group was that cultural heritage research agendas need to reflect the changes caused by global migration. One respondent was sceptical as to the degree of 'interference' of the processes of migration on 'scientific research':

> *Scientific research has no political boundaries and I believe that it should not be affected by migration.*

Climate Change (#5)
Climate change will have a significant impact on cultural heritage.

The average future impact score for Climate Change across respondent profiles was 6.79. The highest average ranking was given by the Funding Agency and Government groups (8.0) whilst the lowest was given by the Intangible group (5.28).

Future Impact Results by Respondent Profile
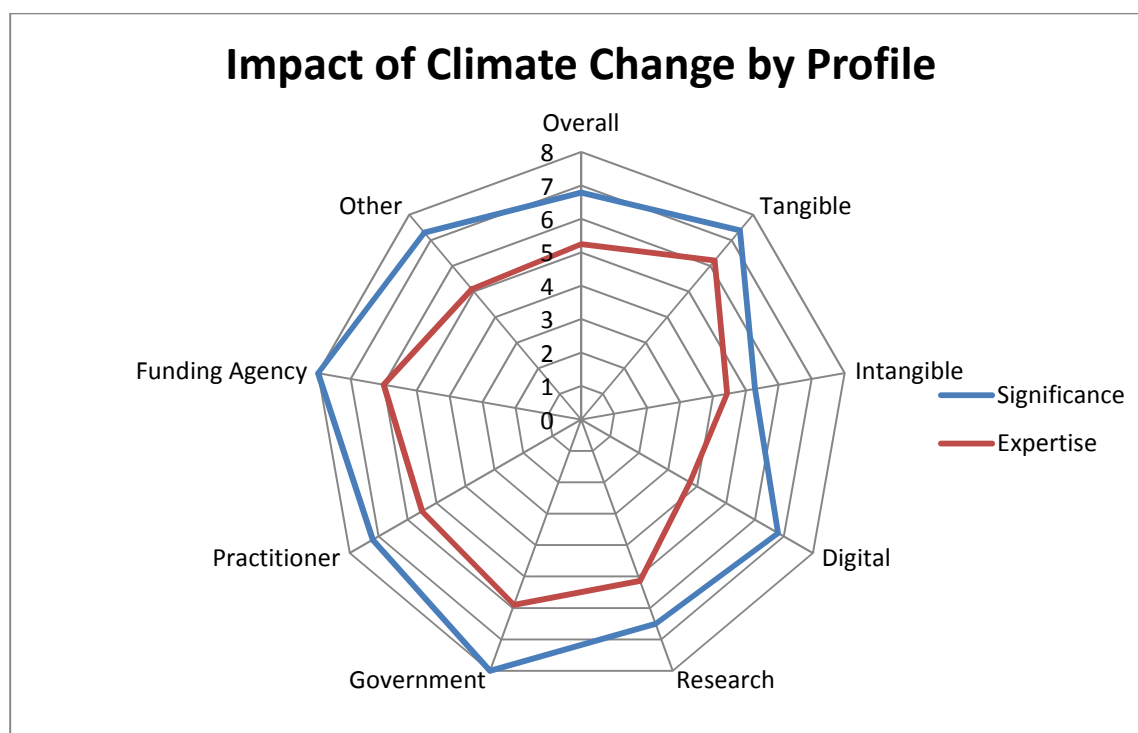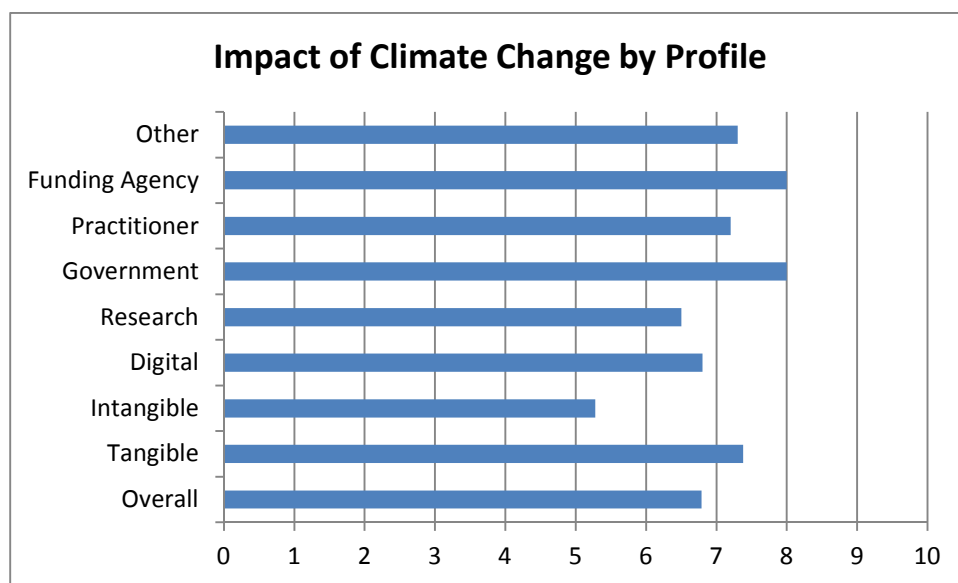
Count: 66

Mean	Min	Max	Median	Std<
6.79	3	10	7	0.261

A changing climate is anticipated to have major impacts on cultural heritage. This is already being experienced according to a number of respondents. There is an assumption that the future impacts of climate will be significant:

> *Climate change and variability are major factors affecting heritage sites in multiple ways and will continue to do so.*

Another assumption is that climate change will have negative effects on built heritage in particular but 'the impact of climate change on economies, politics and societies in general will inevitably be reflected in the effect on cultural heritage'. Even though the main focus is likely to be on built heritage, one respondent commented that it is 'important to emphasize the significant implications for intangible heritage'. In terms of protection, 'much CH remain indoors in climatically controlled surroundings' and is not susceptible to the negative impacts of climate change.

One respondent commented on the solid evidential base for assessing the impact of climate change:

> *Impacts of climate conditions on heritage assets (materials) are measurable and provable.*

As a counterpoint to the mainstream view of the cohort, one respondent stated that 'climate change is a highly overrated phenomenon'.

Implications for cultural heritage research
Following on from the comments made above, the main research issues cited address the 'most likely positive, negative & negligible impacts on tangible heritage'.

> *The decay of open air cultural heritage caused by climate changes will be one of the future major challenges for research in restoration Research must take place in parallel to actual climate change research.*

Aspects of this include
- *Research on building techniques*
- *Materials*
- *Stability*
- *Pathologies*
- *Insect proliferation*
- *More modelling*
- *Soil*
- *Responses of structures*
- *Biological risks and research*
- *Increased focus on preventive measures for the preservation of CH.*
- *Understanding of resilience and adaptation*

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- ▪ *Extreme weather scenarios and single events will necessitate risk preparedness and other work processes and tools.*
- ▪ *Dealing with 'managed retreat' in some vulnerable areas*

This is an area that has been clearly recognised in terms of research:

Climate change has already stimulated vast amounts of research on the impacts on cultural heritage. Each project demonstrates that many questions still remain.

Although the main research focus of the cohort was directed towards dealing with impacts on tangible heritage, several people noted that proper regard had to be given to intangible cultural heritage.

As someone working with intangible heritage, I am concerned that the significant concerns about the impact on cultural heritage will be reflected in an over-emphasis on tangible heritage, especially the conservation and preservation of built heritage and cultural environments.

Ageing Populations (#6)

'Ageing populations in Europe will have a significant impact on cultural heritage'.

The average future impact score for Ageing Populations across respondent profiles was 6.73. The highest average ranking was given by the Funding Agency group (7.5) whilst the lowest was given by the Digital group (5.72).

Future Impact Results by Respondent Profile

Impact ofAgeing Populations by Respondent Profile

Impact of Ageing Populations by Profile
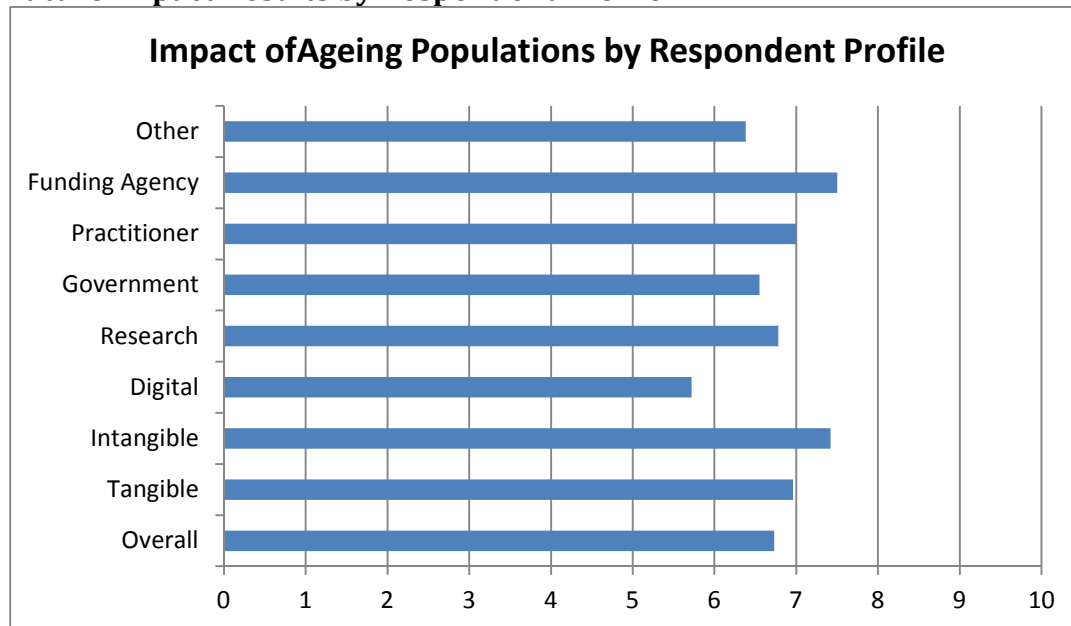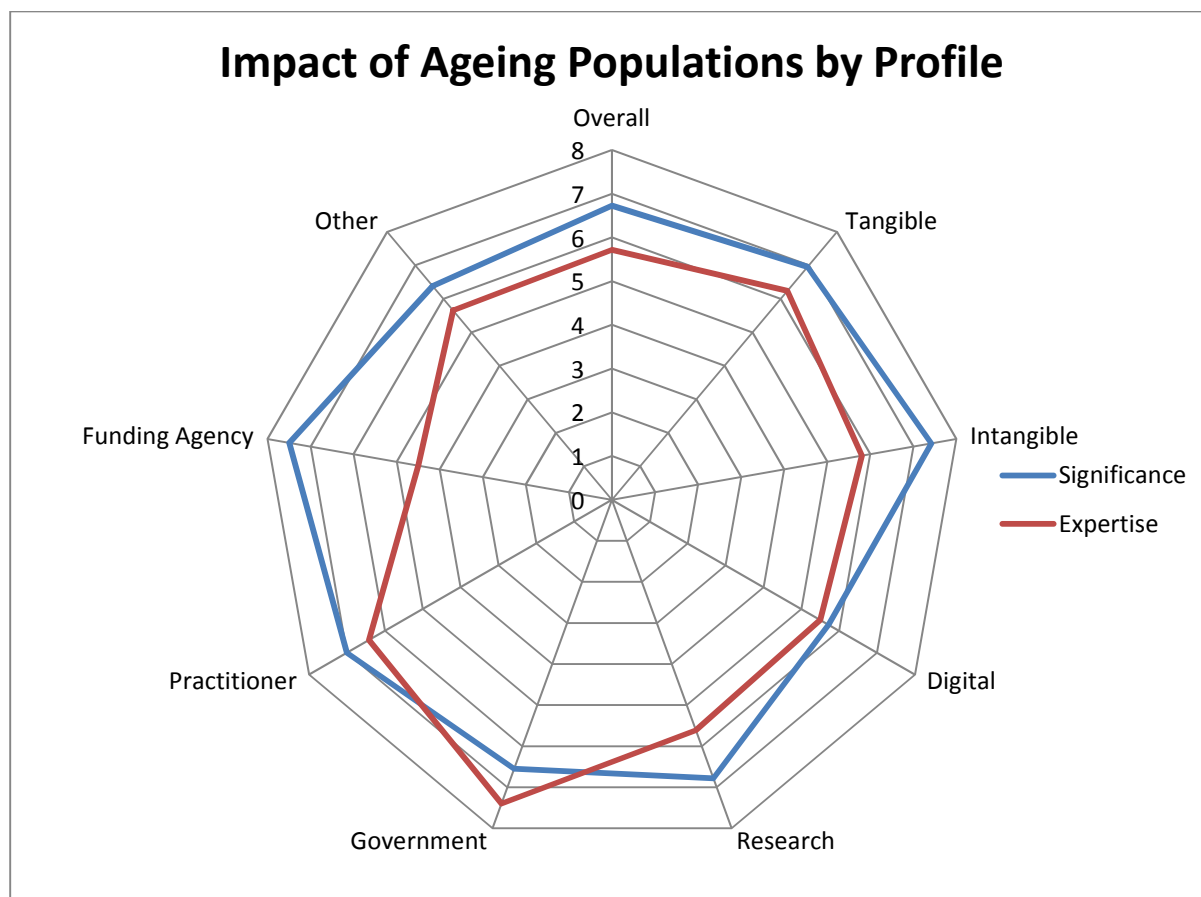
Count: 99

Mean	Min	Max	Median	Std<
6.73	1	10	7	0.172

Older population's interest in cultural heritage
Respondents pointed to the tendency for older people to have greater interest in heritage and cultural heritage than younger people.

> *We already see a greater interest in the past on the part of the older elements of the population and the increase in older people will presumably serve to further emphasise this.*

Ageing populations therefore could mean more demand for cultural heritage. Several participants suggested that older people would still have more time (compared with younger people) to enjoy cultural heritage and cultural tourism– even if they have to work longer. Would older people have the financial means to pursue interests in cultural heritage in future? Several responses pointed to the assumption that there would be sufficient disposable income available to older people – even if it there are pressures and uncertainties. In short, the common view was that a combination of these elements would generate interest in/demand for cultural heritage: interests +time + financial resources. Some participants believed that declining incomes and purchasing power for the older cohorts would impact negatively on cultural heritage.

Values – older and younger populations

The ageing of societies present some interesting questions regarding values and cultural heritage. Responses indicated some distance between the values of older and younger cohorts – in a more generic sense – which may be relevant for cultural heritage. Indeed, the processes of demographic change stimulate debates not only on servicing the needs of older people, but also on how younger people can shape cultural heritage.

> *The younger generations will have an important impact on cultural heritage. They will redefine the definitions and enforce new practices*

> *The younger generation will be the driving force and will have a more significant impact.*

> *The impact is unpredictable, but will surely exist. Cultural heritage is socially constructed therefore all types of demographic change will modify attitudes to CH and its conservation, on what is valued and why, on the balance between new and old. The creation / production of new / future heritage is also age dependent in some way, presumably.*

Technologies

Even though differences may persist between age cohorts in knowledge of technologies,

> *Ageing populations, unlike previously, will be more digitally literate. Therefore the higher age profile of e.g. museum visitors should be accompanied by efforts to strengthen digital heritage.*

The Internet of Things (#7)

'The 'Internet of Things' will have a significant impact on cultural heritage'.

The average future impact score for The Internet of Things across respondent profiles was 6.61. The highest average ranking was given by the Practitioner group (7.66) whilst the lowest was given by the Funding Agency group (5.75).

Future Impact Results by Respondent Profile
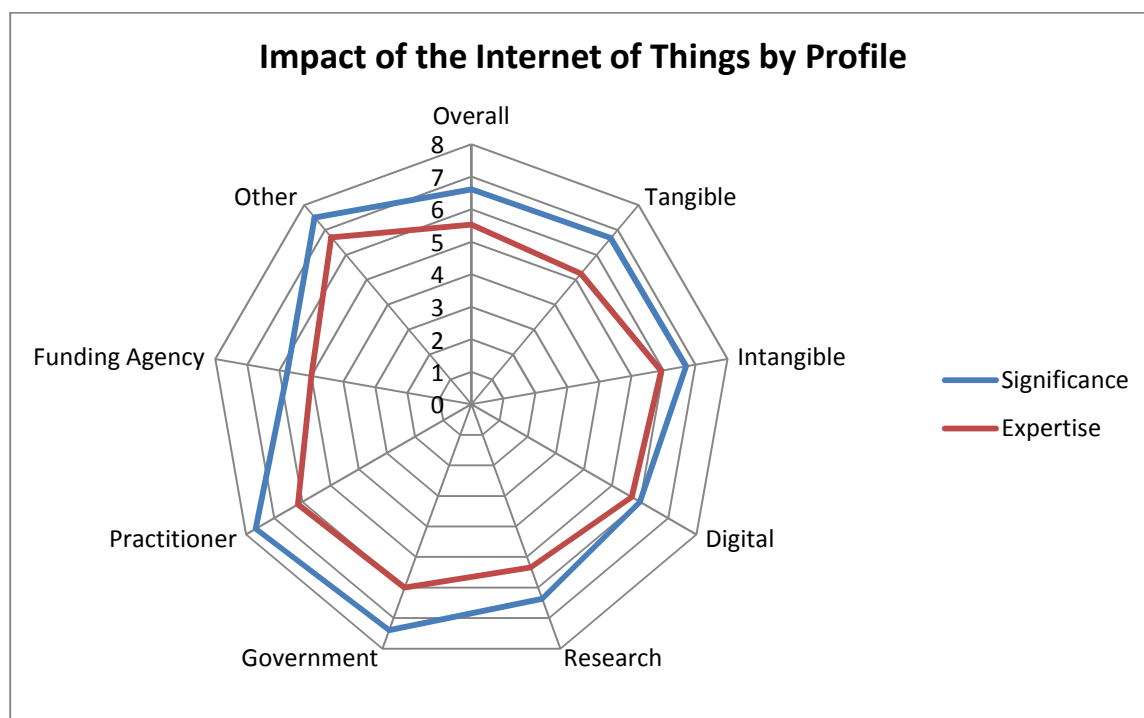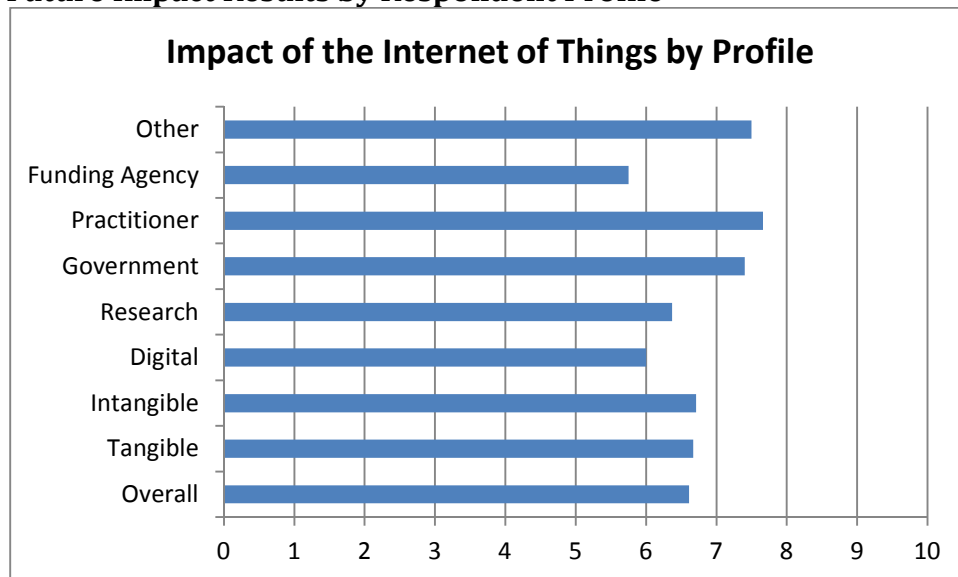
Count: 72

Mean	Min	Max	Median	Std<
6.61	2	10	7	0.264

The distribution of responses on the Internet of Things indicates that there is a dichotomy of opinion on its future significance. Participants tended to give it either a high score (above 7) or a low score (below) 4. Few ranked it in the middle ground. The dichotomy is reflected, to a large extent, in the comments of participants.

The Internet of Things and Digitisation: many participants viewed the Internet of Things as part of the larger developments around digitisation of society, including cultural heritage. Some pointed to the existing use of the Internet of Things within cultural heritage:

> *Such techniques are already being used to monitor microclimatic conditions in and around heritage sites, for example, and will continue to become more important to documenting, monitoring and explaining heritage.*

> *The Internet of Things is rapidly developing in other sectors and has already appeared in cultural heritage research. It's a growing issue and a direction for the development of web technologies, which heritage is already using significantly.*

The Internet of Things would have major impacts on the way people interact with their surroundings; cultural heritage is one manifestation of that.

> *The internet of things is a technique/model/approach that is presently being implemented in the heritage sector. This is a present focus that is likely to impact the area strongly in the next ten years.*

A sizeable minority – that gave a low score – did not believe that the Internet of Things would have great impact:

> *Not significantly, it is a niche.*

Implications for cultural heritage research
- *Tool in communicating with the public and various stakeholders*
- *At the very least many researchers will have to develop new competences and knowledge if they are to make the best use of technological advances. There is a danger of over-emphasis on using the Internet nevertheless because there is insufficient knowledge of the levels of sustainability that will be possible.*

- *It will affect all professional fields involved in cultural heritage.*

  - Novel heritage artefacts (tagged physical objects linked to digital content and other objects) - Potential new role for curators in overseeing linkages to other data

  Implications for this sort of work is to anticipate some of this digital burnout, and figure out new, lighter ways of combining digitization and CH in friendlier ways. CH

experts will need to figure out ways to get people off their computers and into the various avenues of experiencing heritage in other ways -- not old fashioned but not purely digital either.

*We risk orient our research towards the conversion of heritage in digital entertainment.*

The relationship of 'real' to virtual' will change. I suspect cherished concepts such as authenticity and the primacy of fabric, will become more difficult to defend, and will attitudes to physical change. The intangible aspects of all heritage will be more dominant, probably

Big Data (#8)
"Big Data' will have a significant impact on cultural heritage'.

The average future impact score for Big Data across respondent profiles was 6.46. The highest average ranking was given by the Funding Agency group (9.0) whilst the lowest was given by the Other group (5.41).

Future Impact Results by Respondent Profile

Future Impact of Big Data by Profile

Impact of Big Data by Profile

36
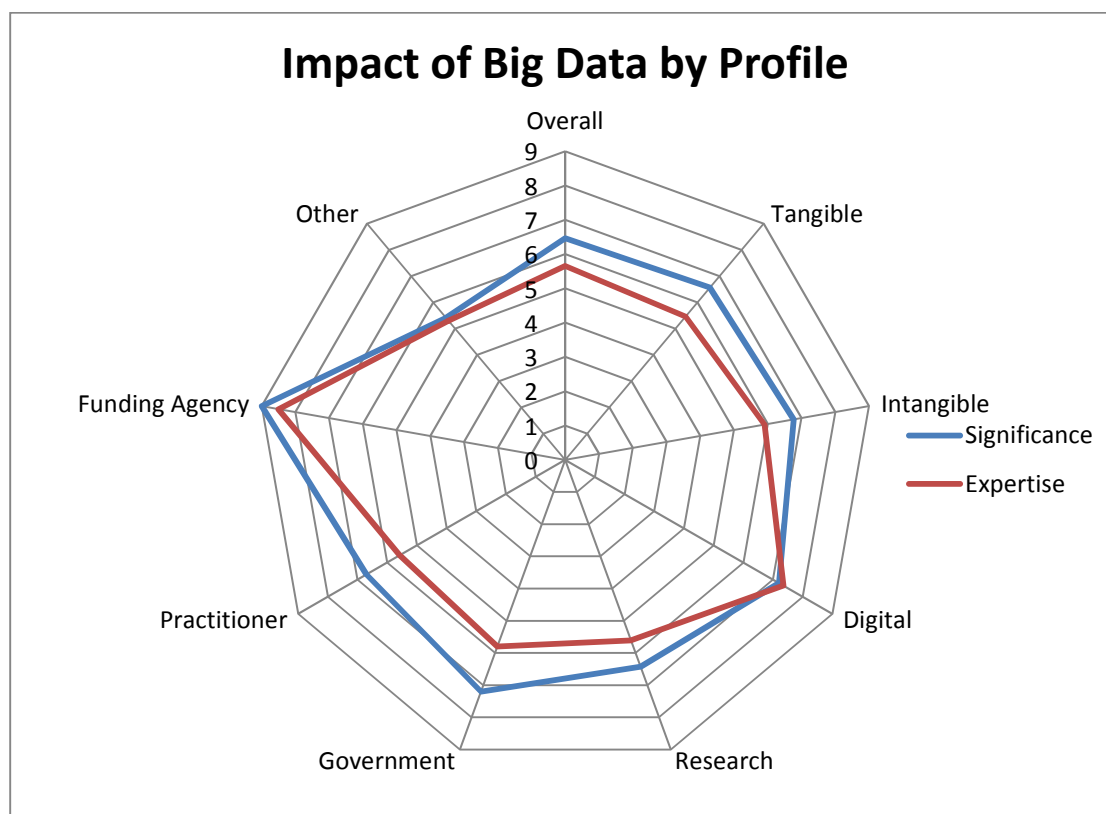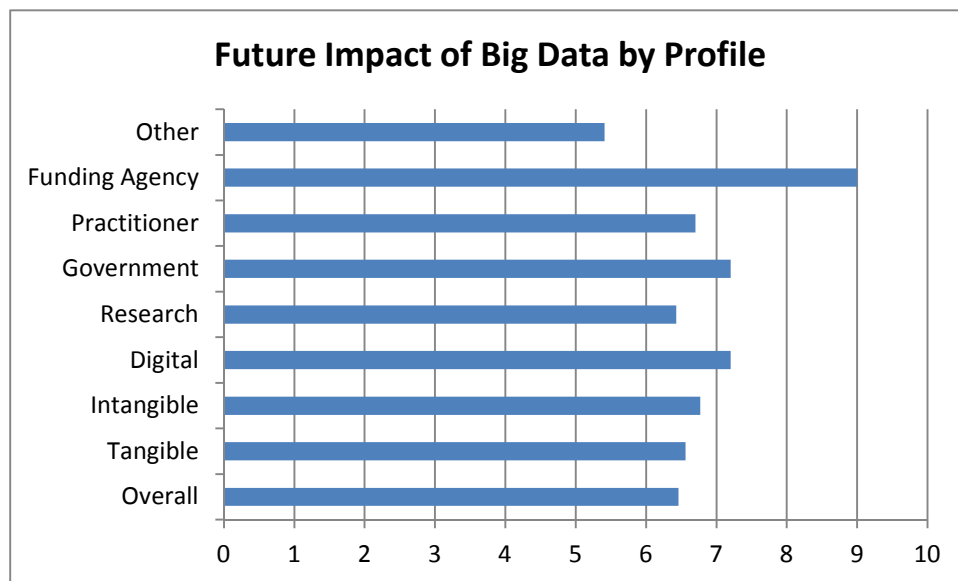
Count: 70

Mean	Min	Max	Median	Std<
6.46	2	10	6.5	0.25

Most respondents that commented on Big Data suggested that it would become increasingly significant for cultural heritage in future.

> *This is the biggest challenge of many aspects of heritage now*

Whilst some referred to specific examples where Big Data was being used in a cultural heritage context, for example, point cloud data sets, the view expressed by others was that there was much to be done in understanding the implications and seizing the opportunities. One of the key questions was how data can be organised in a way that is useful and relevant to cultural heritage.

> *Huge amounts of data will be available - the challenge will be to harness and extract cultural value from that data but the potential is huge.*

As with other aspects of digital technologies, one of the issues challenges raised was the way in which data would be preserved and distributed.

One respondent evoked a deeper issue for cultural heritage – and the possible shift in approach in methods

> *There's an argument that the idea and methods of heritage evolved in world of small scale, inadequate expert-led data; big data is likely to create a different approach, indeed even different objectives and goals. This connects to the concept of everyday as opposed to special or 'big' culture or heritage; we see changes in attitudes and policy happening already when heritage is seen through a landscape perspective.*

Implications for cultural heritage research
- Demand for new skills and expertise
- Perils of Data without meaning:

> *How much of this data is useful? How much is misleading 'noise'? How much valuable research time will be wasted sifting through garbage to find a nugget of gold?*

- Need for more research and understanding of big data, and new research agenda.

> *It opens up a new research agenda. This is an areas which is not well understood in CH research.*

> *Open linked data…will create new opportunities to link global heritage metadata and link heritage data with other sources of information (f.i. social media input, biographical data, research data etc)*

- Need to balance quantitative and qualitative data
- Behavioural patterns of heritage users
- Connectivity and infrastructure**:** *use of research eInfrastructures and related advanced services*

The significance of big data for Cultural Heritage Research

> *The implications are huge. We have already created a huge body of digital data that is varied and complex, and lack the research methods and tools to creatively engage with it in ways that new research questions can be developed. This is a missed opportunity.*

Sceptical views

- *Little, except the danger that big data could be thought by government as research*
- *That is a pure ICT problem.*

Virtual Reality (#9)
'Virtual reality will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Virtual Reality across respondent profiles was 6.26. The highest average ranking was given by the Funding Agency group (8.0) whilst the lowest was given by the Intangible group (5.06).

Impact of Virtual reality by Profile

Impact of Virtual Reality by Profile
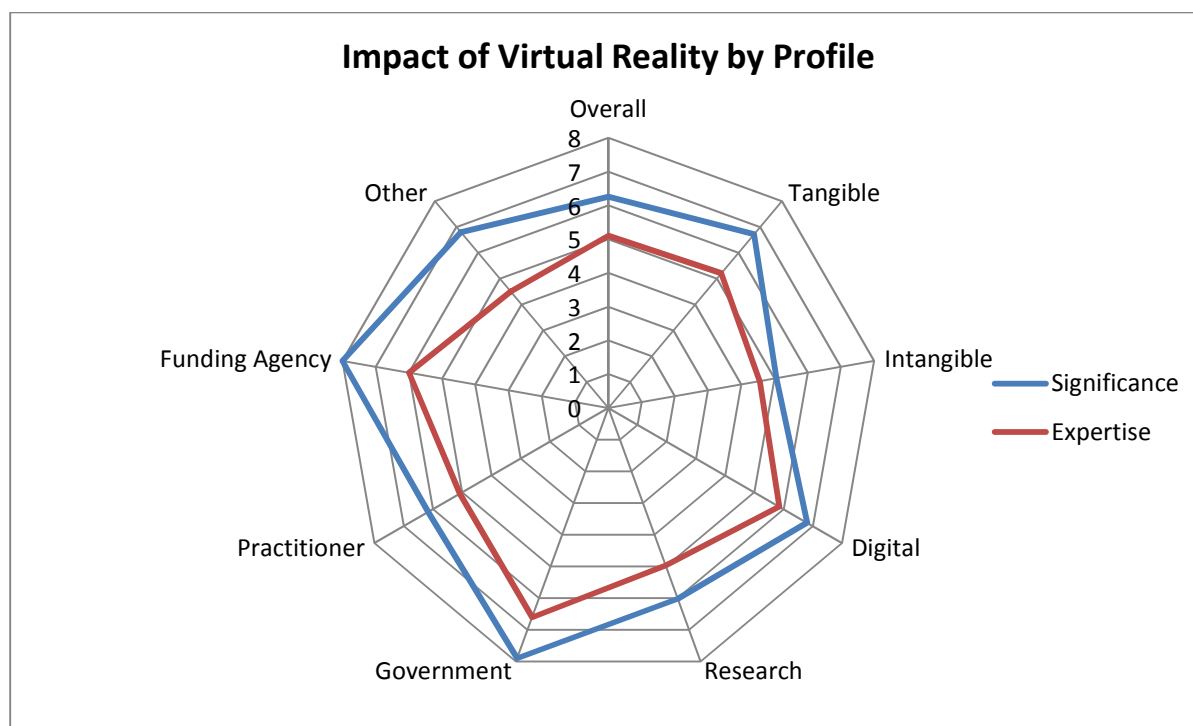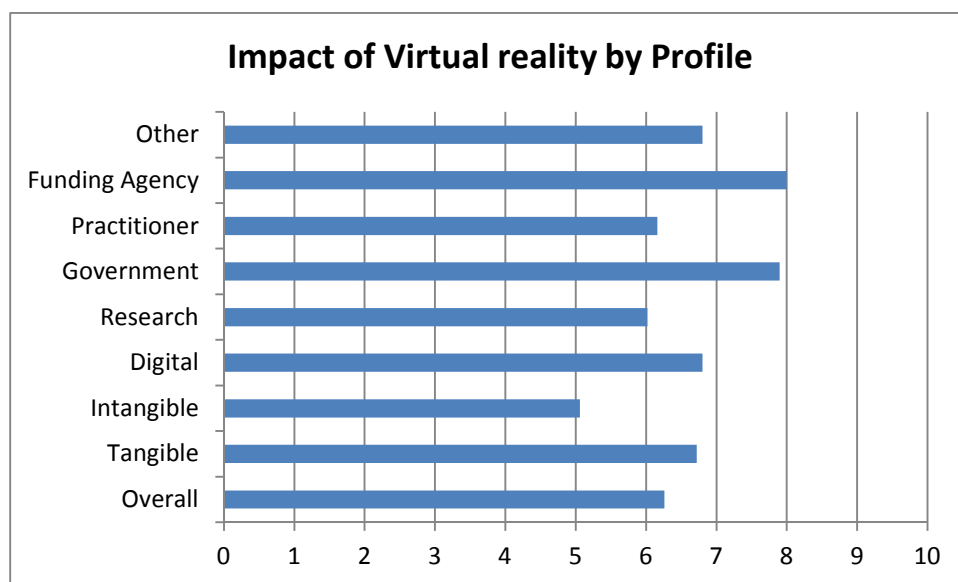
Count: 68

Mean	Min	Max	Median	Std<
6.26	1	10	6	0.271

The majority of respondents that commented anticipated that virtual reality would become more significant over the coming years. The significance of VR was associated with the following:
- *Popular interpretations of heritage*
- *Virtual access to sites will increase interest and understanding*
- *Enhancing the visitor experience*

Several pointed to the way in which virtual reality was already having an impact in the field. Increased future impact will depend partly on the further development of the supporting technologies.

The range of scores that respondents gave to virtual reality (between 1 and 10) indicates a real division of opinion. Some views are redolent of the earlier ones expressed on digitisation whilst others are more sceptical about virtual reality.

For a number of respondents – such as the one cited below – virtual reality could have a major impact on cultural heritage:

> *Most likely to become the next big thing in digitisation of cultural heritage, e.g. through smart objects*

> *My guess is that VR is largely a short-lived and rather superficial gimmick.*

The same respondent goes on to say
...but reading the above responses, maybe I am wrong.

The importance of the real and tangible
Several respondents emphasised the importance of real and tangible heritage – even if virtual reality offered new possibilities for access and interpretation.

> *...this is not about heritage but about management of digital analogues of heritage. It will not affect heritage as I understand it, but will make it more accessible to people.*

> *Potential danger that VR takes over from the tangible as the normal experience of heritage.*

Implications for cultural heritage research

- *Skills needs: need to train researchers with competencies in VR and archaeology/ History/anthropology*
- *Qualitative research on heritage will remain the basis for understanding and virtual presenting of cultural heritage.*
- *Great potential for much greater use for the presentation of results, but also possibly for visual 'testing' of interpretations. Potential to present 'inaccessible' sites such as Doggerland.*

- *Very important, because virtual reality is a great field of development for museums, teaching and theoretical research*
- *No priority as this is being developed in other areas as gaming industry, ...*
- *It will significantly improve options for outreach and thus help to validate research. Above that, it may also become a major instrument and methodological tool of research*
- *Perhaps crossovers with serious gaming could lead to both new heritage and a renewed interest in existing heritage. One might also think about reconstructions which will not affect the original work of art, etc.*
- *CH is far behind other disciplines (medicine, etc) in use of virtual reality. Unless there are significant shifts in greater emphasis on collaboration with technical disciplines/industry, or we see the development of far more ubiquitous approaches to VR, I see no reason this will change over the long term.*
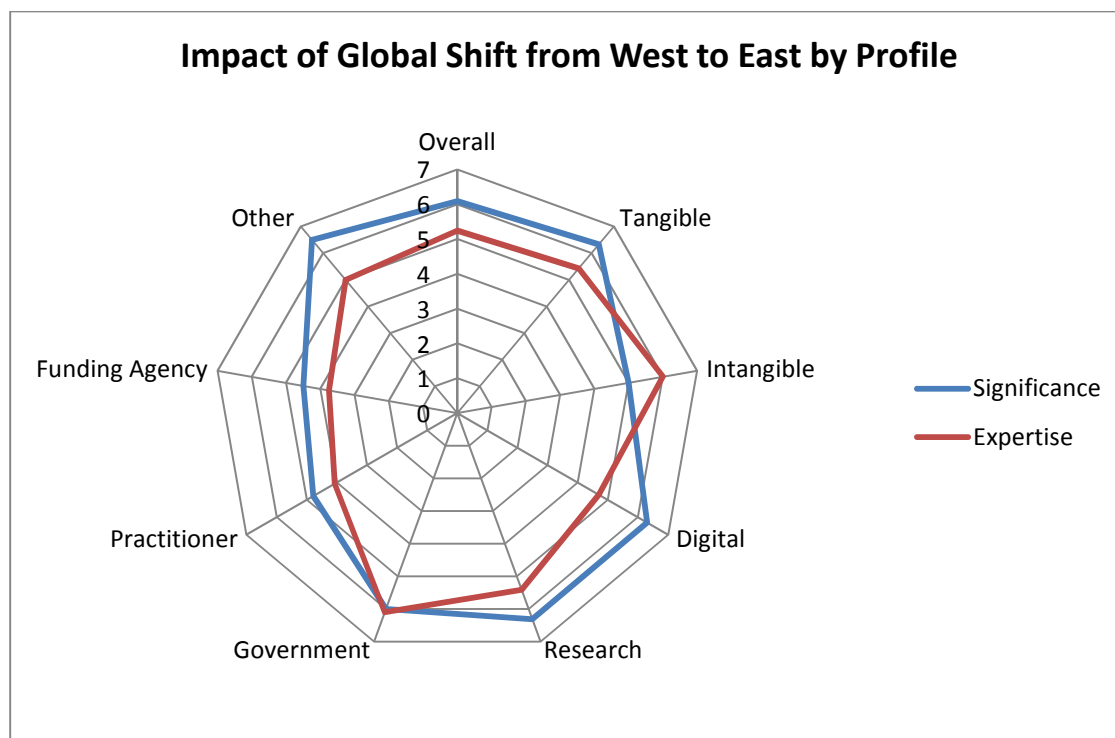
Global Shift from West to East (#10)

'The global shift from the West to the East will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Global Shift from West to East across respondent profiles was 6.09. The highest average ranking was given by the Other group (6.5) whilst the lowest was given by the Funding Agency group (4.5).

Impact of Global Shift from West to East by Profile
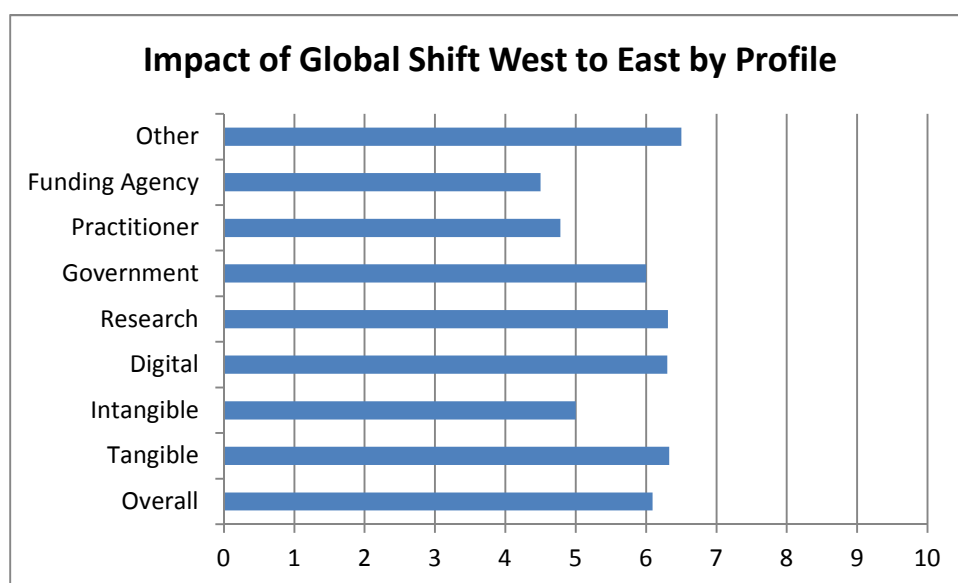
Count: 77

Mean	Min	Max	Median	Std<
6.09	1	10	6	0.238

A global shift from West to East could have important impacts on understanding and interpretation of cultural heritage. The scale and particular focus is significant

> *because heritage is determined with its local historical, aesthetic, sociological and other specifics.*

> *This all depends on whether we're looking at the macro or micro vision of cultural heritage.*

> *The W to E [West to East] shift will alter the very definition of cultural heritage and open up new forms of heritage. Heritage conservation practices may also alter in response.*

The possible global shift does not necessarily equate to negative impacts for cultural heritage in the West. It is seen by many participants as an economic phenomenon. The growing material affluence of the East may simply result in greater aggregate interest and support for cultural heritage.

> *Heritage is important in both West and East, and it is influenced by various forces. I do not think the global shift from West to East will have a very different impact on heritage - all world regions realise the importance of their heritage in the country development and tourism-one of the biggest industries. Competition for heritage*

tourists will increase, and it may have both direct and indirect impact on heritage itself.

The suggestion is that this is not a zero-sum game:

The shift doesn't mean that cultural heritage in the West will reduce. It offers augmentation rather than substitution.

The meeting of influences

Several commented on the potential for a more significant 'meeting of influences' between West and East in the cultural heritage field. Rather than a 'shift', this was understood more in terms of exchange and the evolution of the cultural heritage field, captured succinctly in the statement that 'east and west will influence each other'.

The impact will essentially consist in a hybridization of the western, more traditional, concept and awareness with the less orthodox East Asian concept. It's not a matter of adopting or not 'eastern' philosophies or approaches, more one of taking the benefits of global perspective, being able to see how both perspectives are historically and culturally contingent and thus open to change.

Nevertheless, some respondents believed that there would be some implications for cultural heritage, as it has been 'constructed' and supported in the West:

Our thinking about cultural heritage must become less parochial, less Eurocentric.

One respondent was critical of the 'biased and Eurocentric' nature of the question, pointing to the need for a longer term, historical view.

Implications for cultural heritage research

The comments made by respondents on research implications are grouped into three main themes

- **International Cooperation and shared cultural heritage:** the global shifts provide further impetus for good international cooperation. Specific points made include the following
    o *The theme of "East meets West" is very actual. > shared heritage / mutual heritage/ etc.*
    o *Consensus on procedures for research, protection, conservation, restoration and diffusion of cultural heritage.*
    o *Difficult to predict, but it can only increase the perceived 'premium' attached to research undertaken abroad*
    o *New technologies that facilitate communication and shrink the world will mean that the east and west cultural research can be integrated / done in tandem with each other*
    o *More focus on cross-border impact, both historical and contemporary*
    o *An increasing demand for international, and global perspectives, and the need to incorporate very different value systems and contextual sensitiveness in the analysis. As well as the development of an understanding the mechanisms fostered by the parallel existence of multiple values.*
   o *Increase of academic exchange between Europe and Asia*

- o *Greater visibility of a larger number of CH resources worldwide. More complex IP models.*

- ▪ **Conservation**
  - o *Changes on the approach to conservation of CH in particular architectural heritage ...the European school of restoration will continue to be the main reference?*
  - o *New sites will open up to global scholarship, new conservation techniques will be able to be evaluated and debated.*

- ▪ **Reduced research funding for 'Western' cultural heritage**

Superfast Broadband (#11)

'The availability of and access to Superfast Broadband will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Superfast Broadband across respondent profiles was 5.89. The highest average ranking was given by the Practitioner group (7.41) whilst the lowest was given by the Other group (4.59).

Superfast Broadband (#11)

Impact of Superfast Broadband by Profile
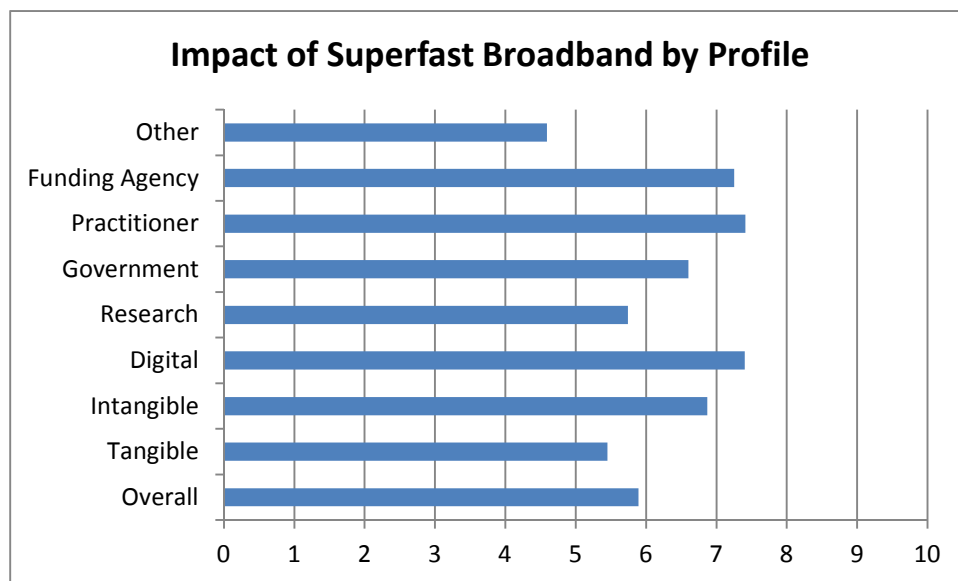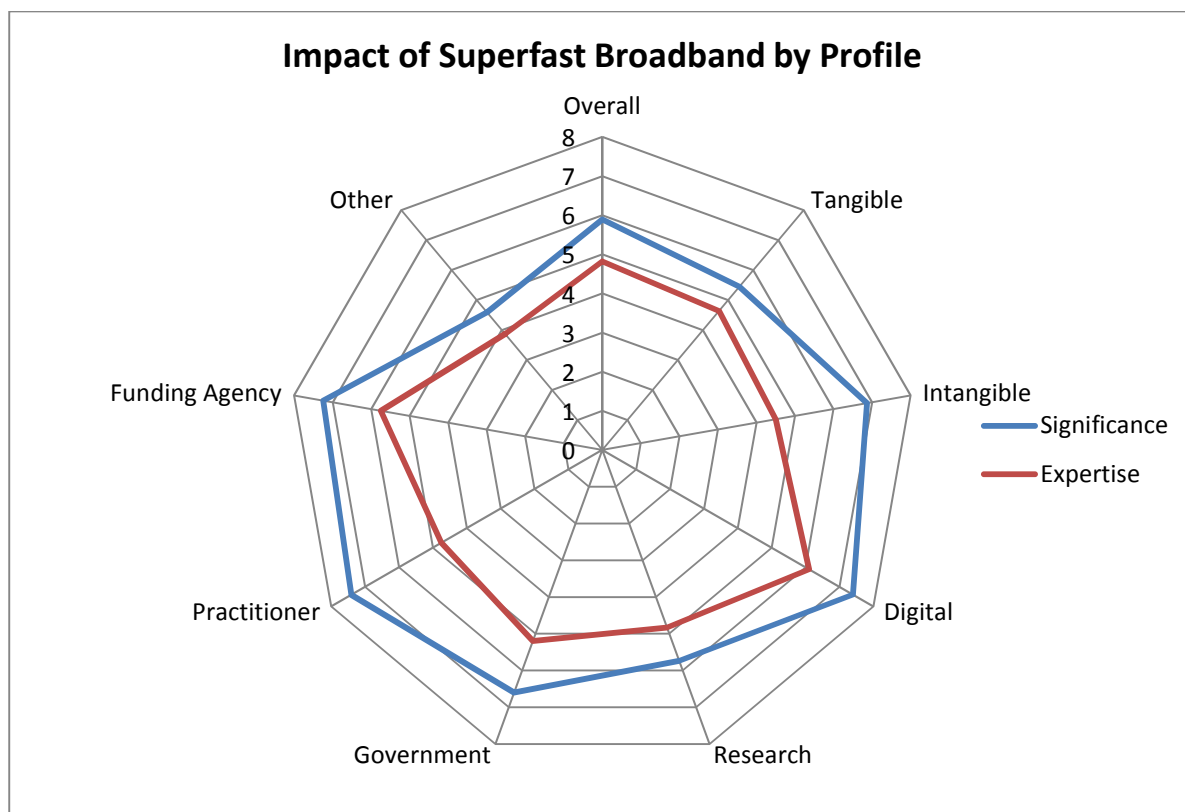
Count: 68

Mean	Min	Max	Median	Std<
5.89	**1**	**10**	**5**	**0.274**

Most respondents stated that the impacts of Superfast Broadband on Cultural Heritage would be similar to those cited for other digital technologies (such as the Internet of Things, gamification etc). One participant commented that the statement should be viewed 'the other way round - heritage can help broadband by providing content'.

Implications for cultural heritage research

Most participants viewed Superfast Broadband as a way of enabling collaboration and access:

▪ *Will provide exceptional opportunities for world-wide collaborative research.*
▪ *Greater public awareness & access to sites should prompt a great deal of research questions*
▪ *Expansion of research outlets and interdisciplinary approach to developing new dissemination media. The increased possibilities for reaching audiences and participants in cultural heritage projects will hopefully drive research funding availability.*
▪ *The impact will only be as good as the content created, its interoperability, and the research infrastructures that support it.*

47

Generation Y (#12)

'Generation Y' (Millennial Generation) will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Generation Y across respondent profiles was 5.87. The highest average ranking was given by the Government group (7.3) whilst the lowest was given by the Research group (5.64).

Impact of Generation Y by Profile

Generation Y (#12)

Impact of Generation Y by Profile
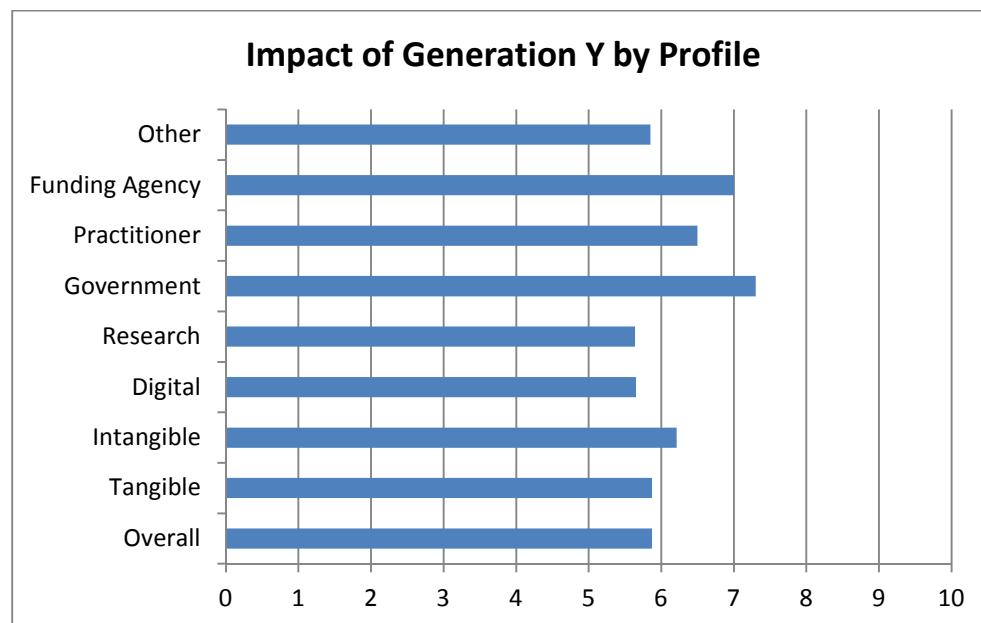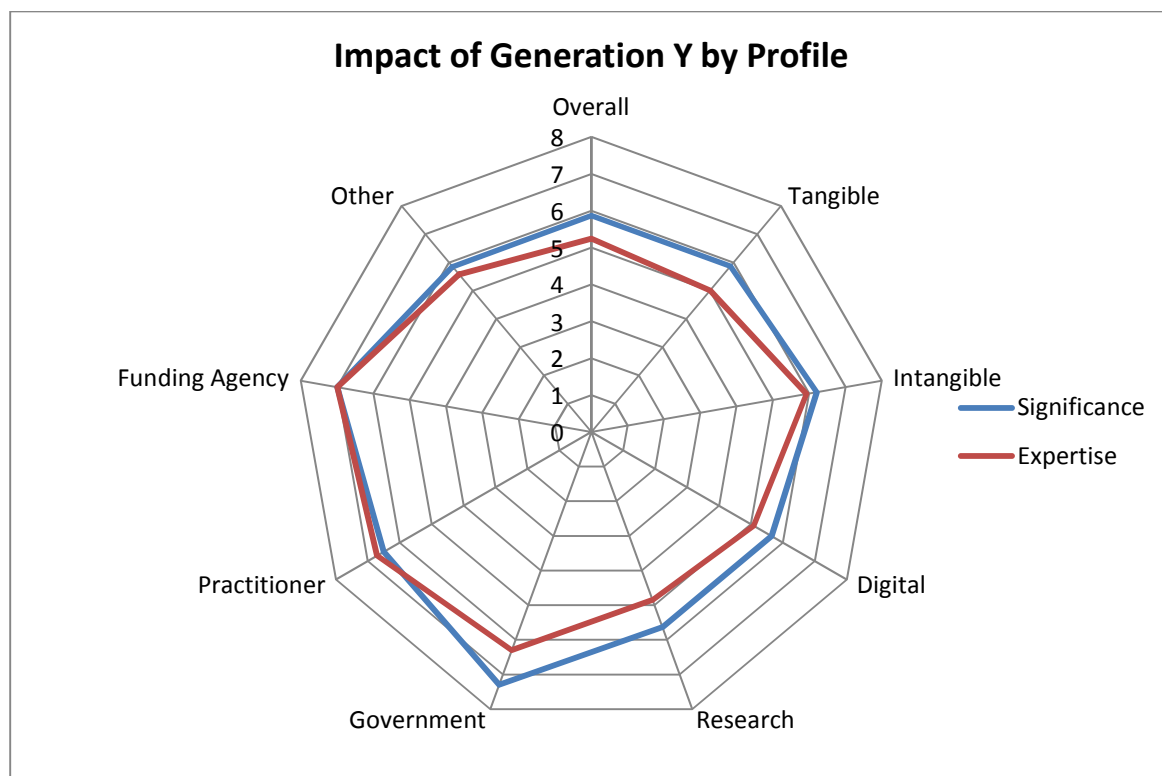
Count: 76

Mean	Min	Max	Median	Std<
5.87	1	10	6	0.259

Is Generation Y that different?

Most respondents commented that every generation has an impact on cultural heritage – and that not one should be viewed as more significant.

There were contrasting views on the values of Generation Y.:

> *I'm not convinced that Generation Y has different values; they do have different skills.*

Several respondents were keen to point out that there were indeed differences in values and behaviours for Generation Y:

> *Gen Y is more technologically advanced and expects more digitalised forms of "heritage entertainment", on the other hand, there is a growing No of people of this generation who want to go back to their roots and explore the "purest" forms of heritage. Both ways will be influential in very different ways.*

> *There are two sides to take into consideration: Generation Y as a cultural participant and Generation Y as cultural professionals. The former will be characterised by more eclectic, perhaps less canonic use, the latter by new ways of working, more focused on re-use and services than specialised collection management.*

The one area of agreement for most respondents was that Generation Y is more digitally literate and oriented, which should create opportunities for 'cultural engagement that will be attractive and innovative'.

Implications for cultural heritage research

- Media and digital technologies:

  Higher expectations of digital cultural heritage, based on greater awareness and use of digital sources and methods in education globally.

- Combining specialists and non-specialists:

  A lot of the research will be carried on by non-specialists working with specialists to develop means of dissemination that go beyond traditional outlets. It will be particularly significant for research into intangible heritage.

- Networking – social and civil society; more emphasis on social sciences research.

Energy Production and Consumption (#13)

'Changes in the production and consumption of energy will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Energy Production and Consumptions across respondent profiles was 5.83. The highest average ranking was given by the Funding Agency group (7.5) whilst the lowest was given by the Digital group (5.25).

Impact of Changes in Energy Production and Consumption by Profile

Impact of Changes in Energy Production and Consumption by Profile
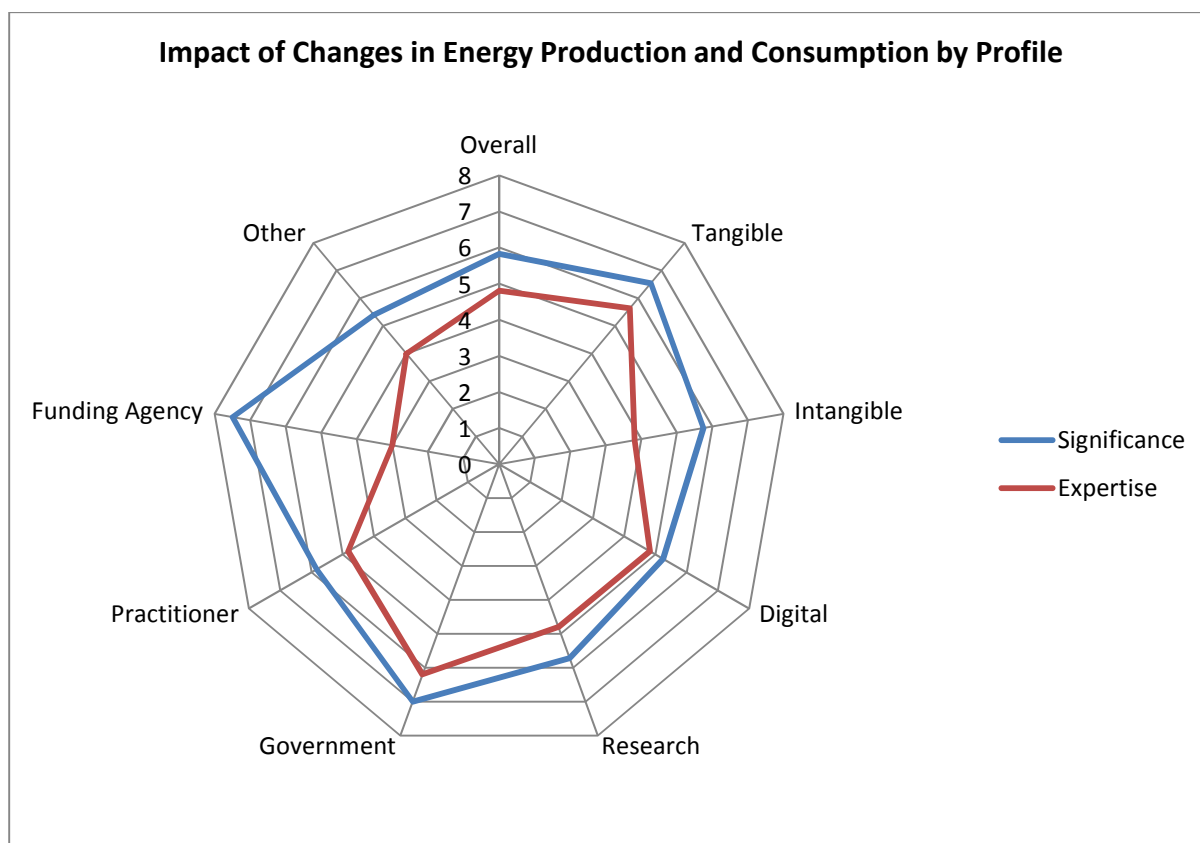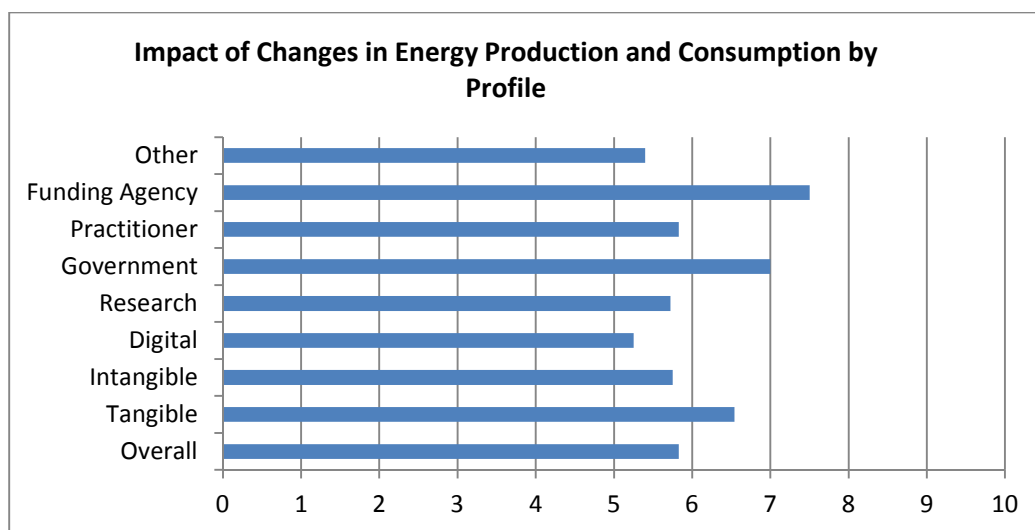
Count: 68

Mean	Min	Max	Median	Std<
5.83	1	10	6	0.254

As in other fields, the 'greening' of buildings is viewed as a way of reducing energy consumptions. Such changes depend largely on the application of technological solutions in the cultural heritage field. One respondent stated that 'the fabric of heritage will change to accommodate this [changes in energy]'.

> *Energy requirements will be related to costs of maintaining; impact will be in looking how to reduce energy consumption but at the same time how (very imposing) energy standards will not jeopardize the essence of heritage.*

Implications for cultural heritage research

- *More research needed on energy-efficiency of historical buildings to be restored*
- *Research in "climate control" is crucial*
- *Significant - fabric of historic buildings already being changed for the carbon agenda*
- *We will need both new technologies developed specially for heritage, the adaption of existing technologies and the revitalising of old, sometimes almost forgotten technologies.*
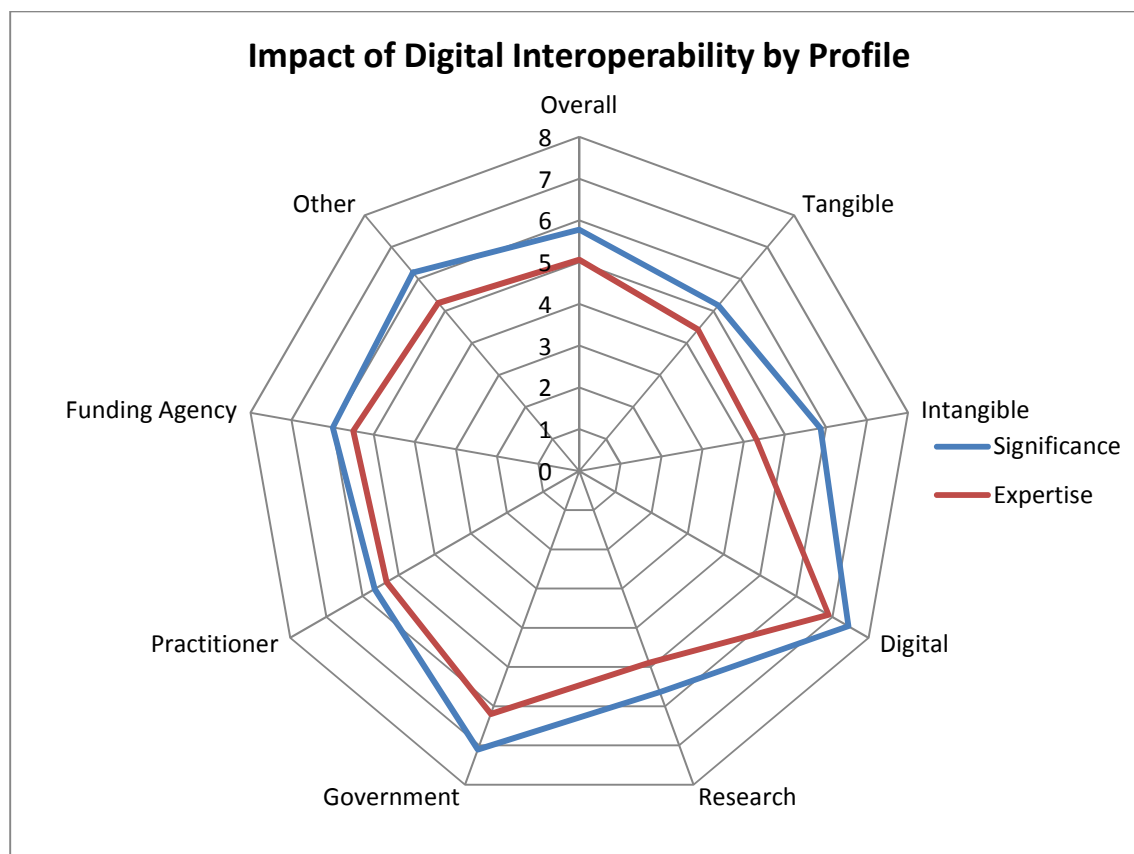
Digital Interoperability (#14)

'Digital inter-operability of systems will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Digital Interoperability across respondent profiles was 5.78. The highest average ranking was given by the Digital group (7.45) whilst the lowest was given by the Tangible group (5.18).

Impact of Digital Interoperability by Profile

Impact of Digital Interoperability by Profile
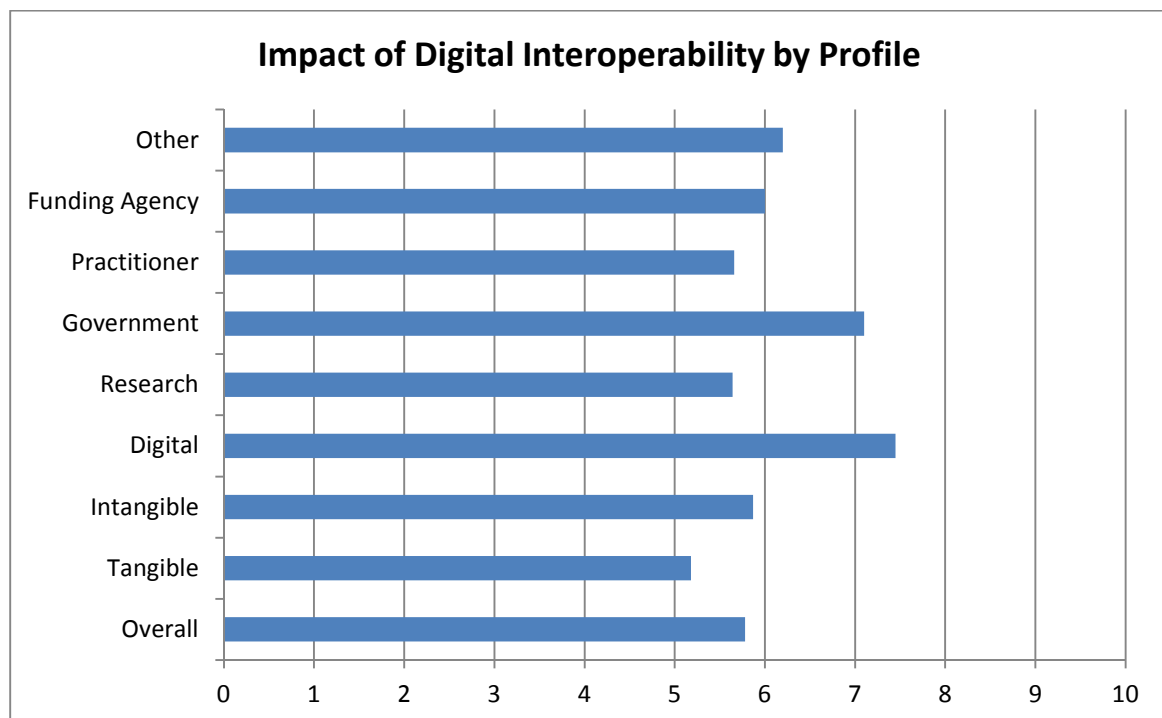
Count: 68

Mean	Min	Max	Median	Std<
5.78	1	10	4.75	0.278

Most respondents commented that digital interoperability belonged to the other questions included in Real-Time Delphi on digitisation, the Internet of Things, and so on. The point was made that compatibility between systems was very important, and that,

> *Digital heritage will thrive best with established interoperability.*

**Implications for cultural heritage research**
- *Cooperation and ownership: 'Is there a will to cooperate? What about ownership [of] data?'*
- *'Sharing and reusing of data sets and knowledge more effectively & efficiently', including the 'relationship between private and public collections'.*

Nanotechnology (#15)

'Nanotechnology will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Nanotechnology across respondent profiles was 5.75. The highest average ranking was given by the Practitioner group (7.33) whilst the lowest was given by the Funding Agency group (4.25).

Impact of Nanotechnology by Profile

Impact of Nanotechnology by Profile

Count: 69
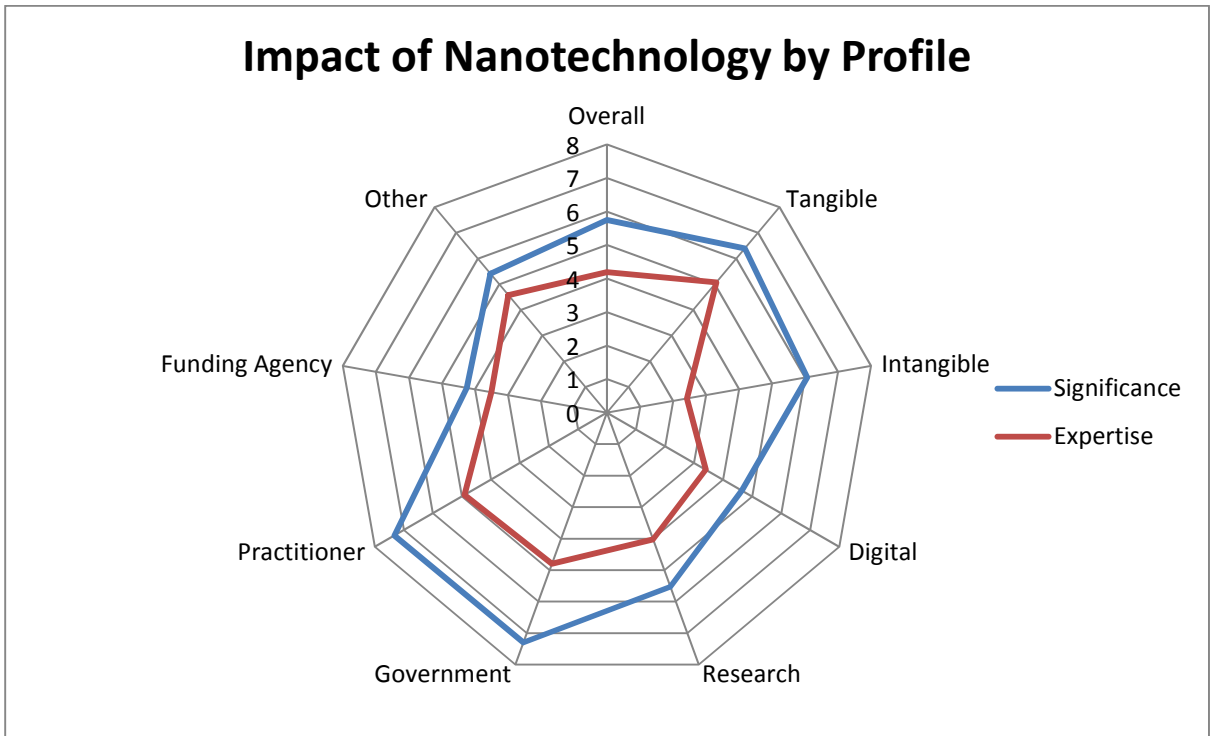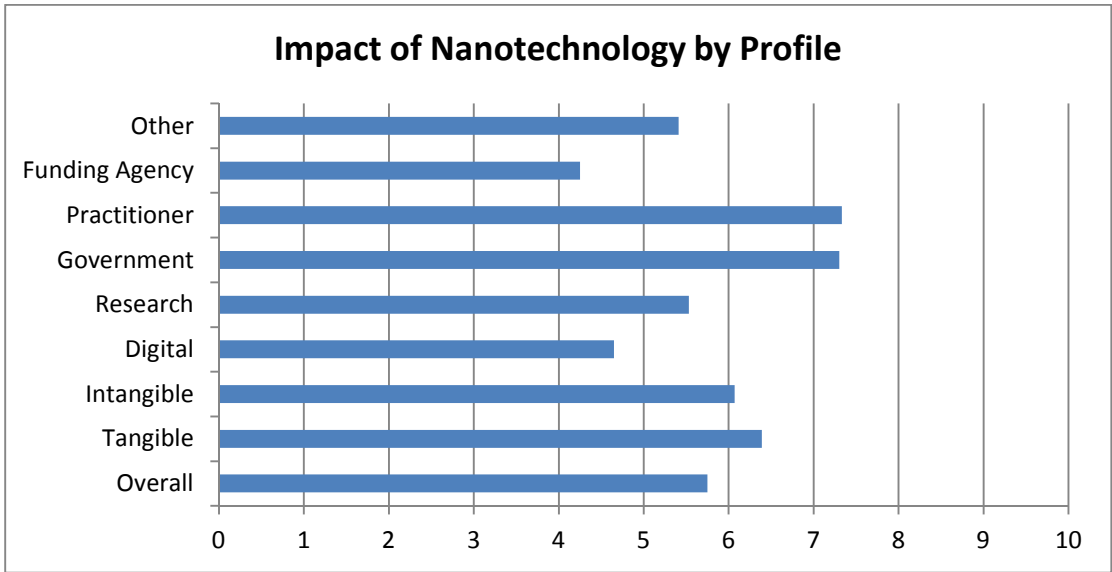
Mean	Min	Max	Median	Std<
5.75	2	10	4.5	0.25

Most respondents anticipated that nanotechnology would have an impact on cultural heritage. One respondent commented:

> *Not convinced the direct effect will be significant - at least for now, nanotechnology has contributed to development of conservation treatments; however, with the lack of resources, these are unlikely to be implemented on a big scale in the short term. The influence is likely going to be indirect, in the medium term.*

References were made to the impact that nanotechnology is already having on heritage conservation and other forms of heritage science. Although respondents referred to 'endless possibilities', there were major doubts on the application of nanotechnology due to unknown impacts and risks for health and the environment.

Implications for cultural heritage research
- *Research on conservation techniques in tangible heritage and materials research*
- *Direct applications of nanotechnology are unlikely due to current costs of development and lack of resources. In the mid-term, nanotechnology could contribute through development of new sensing and other technologies, including those improving access to heritage. However, new skills will be needed.*
- *Ever greater connection to all natural science basic and applied research. An increased need for better natural sciences education of curators, conservators and policy makers.*
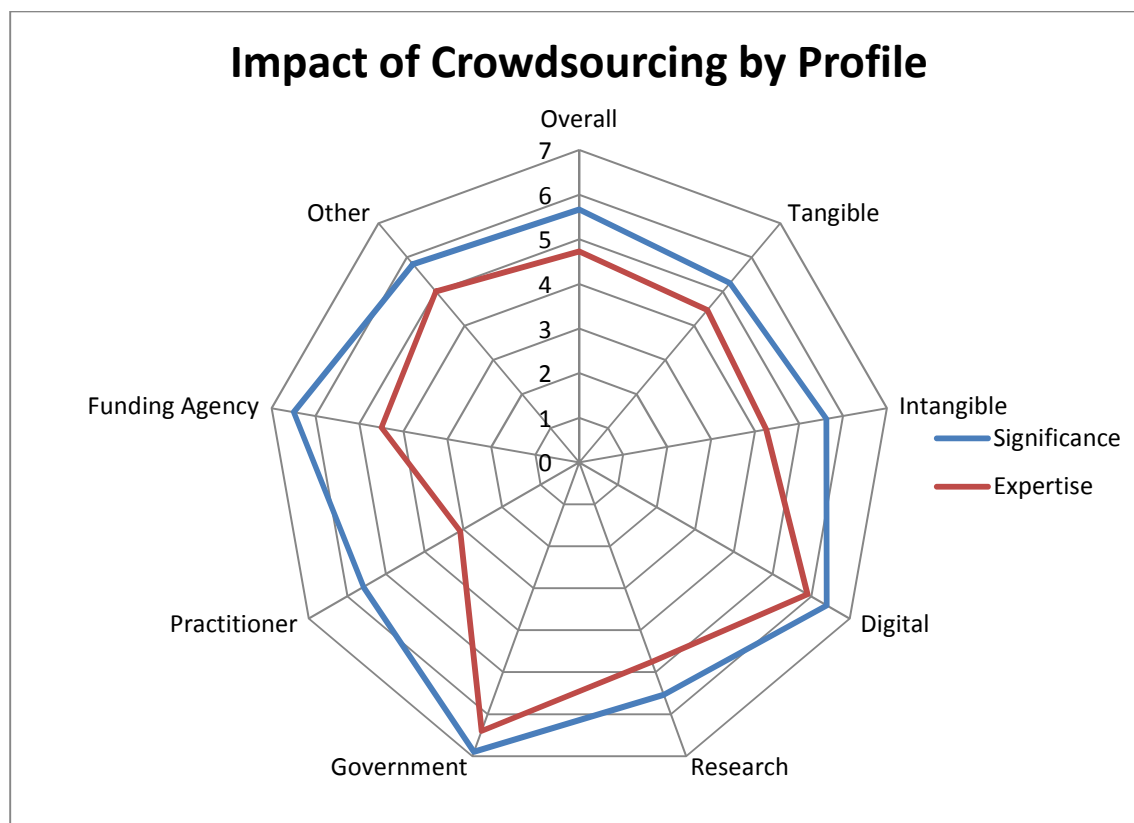
Crowdsourcing (#16)
'Crowdsourcing will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Crowdsourcing across respondent profiles was 5.67. The highest average ranking was given by the Government group (6.9) whilst the lowest was given by the Tangible group (5.25).

Impact of Crowdsourcing by Profile

57

Impact of Crowdsourcing by Profile
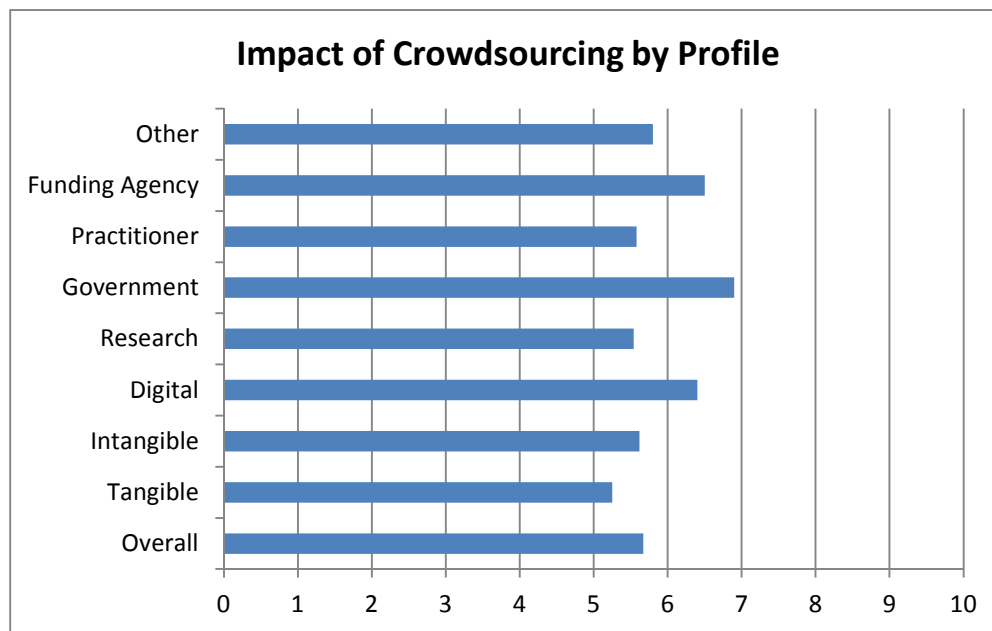
Count: 68

Mean	Min	Max	Median	Std<
5.67	2	10	4.5	0.241

Respondents identified the potential of crowdsourcing to build knowledge and awareness of cultural heritage based on the experiences of users. Crowdsourcing is seen as a 'rather new opportunity where many people may participate and make a difference'.

> *This area may come to have large influence both on financing and volunteering in the heritage area, but also on collecting information in the areas of archaeology and micro-history.*

Although the benefits of engaging users in cultural heritage were widely accepted, some participants were cautious about current experiences of crowdsourcing initiatives:

> *Crowdsourcing is huge at the moment, and very 'trendy', but I have seen very little evidence of its impact in CH. A lot more research is needed on the impact of the many, many crowdsourcing projects that have been funded, and I suspect that current models will become outdated very quickly. I see a greater emphasis on mediated crowdsourcing, or meta-crowdsourcing, than current approaches.*

Implications for cultural heritage research

- *Great opportunity to finance scientific research applied to CH.*

- *More outreach needed, new skills required.*

- *There will be the odd case study, but this will never replace the hard working individual researcher*

- *Evaluative methodologies to process user generated content in relation to data created by the institutions.*

- *Crowdsourcing can be used for a lot of data, but only a few data which are collected by crowd sourcing can be at the base of research. One can for instance help church owners with gathering data for their own and for our use, but this will be an enormous effort. We could, however, use data from crowds if we provide the right templates or metadata.*

- *Exploiting citizens for digital annotation and content generation provides a leveraged workforce that isn't achievable in any other way, but quality assurance and moderation by experts remains critical to maintain the quality.*

Security Technologies (#17)

'Security technologies - sensors and monitors - will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Security Technologies across respondent profiles was 5.63. The highest average ranking was given by the Government group (6.6) whilst the lowest was given by the Digital group (4.66).
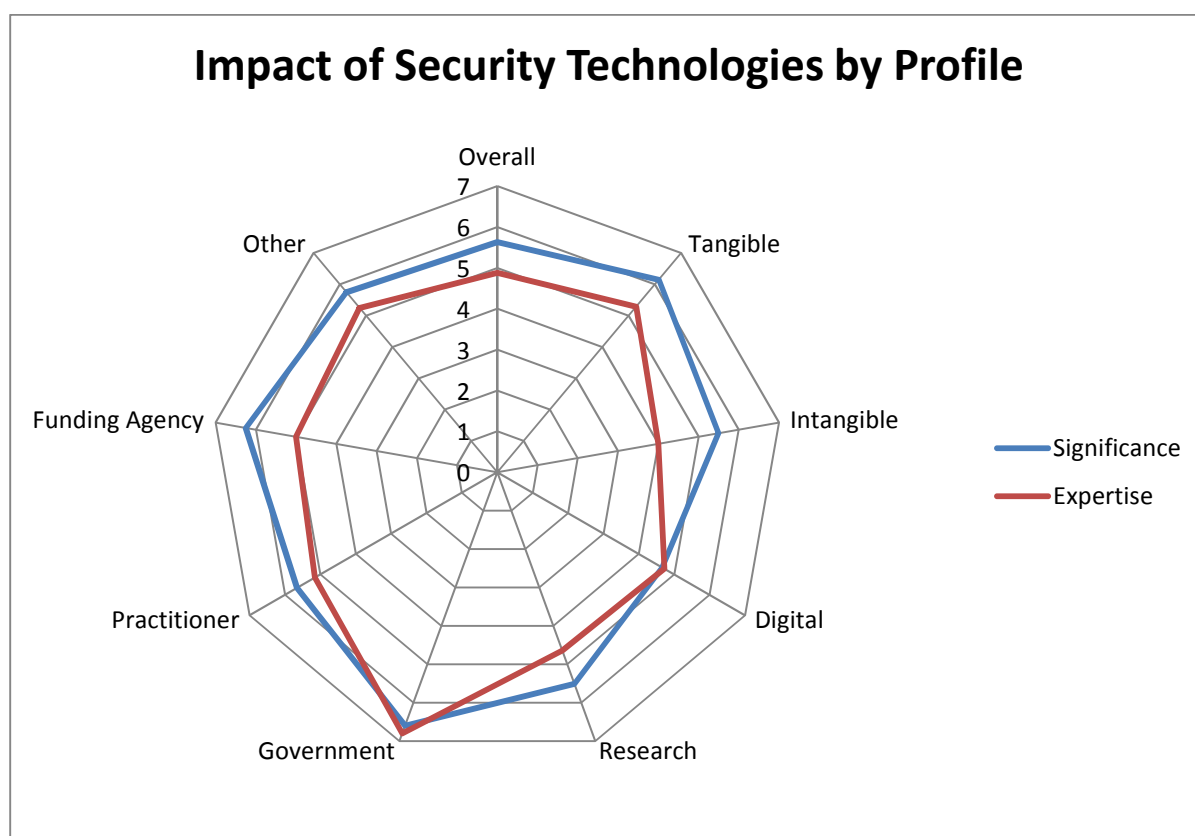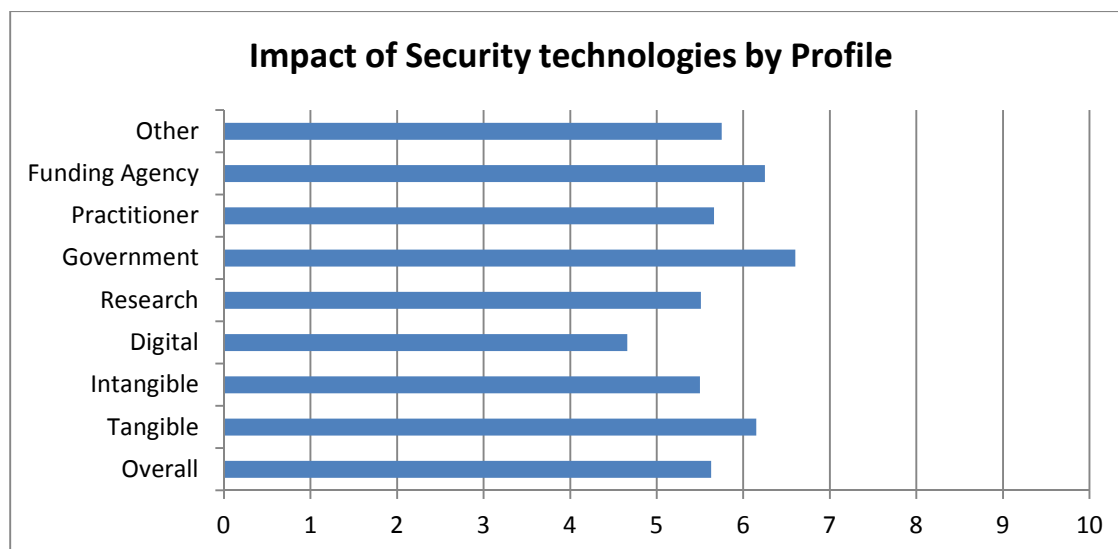
Count: 67

Mean	Min	Max	Median	Std<
5.63	2	10	4.5	0.253

Several respondents noted the positive contributions that security technologies could make in the field of cultural heritage. Whilst most who commented were of the view that security technologies would have 'Very high impact for the conservation and protection of tangible assets', a few respondents described the impact as relatively insignificant.

**Implications for cultural heritage research**

- *Development of sensors for the security and satellite earth observation of archaeological sites affected by man-made risks (urbanization, looting).*

- *Monitoring, preventive conservation, control of fluxes (tourists, etc)*

- *The technologies for security of museums, monuments, and archaeological sites are already available. Conversely, the problem of traceability represents an open problem to be suitably addressed.*

- *Monitoring and risk management are already a subject for research and this will increase especially in the medium time range.*

Biosciences (#18)
'Biosciences will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Security Technologies across respondent profiles was 5.62. The highest average ranking was given by the Government group (7.0) whilst the lowest was given by the Digital group (4.9).

Impact of Biosciences by Profile

Impact of Biosciences by Profile
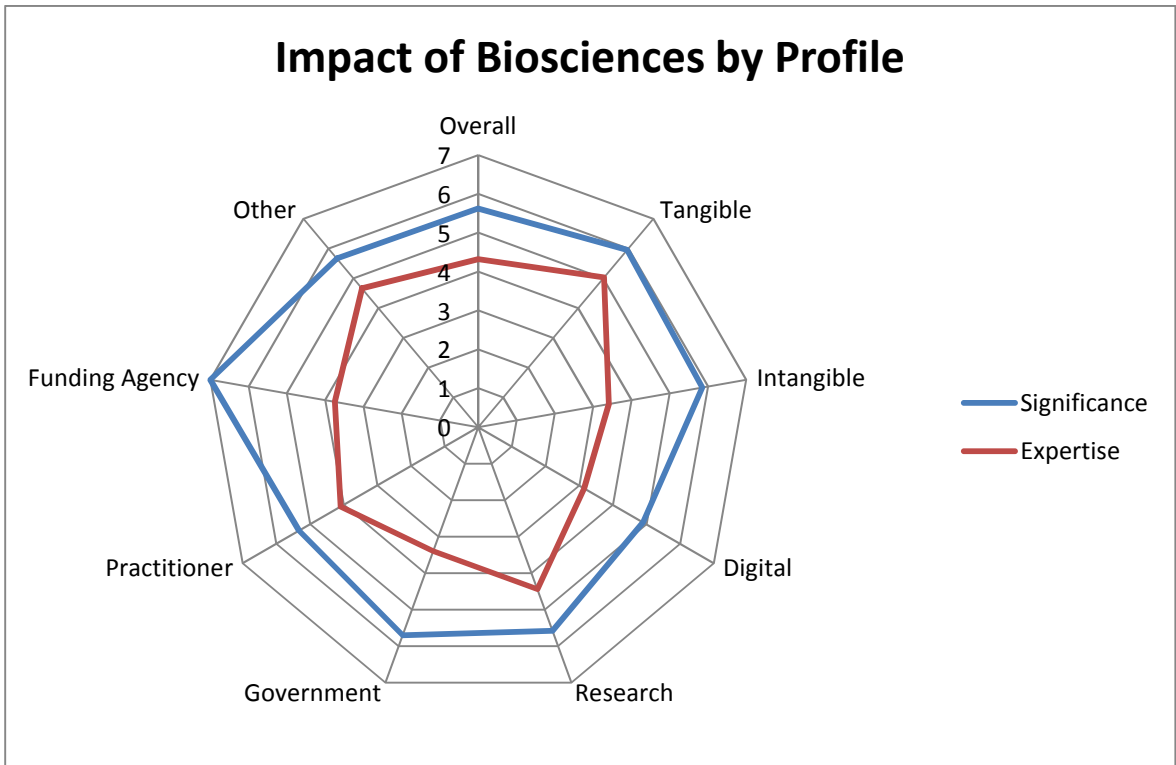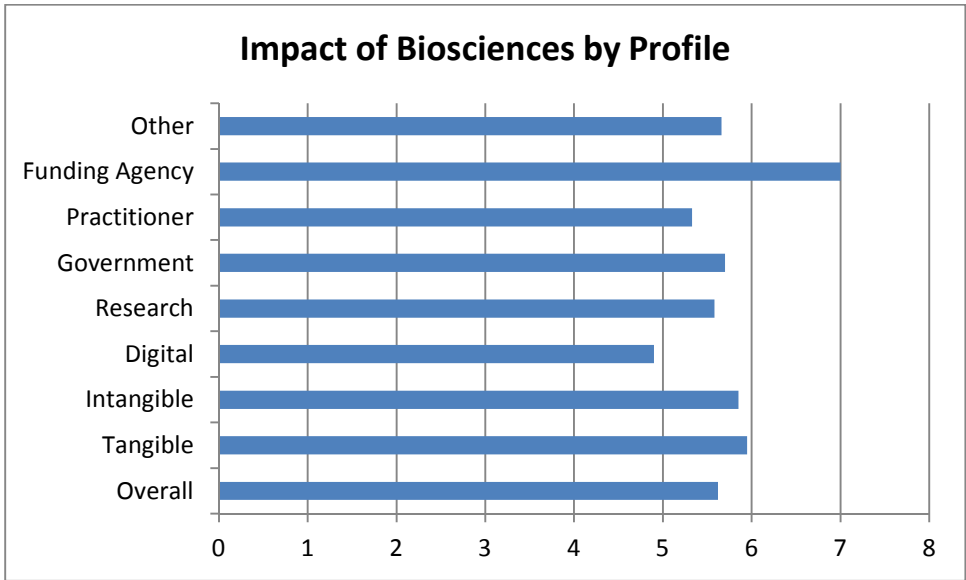
Count: 67

Mean	Min	Max	Median	Std<
5.62	2	10	4.5	0.237

Comments made by respondents on the impact of biosciences

- *Biotechnology and other areas of biosciences, eg biodiversity science, have already many links with cultural heritage through heritage science*
- *In terms of biopolymers, they touch on much heritage - parchment, leather, wood, silk, textiles, paper*
- *Biomaterials could be produced/improved for conservation. New diagnostic analyses can be developed. The impact does not seem different to other field of the research*
- *Big impact, but not as much as nanotechnology. Especially for the preservation of tangible heritage.*
- *Same as with nanotechnologies - there may be a significant effect, but in the long to mid-term only. The domain is too underfinanced currently to allow for effective absorption in the short term.*

**Implications for cultural heritage research**

- *Research on bioweathering and bioprotection of cultural heritage*
- *Biodegradation of facade finishes of heritage buildings under the influence of climate change: more moulds etc.*

Gamification (#19)

'Gamification' will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile

The average future impact score for Gamification across respondent profiles was 4.87. The highest average ranking was given by the Government group (6.4) whilst the lowest was given by the Practitioner group (3.91).

Impact of Gamification by Profile

Impact of Gamification by Profile
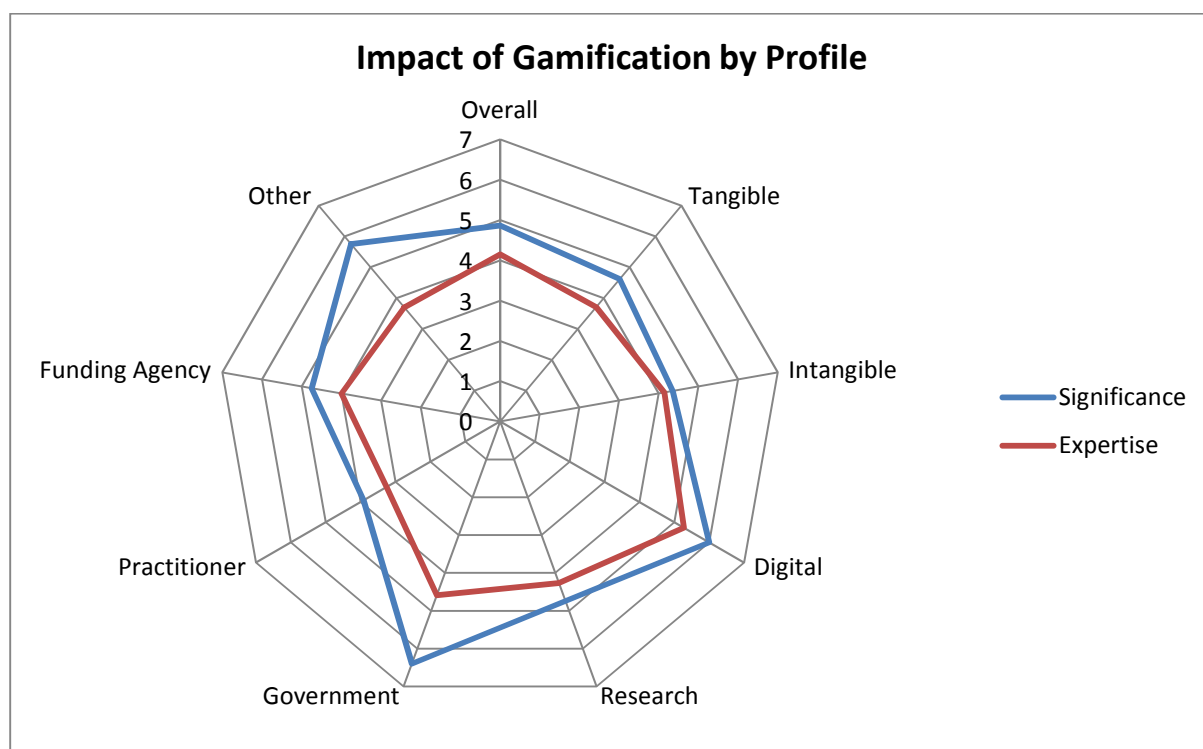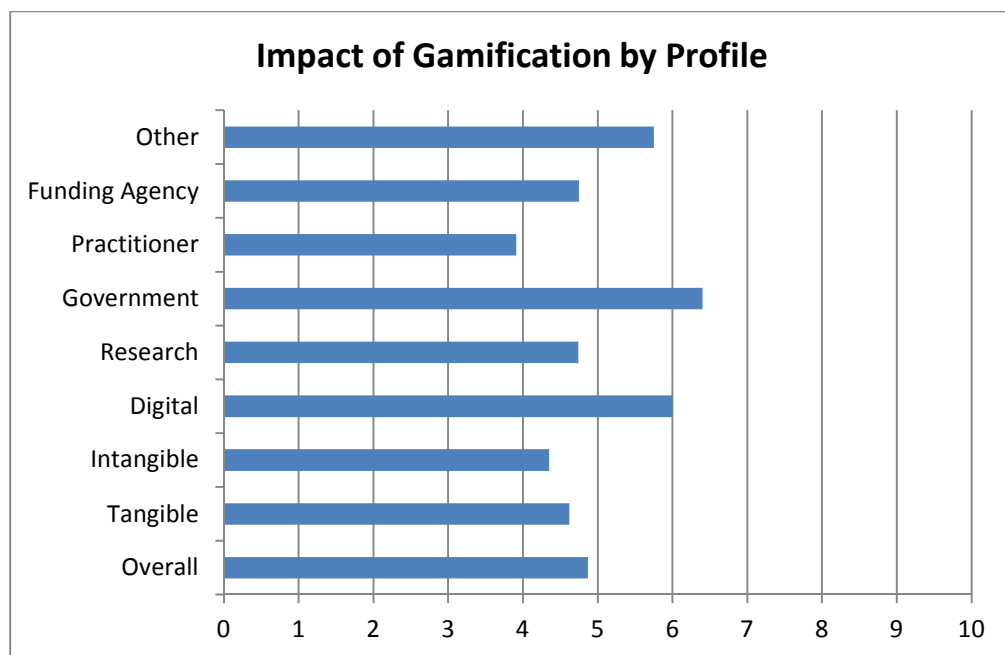
Count: 69

Mean	Min	Max	Median	Std<
4.87	1	9	4.5	0.236

On the whole, respondents did view gamification as a driver that would have a major impact on cultural heritage (ranked one from the bottom in average scores). Its potential benefits and uses were acknowledged – as a means of engagement and communication. A number of respondents described it as a short-term fad and gimmick although others were keen to reinforce the point regarding engagement and younger people:

> *Gaming will provide outlets for cultural heritage archives (as in games like Assassins Creed), and serious gaming will play a role in engaging younger people with cultural heritage.*

Implications for cultural heritage research
- *Limited, although using CH in games could promote engagement with CH, so needs to be researched. New skills necessary, though.*

- *Not sure it is an area for research investment; if there are commercial drivers it will happen anyway*

- *This strongly depends on the funding opportunities of heritage institutions. Games are costly. Games have hardly been instrument of research analysis, although they can be used as instruments for disseminating knowledge about heritage over groups of users that have no strong connection to heritage.*

65

Cyber Security (#20)
'Cyber security will have a significant impact on cultural heritage'.

Future Impact Results by Respondent Profile
The average future impact score for Cyber Security across respondent profiles was 4.47. The highest average ranking was given by the Practitioner group (5.25) whilst the lowest was given by the Funding Agency group (3.25).
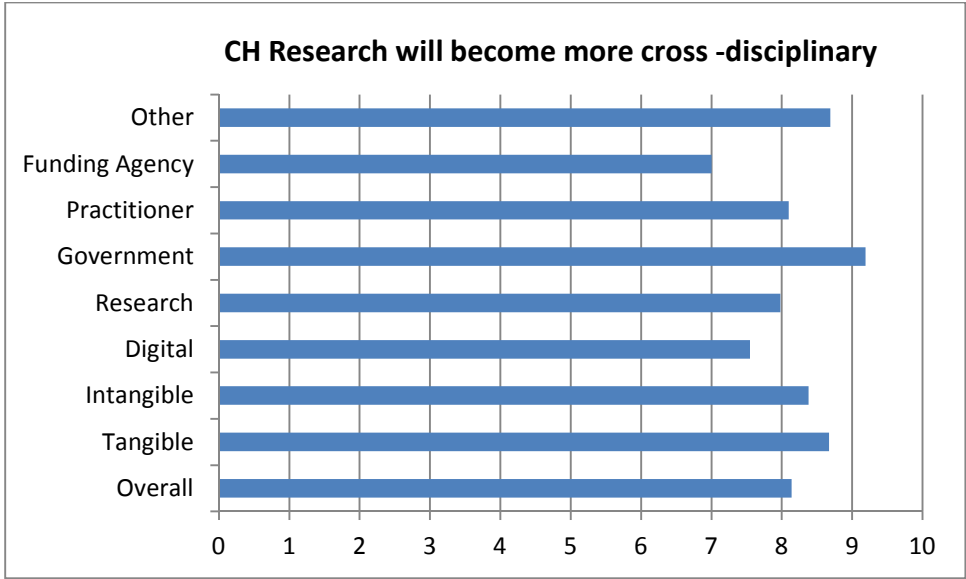

Count: 67
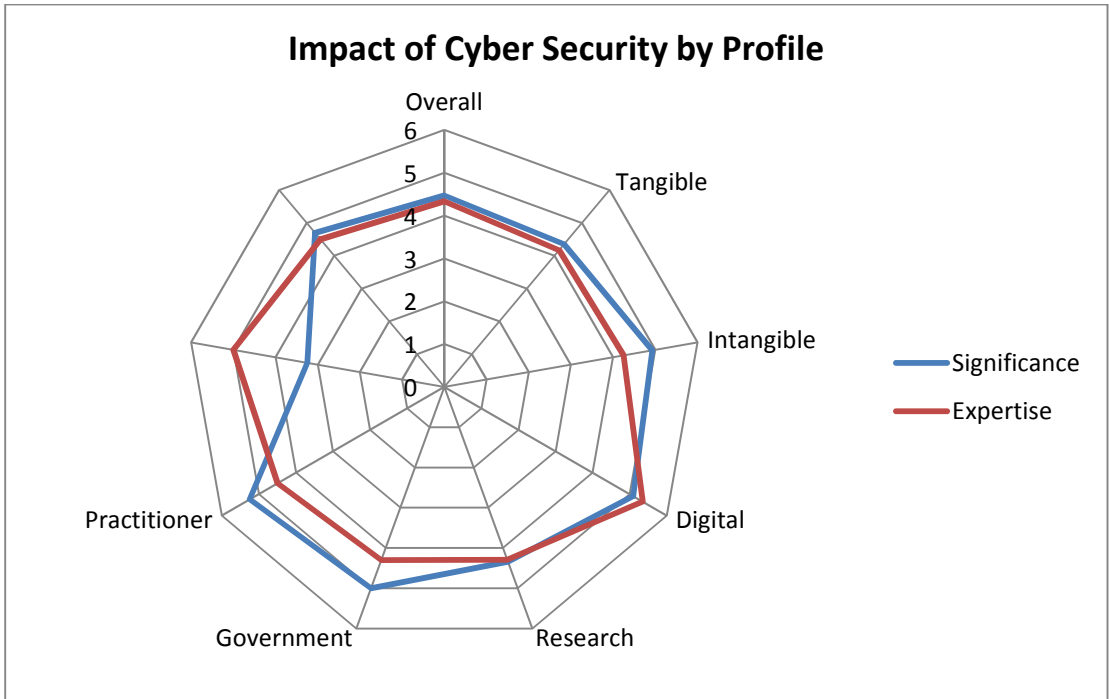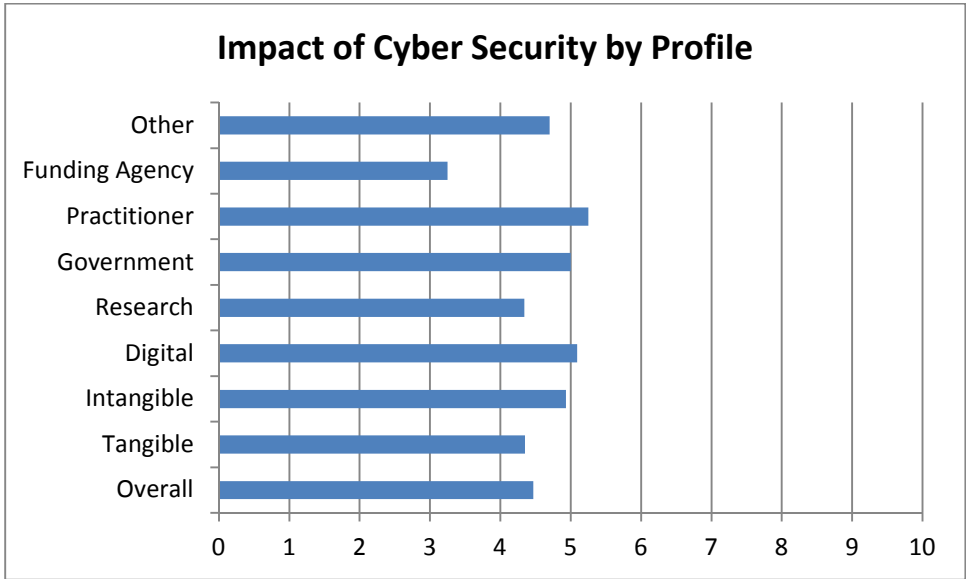
Mean	Min	Max	Median	Std<
4.47	1	10	4.5	0.234

This was the lowest ranked driver amongst respondents. Most comments acknowledged the general risks posed by cyber security. In terms of cultural heritage, these risks could contribute to methodologies for digital authenticity.

6. Factors shaping the future cultural heritage research environment

'Cultural heritage research will become more cross-disciplinary'.

There was a strong degree of support for this statement, with an average score of 8.14. The highest average score was provided by the Government profession category (9.19), whilst the lowest score was given by the Funding Agency profession category (7.0).

CH Research will become more cross -disciplinary

Count: 67

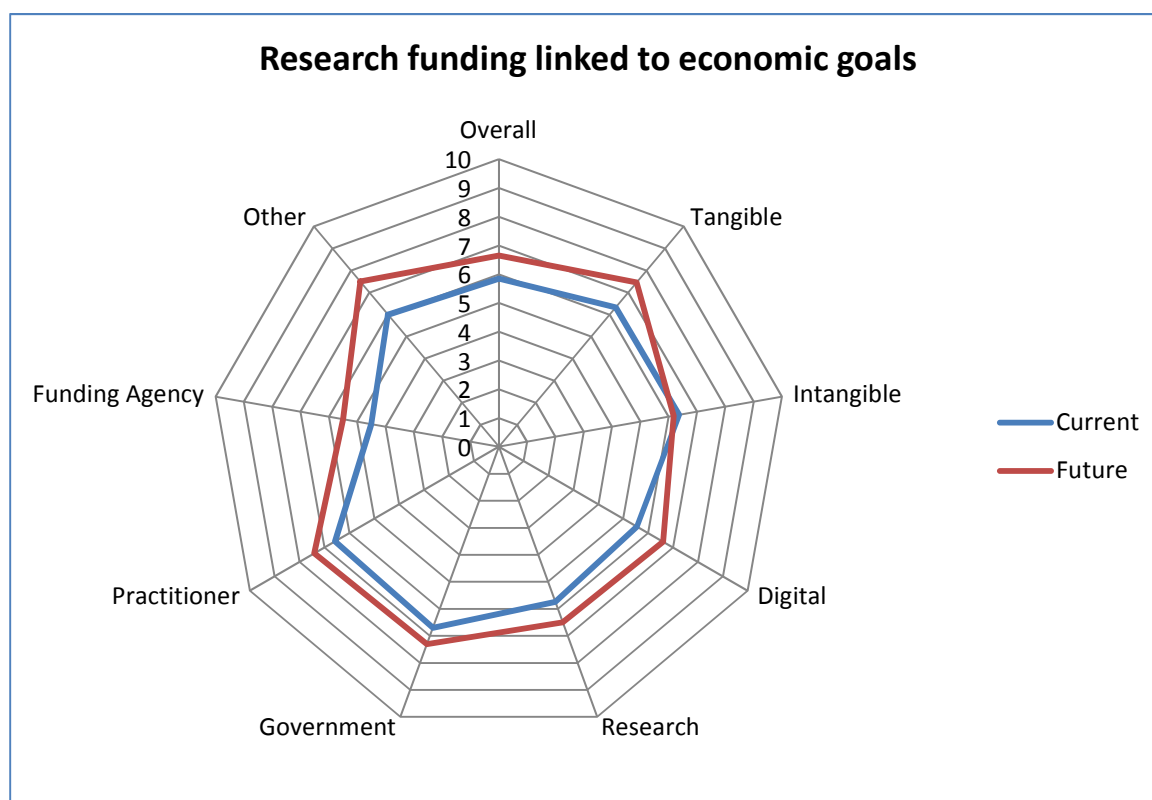| Mean	Min	Max	Median	Std<
8.14	3	10	9	0.25

There was a high level of consensus amongst respondents that cultural heritage research will become more cross-disciplinary. This is already an established approach which is likely to continue and become more significant in future.

One respondent, less convinced of progress towards cross-disciplinary approaches, commented:

> I'm not sure about 'will'. It should, but there always seem obstacles ('cross disciplinarity is more than one group using another's technical methods, it should involve sharing disciplinary mindsets and perspectives, much more difficult).

'Funding for cultural heritage research will be linked to meeting economic goals (e.g. for tourism; the games industry)'

Participants were asked their views on both the current/recent situation and the anticipated future situation. Overall, the participants thought that, in future, there would be increased linking of cultural heritage research to economic goals (from an average of 5.85 at present to 6.65 in future). This view was expressed by all categories with the exception of those that worked in Intangible cultural heritage. The two groups that anticipated the biggest shift in emphasis in the future were the 'Other' primary profession and those engaged in Tangible cultural heritage.

Data for current/recent situation
Count: 68

Mean	Min	Max	Median	Std<
5.85	2	10	5	0.257

Data for future situation

Count: 68

Mean	Min	Max	Median	Std<
6.65	2	10	7	0.248

An increased policy focus on the economic impact of cultural heritage research was largely acknowledged by respondents – although not endorsed. From the responses

received, the situation appears to vary according to national conditions – some reporting the importance of the 'impact' agenda in research (such as the UK), whilst others stated that it had not been their experience.

One respondent commented:
> *Funding for cultural heritage research is already linked to meeting economic goals. Not necessarily a positive development in all cases.*

Respondents signalled risks in adopting a more economic approach to funding research in the field – particularly in diverting resources away from areas that were more deserving in an intrinsic sense. Others stressed the applied nature of cultural heritage research – and that it was difficult to impose greater expectations of economic returns from the investment:
> *There will be a bigger push for more economic impact of all research. Yet, the domain is already largely driven by application, so it is unlikely that the impact will be bigger.*

'Funding for cultural heritage research will be linked to meeting social goals (e.g. social cohesion)'

Participants did not see the social agenda having as much impact on research funding in future compared with economic goals. The average for the group was 5.26 for the present/recent situation, and 5.83 for its future influence on research funding.

Research funding linked to social goals
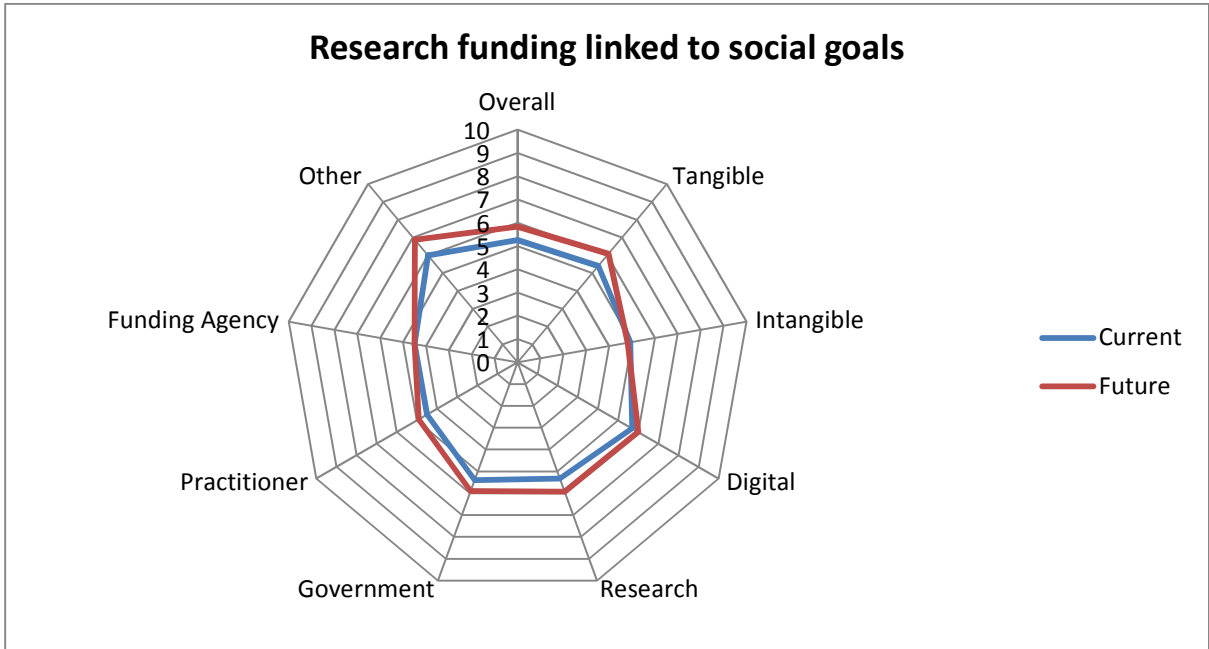
Data for current/recent situation
Count: 67

Mean	Min	Max	Median	Std<
5.26	1	10	4.5	0.254

Data for future situation

Count: 66

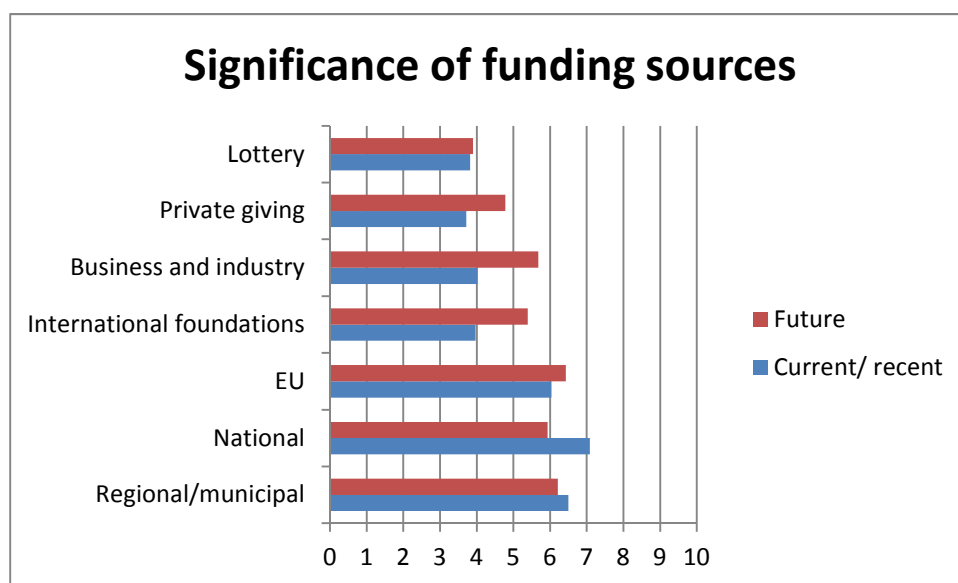| Mean	Min	Max	Median	Std<
5.83	1	10	5	0.24

Although not considered as significant as the economic agenda, there were areas where linking cultural heritage research to social goals could become more apparent, particularly cultural diversity and integration, and (national) identities.

**Significance of various sources of funding for cultural heritage research**

Participants were asked to judge the significance of a range of identified funding sources for cultural heritage research – both the present/recent situation and that anticipated in future. The most significant funding sources at present for the group are, in order, national; regional/municipal; EU. Participants anticipated that national and regional/municipal funding would become proportionally less significant in the future, whilst the EU would become more significant than at present – and the most significant of all sources.

They also thought that Private giving, Business and industry, and International Foundations would become significantly more important in future.

'Philanthropy and giving (including crowdfunding) will have a significant impact on cultural heritage'

There was a separate question on philanthropy and giving (including crowdfunding). Overall, participants stated that there would be a modest increase in the impact of such funding (from 5.91 at present to 6.06 in future).
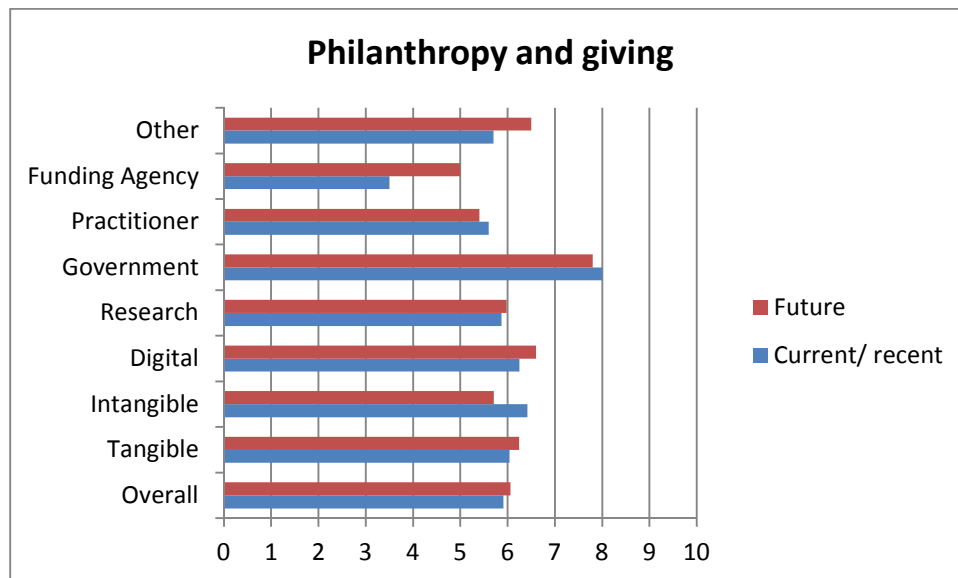
'Users will become more involved in cultural heritage research'.
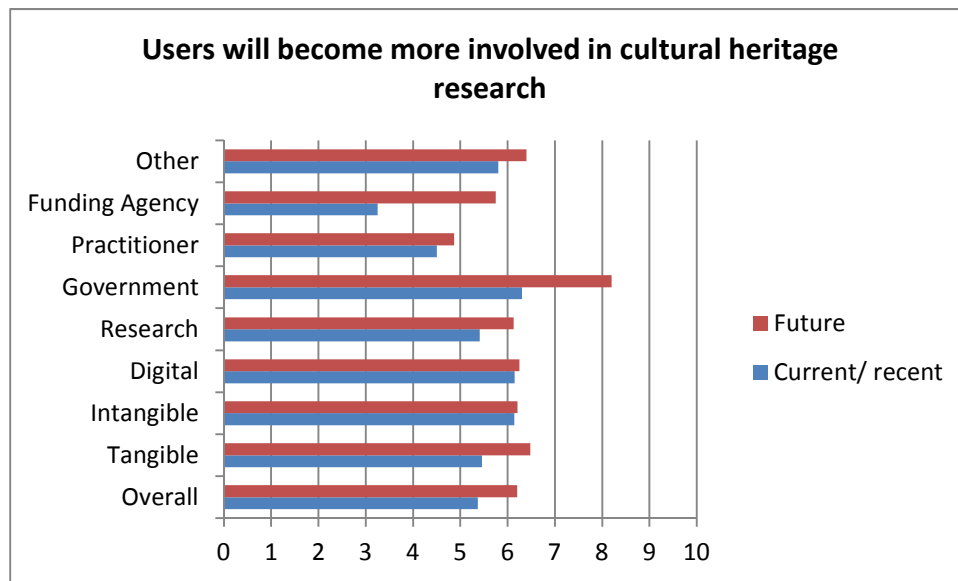
Current/recent
Count: 65

Mean	Min	Max	Median	Std<
5.37	2	10	4.5	0.237

situation

Future situation

Count: 65

Mean	Min	Max	Median	Std<
6.2	2	9	7	0.234

Overall, respondents anticipated an increase in the involvement of users in cultural heritage research (from 5.37 for the current/recent situation to 6.2 for the future situation).

There were noticeable differences of opinion regarding the degree of involvement of users – and participants' views on the desirability of this approach. Some strong endorsements were made of user involvement in research:

> *The best way forward is user involvement, which will be increasingly recognized as the successful strategy to take.*

> *Users will always be the primary goal for the cultural heritage.*

Although the view was not representative of the majority, the involvement of users appeared to be at variance with certain respondents' conception of cultural heritage research:

> *Not likely, it is a field with a demand for highly educated personnel, with a broad range of competencies.*

The majority viewed user involvement as likely and desirable:

> *Everyday users (visitors) should be more involved in participatory research, as they define heritage. It would make sense for heritage institutions to become more involved in research to ensure that research answers real research questions.*

'There is an adequate supply of education and training (volume and type) to satisfy for cultural heritage research needs (next 10-20 years)'.

The average future impact score for Adequate Supply of Education and Training across respondent profiles was 4.18. The highest average ranking was given by the Government group (6.0) whilst the lowest was given by the Intangible group (3.42).

Adequate supply of education and training for CH research
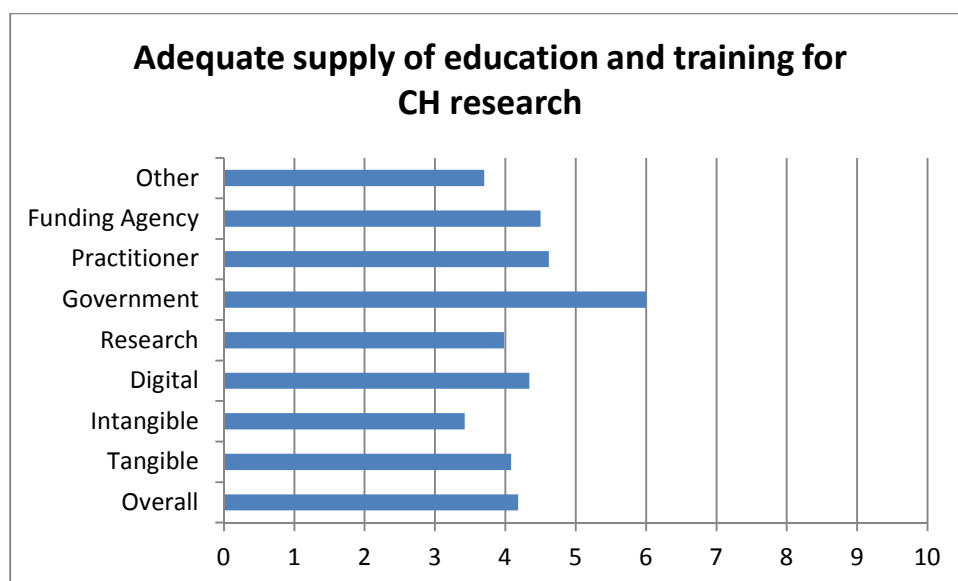
Count: 64

Mean	Min	Max	Median	Std<
4.18	1	10	4	0.252

It is clear from the scores provided that most respondent groups do not feel that there is an adequate supply of education and training for cultural research. The respondents identify some key factors and concerns:

- Lack of inter-disciplinarity/cross-disciplinarity: this was the factor cited most often by respondents.

    There is not enough cross-disciplinary education - most education in the EU is highly siloed and does not correspond to the real needs of the field for collaborative, highly responsive research. While there may be much education going on, the resulting skills are not adequate for the domain to face the challenges.

- Lack of dedicated programmes for cultural heritage researchers
- Inadequate funding for participants to take up programmes available

'Labour market mobility (including that of researchers) within the EU will have a significant impact on cultural heritage'.

The average future impact score for Labour market mobility across respondent profiles was 6.13. The highest average ranking was given by the Practitioner group (7.0) whilst the lowest was given by the Intangible group (4.78).
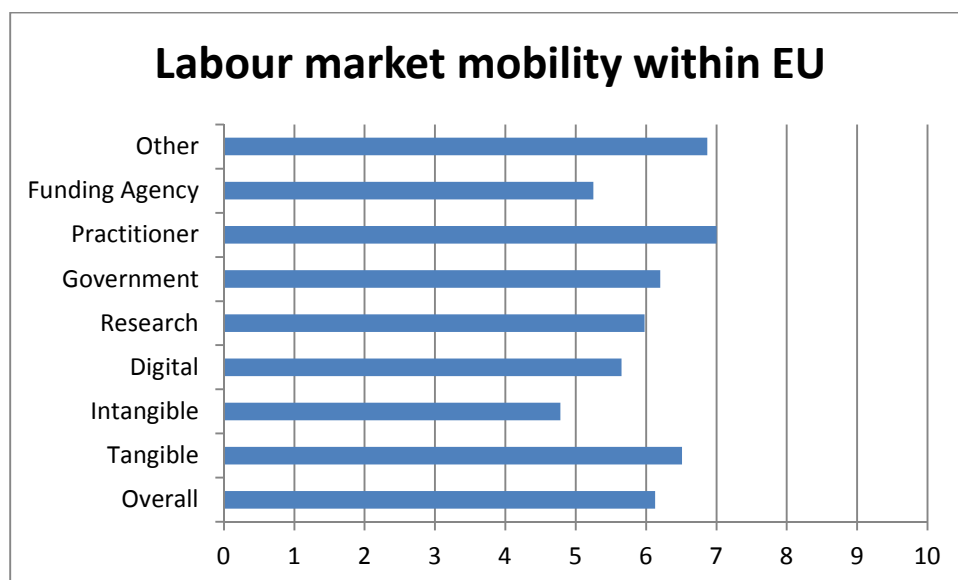
Count: 63

Mean	Min	Max	Median	Std<
6.13	2	10	6	0.276

It was noted that mobility is still very limited in research particularly in the humanities. One respondent commented on the importance of mobility in cultural heritage research given its specific character:

> *Since the CH research is a small domain, mobility is crucial. It is essential to open the knowledge market even more.*