Human Brain Project

Citizen's view on neuroscience and dual use

[United Kingdom]

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Content

Summary of results

31 citizens convened in London, Vauxhall, based in the United Kingdom on Saturday 3rd March, with a view to deliberating for a full day on the ethical and social implications of dual use of the findings from the European Commission funded Human Brain Project. The day involved informing citizens about the issues that arose, engaging in small group and large group (plenary) discussions, as well as prioritising and identifying key questions for the Human Brain Project to address with a view to engaging citizens in deeper dialogue about these issues. This report summarises the findings, methodology and next steps of that workshop.

Areas where there was consensus:

- Inequality of power and control; a sense of increasing centralisation: There was significant interest and engagement on the issue of dynamics of power, inequality and control over the transparency and use of data through initiatives such as the Human Brain Project. Strong themes that emerged consistently throughout the day was the sense that inequalities of and increasing concentrations/centralisation of wealth and power between citizens, states and corporations posed a series of systemic barriers to the ethical use of information and data gathered through initiatives such as the Human Brain Project (and that these would need to be addressed if issues raised by dual use were to sufficiently respond to people's values and concerns).

- Lack of transparency and secrecy: Many citizens felt that a significant barrier enabling more ethical approaches to the use of information was (oftentimes) the inability to hold organisations (whether military or intelligence) to account for their use of the information – primarily because of issues relating to such organisations' approach to maintaining secrecy for public security reasons. Many citizens felt that *organisations that sought to realise the public interest* such as M15, GCHQ and M16 (UK security services) faced a genuine tension between need to maintain a balance between outcomes that secured public security in the common/collective interest; and the need to use data and wider information in a manner that protected people's individual rights and liberties. Most participants felt they did not trust their sources of information about these issues - participants raised concerns about the nature and quality of information available on how military and security service organisations conducted their affairs. And many were critical of the extent to which (oftentimes) media reporting lacked balance on the socio-ethical implications of neuroscience, and an ability to promote a more informed dialogue between citizens and such institutions.

- Appetite for greater public education on, and a strong interest in public engagement on these issues: Other citizens felt that these issues meant there was a strong need for corporations, military and defence organisations as well as security services to undertake more anticipatory, early stage research and innovative public engagement; in a manner that allowed them to both better understand public values on the use of neuroscience data in an informed fashion but without necessarily taking a 'mass-communications' based approach to the engagement. Citizens indicated that they had enjoyed the day (and had not necessarily thought they would have such a strong interest in the application and use of neuroscience – but had discovered in actual fact that they had *both* an interest in, and desire to continue to engage with institutions on these issues).

On dual use in particular, citizens recognised similar but also distinct issues in relation to *corporations* that might be contracted to use and apply such information in the public interest (e.g defence companies or contracted companies to provide military services to nation states). Similar questions arose – particularly around the tensions between such organisations maximising profit, seeking to maintain shareholder value and maximise shareholder gain; and such organisations' incentives to ensure sufficient transparency and protection of people's rights to their own personal liberty and privacy.

Areas with less consensus:

The extent to which dual use itself is an ethical issue: Some citizens felt that focusing on the question of *dual use* itself did not sufficiently address the question of whether the technology/data used was an ethical use of that technology or data; whereas other citizens *did* feel that it mattered as to whether information was inherently used in a military or a non-military context. It was noticeable that many citizens did 'push back' against the idea that 'dual use' was the ethical issue per se, but rather felt that dual use brought to starker light ethical issues that might apply in a non-military or intelligence based context as well; numerous citizens cited examples of technologies that had been developed with a military purpose in mind; but had in fact been applied in domestic contexts to secure significant public benefits; and numerous citizens also cited examples of technologies that had been developed with purely domestic purposes in mind, which had then been applied for a military purpose. Examples of such technologies included the microwave, the atom bomb. A number of citizens saw the potential for positive application of such technologies in both a military/non-military context; as well as negative applications of such technologies in both contexts; 'we cannot have a hard line or border between military and civilian use,' argued one participant. However, other citizens felt that the *purpose* for which such data was used was inherently an important question – and a number of other citizens opposed the use of this data to advance developments in a military contexts (often because of the serious implications of such uses for e.g loss of life, fracturing foreign policy, or because, in some very specific instances, of a general values or faith-based opposition to the use of warfare itself).

Bias- Citizens also expressed a variety of views on the kinds of ethical issues that arose in relation to both domestic/military applications of such technologies that they felt warranted examination. These included concerns relating to inbuilt or implicit bias of such technologies (that the use and application of neuroscience in a military context might inadvertently use datasets that discriminated against particular groups or individuals) – some citizens seemed to feel that this was more of an issue than others. **Predictive accuracy of technologies:** Some citizens felt that there were concerns with using neuroscience data that aimed to make predictions and assumptions about the human condition when that in and of itself was a complex condition – 'we evolve, shape and change rapidly as persons,' said one participant. However, others thought that the ability of technologists to interrogate sufficiently large data sets might be more accurate and more able to understand the likeliness of human responses than the types of cognitive biases exhibited by individual decision makers and humans.

Results from Round 1: Research and Dual Use - Overall principles

The general opinion on dual use was that, inherently, the ethical issues that arose were not necessarily restricted to dual use; but often that dual use made those ethical issues more stark. Examples were provided where dual use had resulted in significant benefits to civilians – but also where dual use had led to unintended/unforeseen consequences (the atomic bomb was cited as an example). Most citizens felt that the issue of 'dual use' was less of an issue than other issues – such as who had access to the information and who did not, the purpose to which the technology or data was likely to be used, how transparent and ethical the use itself was, and potential risks/the kind of harm that might ensue if the technology was misused and/or got into the wrong hands. Very few participants felt that dual use was completely unacceptable in any given context. However, most participants gave strong caveats and conditions around which they felt dual use might be more permissible:

Issues and similar themes which came up consistently across the groups included the following: Access to such technologies, the lack of transparency in military and non civilian contexts was raised as being problematic, as well as the need to secure individual human rights such as the right to privacy and the right to know how personal data was being used. They expressed a desire for greater impartial information and engagement on the ethical questions arising, as well as to see that research and development in this space had a clear risk framework, boundaries and recognised/managed for the potential for harm to citizens. A number of people raised questions around uncertainty and trust – people felt that the purpose for the use of such research was often unclear, and that in itself generated uncertainty and contributed to declining trust in organisations who may wish to (legitimately) use such information to prevent terrorism, address other security concerns, or in a military context. Areas where there appeared to be some difference in opinion between the group included:

- The extent of risk and uncertainty about how data/information is used in the future
- the kind of balance to be struck between anticipatory, upstream, slow and deliberative innovation; and the benefits of rapid innovation that could accrue (especially with dual use) – how free of oversight should developers be?
- How acceptable dual use itself was (people had very different/polarised views on this one).
- The extent to which there was risk of harm to people and society through allowing dual use
  Many participants described feeling uncomfortable about the HBP collaborating with organisations and initiatives that received funding from military and defence organisations (particularly those not based in the European Union). They stressed the importance of clear frameworks and boundaries around the actual use of that information should it be shared, as well as a way to effectively enforce any abrogation/breach of those boundaries. They recognised that in many contexts, including foreign policy contexts, it might be necessary to share information across boundaries to tackle global problems and to keep citizens safe; as well as to also pool resources to avoid overlap . However, they stressed that such information and access to such information/dual uses might easily be transferred and misused by other organisations, corporations and persons who are responding to incentives other than the social good of particular groups of people.

Results from Round 2: three areas of research

Provide an analysis of the results from round 2 in the United Kingdom. One for each area, and one crosscutting with issues, concerns, hopes and dilemmas that came up across the area subject.

Medicine

Strong themes from the groups included the potential of such developments in medicine to improve the quality of life of people, especially those who had suffered in a military environment. They recognised the potential advances had to promote greater independence and agency for those people; as well as to tackle mental health problems that arose (e.g PTSD) as a result of experience of warfare. Some people also spoke about the benefits for animal welfare as well as human welfare. They expressed hopes that developments would help with earlier, more preventive and more accurate diagnoses. People stressed the economic benefits as well – leading to a more able workforce for longer, which would be beneficial for companies and governments hiring employees.

However, dilemmas and concerns also raised focused on money and affordability – not everyone would necessarily be able to benefit and access advancements. Many people raised concerns that advancements would demand people to become 'homogenous', with less tolerance and acceptance of natural human diversity and disability. Many people raised moral, religious and ethical questions about tampering with human bodies too extensively or profoundly; as well as questions of agency (not wanting to reduce humans to experimental guinea pigs, or to robots). And a range of people raised concerns about unintended side-effects that might result in e.g emotional suppression or harm to people's psyches.

Artificial intelligence (computer learning)

Strong themes within these groups included the extent to which the use of AI could help develop the efficiency and cost-effectiveness of military and intelligence services. Many people also felt that they could support a more discreet form of counterterrorism and security than those that often existed (which felt very threatening e.g police forces at demonstrations and rallies). A number of citizens also highlighted the extent to which they felt such initiatives were capable of more rational and reasoned decision making under pressure through the use of deep learning.

However, ethical dilemmas and concerns that were raised focused on the potential loss of human freedom and lack of responsibility arising as a consequence of handing decision making over completely in such environments (who should we blame if/when things go wrong , especially if decisions are irreversible as they often are in military environments?). There was strong concern that the data the AI would be trained on was at real risk of bias and discriminating against certain groups in military contexts. Many people were worried about the risk of hacking and leaks of personal and potentially dangerous data in the wrong hands. Others raised the question about the dependency culture this might create – in turn leading to lowering levels of empathy and humanity in military & intelligence contexts. Many people also questioned the extent to which taxpayer money would/should be paying for such developments at a time of deep constraints on the public purse for civilian use.

Brain-computer interfaces

Numerous groups cited Stephen Hawking's support as an example of brain-computer interfaces leading to developments for a person's quality of life, but also wider society through supporting people to make the most of their human potential. They recognised that BCI could help amputees and others suffering in a military context to recover and to regain their freedom/agency going about their daily lives. Many people also highlighted potential cost benefits in military contexts by reducing expenses through creating lifelike simulations of military environments; as well as its ability to help soldiers improve their responsiveness and decision making through being trained in such environments. They felt it promoted greater efficiency, saving time; as well as a better quality of work (reducing the need e.g for soldiers to do quite as much hard manual labour) – allowing for them to spend more time thinking/being more creative. Many people also highlighted the way in which BCI could help address mental health issues such as PTSD, psychosis and flashbacks.

However – dilemmas and issues raised included the risk of poor accuracy; serious concerns about what this meant for privacy and intrusion into people's minds and thoughts; as well as how this information and technique could be used by organisations that did not aim to secure the broader public good. Numerous issues around consent, who can access the information and the conditions under which it could be shared were raised. Many people were concerned about whether such approaches could be used to repress memories or to distort people's sense of reality and 'normal' – through, for example, normalising violence. People also expressed concerns about how reading patterns might lend themselves to fallacious interpretations and judgements of people's minds and thoughts.

Cross-cutting

Cross cutting issues included:

- The need to secure a balance between realising cost-benefits, better efficiency of services and improved quality of life against the potential harm and damage that may arise as a result of dual use.
- The need to manage the pace of innovation so that ethical concerns could be addressed alongside development rather than immediately after development and dual use .
- Striking the right balance between supporting those injured, unwell and disabled, and allowing for a future in which homogeneity, intolerance and inacceptance of diversity and disability was permitted.
- Reducing humans to robots themselves – without agency, responsibility, ability to consent, hold decision makers to account, influence and control the world around them.
- Inequalities of power, money and access resulting in differential social outcomes based on priorities set by the very wealthiest in society.
- The need to respect and protect individual human rights – especially the right to consent and the right to privacy.

Results from Round 3: Questions to address in the future

The groups were asked to prioritise and to identify key questions to be addressed by a wide range of stakeholders, including researchers, policymakers and citizens. These were the top ten questions of the numerous aimed at a breadth of stakeholders that they identified and selected:

1. Determining the limits and the purpose for which such technologies are used (Where do you intend to take this and where are the limits?) – Policymakers and researchers

2. Money, finance and tax (who pays for this, and how?) – Policymakers and researchers

3. How can citizens have a more informed sense of input and influence? – Policymakers and researchers

4. What input do we have as citizens, and how accountable a framework exists for ensuring we understand and can challenge? – Citizens, and other stakeholders including civil society

5. Risk – How do we best ensure that risk is managed in a way that secures beneficial outcomes for people and society? – Policymakers and researchers

6. Risk: What is the risk that emerges here, and how will you manage the risk? (Researchers)

7. What sense-check/approaches will you use to make sure that you know whether something is causing harm or not? (Policymakers, politicians and researchers)

8. What is the source of a common morality around such approaches when our societies are so different? How do we find a shared common ground? (Citizens, and stakeholders, especially civil society)

9. Inequality of power – how will you stop being part of a system that distributes power unequally? (Policymakers, researchers and stakeholders including companies and industry)

The kinds of questions raised focused largely on the subject of discussion throughout the day – questions of protecting human agency, responsibility, accountability and control in what increasingly felt to many like an area that lacked certainty as to its consequences (now and in the future). Citizens wanted to see clearer answers as to what decision making frameworks companies, developers and policymakers would be using to determine the right way to develop, invest in and then manage the potential risks around certain technologies. Many citizens also asked intractable questions – linking the need to agree a common set of standards to some of the challenges around human morality (which many argued was subjective). Many people felt there was a deeper need to develop a shared set of values and common basis for morality (see question 3). There were specific questions around the use of information about individual people – as well as people's right to access that information about themselves; and a desire to access more information and education about the social implications of technologies.

Key themes present across rounds

Most participants recognised that further developing the application of neuroscience, and sharing information in a way that supported its development had enormous potential to benefit human beings and wider society. The majority of groups and citizens felt that pursuing innovation in this area for social good outweighed and was greater than the risk of not pursuing that innovation at all more generally – however, the group was very clearly split on whether that was really the case with dual use in a military and intelligence context. On that issue, there was very little consensus. Whilst people recognised the potential for greater harm/damage arising as a result of use and application in a military and/or non-military context, some people felt that there was not much of a distinction between the ethical concerns that came up in a civilian context with the use of such technologies; and those that came up in a military/intelligence context. Some citizens also felt that the question was less about whether dual use was acceptable – and more about the purpose to which those technologies were used, the intended and actual outcome, and who they aimed to benefit.The areas that formed the subject of most debate and discussion included:

- The level of trust people had in institutions to use the information they had gathered for the benefit of wider society (some people had much more trust, others significantly less trust)
- Whether it was appropriate for military and intelligence organisations specifically to make use of information that was developed for non-dual use.
- The extent to which the government/state should intervene and demand regulation and oversight (some people felt that there needed to be a slower, more careful pace of development; others felt that time was of the essence to realise the full benefits of innovation)
- The right kind of balance that needed to be struck between people's personal rights and liberties; and the wider societal interests (e.g counter terrorism and security – again people had very different views about how much they trusted intelligence organisations and military organisations to strike that balance.)

Many people recognised that there were often different, sometimes subjective moral responses to some of these questions, and flagged that it would be important to try to build some common ground across these in order to address such questions. As a result, participants found these forms of engagement (public dlalogue) especially valuable in brokering such conversations – there was much consensus of wanting to see more of such approaches in understanding how institutions should respond to the issues raised by dual use.

Demographic profile of participating citizens

The workshop was hosted in London which is the most well connected and diversely populated city in the United Kingdom. As such, we had a diverse sample from which to recruit citizens – which is reflected in the mixed makeup of the demographic group who attended on the day. London is also a city that experiences significant inward migration – a number of London residents are originally from rural areas and towns, as well as EU migrants, which also contributed in part to the balance of the group. However, younger citizens are overrepresented in London, with fewer older citizens living or travelling into the city (and adverse weather conditions for older citizens also contributed to the slightly lower numbers for those older). It is worth noting that a large majority of London citizens voted to Remain in the European Union; with a higher proportion voting to Leave in the North East, North West and Wales in particular. However, this issue of regional difference in attitudes to the European Union would have arisen wherever we hosted the workshop across the UK. We did not seek data from participants on which way they voted in the EU referendum, but it may be helpful for future similar workshops in the UK although would of course need to be treated with absolute sensitivity.

Data on the participating citizens:

Age:	Participants confirmed for the workshop	Participants showed up for the workshop	Percentage of the age group compared to the general population
18-29:	7	6	(20%) 13.6% UK
30-39:	4	4	(14%) 13.1% UK
40-49:	7	7	(22%) 14.6% UK
50-59:	9	7	(22%) 12.2% UK
60-69:	5	5	(16%) 10.8% UK
70 - :	2	2	(6%) 11% UK

Gender:	Participants confirmed for the workshop	Participants showed up for the workshop	Percentage of the age group compared to the general population
Women:	16	15	45% (50% UK)
Men:	18	16	55% (50% UK)
Other:	N/A	N/A	Approx 56,000 (not statistically significant) estimated transgender

			people registered in the UK. Hard to make reliable estimate on the basis of current data but this would be 0.09%

Education	Participants confirmed for the workshop	Participants showed up for the workshop	Percentage of the age group compared to the general population
Primary and lower secondary education:	4	4	13% (22% UK)
General upper secondary education :	6	6	19% (22% UK)
Vocational Education and Training:	10	9	29% (31% UK)
Bachelor or equivalent:	12	10	32% (18% UK)
Masters or equivalent:	2	2	7% (5% UK)
Doctoral degree or higher:	0	0	0% (2% UK)

Geographical zone (percentage of population living in…):	Participants confirmed for the workshop	Participants showed up for the workshop	Percentage of the age group compared to the general population
City:	15	15	48% (49.4%)
Town:	16	15	48% (33%)
Rural:	3	1	4% (17.6%)

Other aspects of relevance in your country?

This workshop had a good spread/diversity of people from a variety of ethnic groups (the UK is a particularly multicultural region). Approximately 15% of the UK is black & minority ethnic in origin; we had a representation of almost 19% of the group from a black and minority ethnic background.

Annex 1 – Translated templates from round 1

What do you think about the fact that neuroscience can be used for military or intelligence purposes?

- Who should make the decisions? That's the real question
- Could potentially have beneficial but also harmful side effects – anything can be good or bad
- Good example is atomic bomb (nuclear power could be wielded in different ways to different effects)
- Concern that information could get into the wrong hands e.g other less benign foreign states beyond the EU and be misused in a military context

Is this problematic or reassuring?

- Problematic to some extent – government organisations and other institutions are often made up of individuals with their own agenda.
- Important that citizens have choice and free will over every piece of emerging technology, and yet that is incredibly difficult. Can foresee (e.g use of microchips by government to track/identify citizens) which may start out being relatively benign.

What concerns you about the use?

- Concern that people often do not resist intrusive behaviour/abuse of rights until it is too late (passivity/fatalism of many citizens to push back really requires more sensitivity
- Addressing power imbalances and trust – flags the importance of both as we are trusting our lives to those we do not know (problematic in some respects, esp with the American and Chinese collaboration examples).
- There need to be clear boundaries and parameters around the use of such information (these could be geographical but also entrusted to/by specific government organisations)

Does it make a difference where/who uses it?

- Lack of clarity as to the terms and conditions under which such information is being used. Where do we begin with defining those terms?
- Intergenerational point – young people often don't think about the harmful effects in the longer term future. I'm older – and wish to slow the rate of change down because i've seen the effects it often can have.
- Lack of transparency and accountability –it does make a difference; how would I know how my data is being used and be able to prevent that from happening?
- Yes it does – my human rights and others' human rights must take priority and precedence (respect for life, liberty etc)

RED TABLE

What do you think about the fact that neuroscience can be used for military or intelligence purposes?

- Could be used to prevent war, less damaging to people's lives (technological warfare), more pre-emptive warfare
- However, could be used to be more damaging and problematic for people in non civilian approaches too.
- Could help with preventing terrorism, help soldiers to cope with risk of torture (training and development); withstanding extreme conditions and so on
- Could also help soldiers to better withstand PTSD and improve soldiers' capabilities in warfare.

What concerns you about the use?

- money – intended for civilians, but could be deployed towards psychological warfare
- transparency – hard to know what military organisations are using this for
- medicine – could be used for entirely the wrong reasons/purpose
- data protection (consent and permission); could it be used to aid trafficking or kidnapping?
- Potential failures of the technology could harm soldier/military officials' safety.
- Concerns about the potential for misdiagnoses
- Racial profiling

Does it make a difference where/who uses it?

- Yes it does make a difference – different if it is used to help the mental health of soldiers or others, than if it is used to kill people/advance military strategy.
- Concern that the concept serves as a smoke screen for being truly transparent about the issues
- Worries around racial profiling (is it possible to be able to ensure the data is free of bias?)
- Terrorism – could serve to further terrorism in the wrong hands
- Are we working with something we don't understand the implications of, and developing things too fast?

GREEN TABLE

What do you think about the fact that neuroscience can be used for military or intelligence purposes?

- Has benefits – can overcome negative effects of war (harm, disproportionate violence etc)
- Can help better runderstand how such approaches can be used to combat diseases
- Can make war easier, however – disincentivise peaceful outcomes/treaties and so on
- There is a danger in knowing too much – may lead to unfair advantages
- If the sole purpose of research is war, there may be an imbalance that arises as a consequence
- Concern that investment in military is driven by other financial/corporate incentives (is this fort he common good?)
- Might these approaches be used to target different groups/cause greater strife and division? Concern that there is a drive towards the survival oft he fittest
- May make conflict safer, more effective – and result in less collateral damage; but could also make conflict itself less personal without human connection (legitimising it?)

What concerns you about the use?

- Potential impacts could be destructive and result in more power to the wrong people
- We should try to understand weak points from the start – and try to intervene pre-problem
- It is not clear who owns the research in such contexts and therefore who is able to use the research (who has the right?) as well as in what way.
- In war there are serious negative implications that arise (attempting to eradicate brain defects or short circuit people's decision making has the potential to go very wrong)
- Concern that we are stopping research (just in case) – can't just stop the research just in case.
- If this can be used to good effect in counter-terrorism it can result in a better approach to prevention rather than escalation of military conflict.
- Concern that these approaches could get into the wrong hands (terrorists, rogue states etc)
- Worries about stereotyping at a young age (scanning young minds at an early age to determine their life chances, for example).

Does it make a difference where/who uses it?

- The military exists to protect civilians if well intentioned – unclear that we need to draw such a hard distinction (military is currently doing a good job – some level of trust in the organisation).
- If this can be used to good effect in counter-terrorism it can result in a better approach to prevention rather than escalation of military conflict.
- Concern that these approaches could get into the wrong hands (terrorists, rogue states etc)
- Important that there are clear procedures for consent of the use of data, accountability mechanisms and clear checks.

What do you think about the fact that neuroscience can be used for military or intelligence purposes?

- Uneasiness, discomfort and worry about its control
- Need for self protection but it is uncertain in how it could be applied
- Want to know/understand more about the consequences

What concerns you about the use?

- Innocent people are first in the line of fire as a result of this use
- Need a better understanding of who loses as a result
- Unclear/uncertain how such approaches will work, what it will do
- How can citizens influence or make change happen? Secretive – how can citizens be fully informed?
- Trust – don't trust that powerful organisations always do what they do for the right reasons

Does it make a difference where/who uses it? (e,.g counterterrorism)

- Yes – counterterrorism purposes are more justifiable from a preventative perspective. However there still remain concerns around mistakes – the risk of identifying or targeting innocent civiilians and suspects; as well as how suspects are treated (trying to avoid mental torture). Important that there are ethical frameworks for processes and its uses.

The use of information by other organisations (USA/China):

- Makes me uncomfortable – important to try to place boundaries around the use of the data by US/Chinese organisations. Should be used (wherever it is used) to keep people safe; it is important to pool resources to avoid overlap but also to recognise that those resources could be misused in other hands who have other incentives.

Human Brain Project

Ethics & Society

Annex 2 – Translated templates from round 2

What are the positive aspects of this development?

- Efficiency – can save time and in instances, can help save lives if applied in the right way
- Can help advance human conditions and luxury
- Can improve citizens' quality of life – AI can do things for us so we have more human and enjoyable lives
- Can help make better decisions that are more informed and take into account needs of the majority

What are the negative aspects of this development?

- Taking away your freedom to make decisions; affecting human skill e.g soldiers' skills
- May deprive you of enjoying tasks you may actually enjoy undertaking/feel pride in undertaking
- There is always a risk of human error and misjudgement, even in the use of technology
- Risks around hacking/data leaks and so on
- Concern that we are creating a dependency culture through such change
- Computers often lack empathy and might make very different moral decisions to those humans may make; humans should make the final decision.

What dilemmas does this development create?

- Right balance between using the technology to effect good, make people's lives better, and the risk of it being hacked or being misused in some way. That it might undermine humans' agency in the long run, and fail to reflect our moral and ethical concerns and choices. Who has responsibility?

Do benefits outweigh the costs?

- In general, yes, the benefits do outweigh the costs but there need to be clear parameters around how the technology is used – and people should have more transparency about it. More ability to challenge its use and application is important.

What are the positive aspects of this development?

- Improved quality of life
- Mind over matter – the invention of developments that might improve people's independence and agency
- Effectiveness in being able to tackle and prevent decline in people's mental health
- Interaction between state and military developments can help to benefit more people

What are the negative aspects of this development?

- Money – it's usually a case of what people can afford, so worry that developments will cause differential power imbalances. Often medicinal development takes a long time and lots of investment to reach the majority of the UK population
- Fear of moving towards a more homogenous society (wanting to make everyone the same/fix everyone)

What dilemmas does this development create?

- Concern that we are creating and shaping a less accepting/tolerant society through developments that may be seeking to not accept people's own diversity; but see real benefits in such advancements.

Do benefits outweigh the costs?

- The benefits do outweigh the negative – it is worth the risk for the sake of human and personal progress. But it is important to try to manage these risks (risk management is key).

What are the positive aspects of this development?

- Example of Stephen Hawking's development a good example of the use of a BCI – made significant advancements to human knowledge and helped improve his quality of life
- Life is made easier for amputees who learned how to use new limbs and would not need to rely on drugs quite as much through the process
- Lifelike computer games have serious implications for military efficiency – could improve this and reduce costs
- May help improve people's ability to learn and respond in certain circumstances (e.g under pressure)

What are the negative aspects of this development?

- Potential lack of accuracy and effectiveness from BCI
- Potentially high risk of manipulation by other organisations/agencies
- Concern that uses and applications to repress of memory might have seriously negative implications for people and society
- Concern that realistic simulations can promote/support greater violence in society and the distortion of people's realities (resulting in poorer mental health)

What dilemmas does this development create?

- Worries around attempts to influence/control human minds
- The data sharing implications are profound – data about humans shared without sufficient consent and used without sufficient consent.

Do benefits outweigh the costs?

- The benefits do outweigh the negative – it is worth the risk for the sake of human and personal progress. But again, important to have in place the frameworks that slow down the rate of change so that it is managed in a way that helps people rather than that harms people.

RED TABLE, Medicine

What are the positive aspects of this development?

- Contributing potential to improved animal and human welfare
- Improved research into niche diseases that might be able to cure more people at lower cost
- More accurate preventive measures and diagnoses
- Allows us to use much more of our brains and maximise its human potential

What are the negative aspects of this development?

- Meddling with God's will? No united morality seems to exist – who is in control here?
- Morality as subjective; we could unintentionally do serious harm and damage to others
- We need to understand better what is good for our society and where our priorities lie before developing

Dilemmas and trade-offs:

- We need to develop tentatively/carefully – worry that harm could be irreversible otherwise
- Are we creating a human ideal instead of accepting people's disabilities and diverse identities?
- Are we excluding groups of society (e.g civilians) who cannot afford medicinal care?
- ‚Just take a pill and live a robotic lifestyle' – worrying repercussions for what it means to live a truly human life.

Do benefits outweigh the costs?

- Yes – more so with medicinal benefits, but there need to be clearer frameworks in place to ensure that people are protected and there is not potential abuse and misuse by wrong parties. We need to find ways to ensure consent for the use of HBP data as well – that doesn't appear clear enough.

What are the positive aspects of this development?

- Deep learning can lead to more objective and critical decision making
- Can be used to understand and detect the extent to which civil unrest is likely
- Able to exercise influence and control without threat – e.g police presences are often seen and perceived as a threat. Can reduce spending on police forces – allocate funding more efficiently, and better elsewhere.
- We might feel safer if AI could help us predict a terrorist attack.

What are the negative aspects of this development?

- Relies too heavily on the accuracy of the data – it could be fed in with bias
- Concern that location specific information could be inaccurate (with garbage in and garbage out)
- Costly, expensive – who has to pay for this? From our extra taxes?
- How do we stop the AI (feels irreversible)

Dilemmas and trade-offs:

- AI can't decide for us what priorities and choices are most important – we have to do that. Are we delegating important decisions for us to something else? Need to avoid narrow programming focusing on one goal to the exclusion of all else
- Entrenches further inequalities – those countries with greatest need for this less able to afford it? Which countries and nations would benefit?

What are the positive aspects of this development?

- Time saving, more efficient, more likely to make more accurate decisions?
- Greater potential to tackle and address criminal and anti-security behaviour without witnesses in place
- Can help soldiers and others to reduce their reaction times – that might potentially be better, as well as to make significantly better decisions in difficult and challenging circumstances.

What are the negative aspects of this development?

- Could promote mind-based torture; a very complex ethical area
- Could enemies access your mind? Problematic issue?
- Interpretation – fact v belief – issues with potential to access and interpret thoughts.

Dilemmas and trade-offs:

- How do you limit what you find out about human thoughts and areas of focus – invasion of privacy is a big problem.
- How do we seek proper, informed consent about the use of data in such instances?
- Worries around the escalation of warfare (using BCI) – doesn't actually address the need to de-escalate and avoid conflict whereever possible.
- Does this reduce our agency and ability to make choices that we are responsible for?

Do benefits outweigh the costs?

- Do not find the benefits outweighed the costs – feeling that there were significant issues with the ethical problems raised (consent, clear boundaries around the use of information and data more generally). They thought the ability of other organisations to access human minds in particular was intractable/problematic.

YELLOW TABLE, Brain-computer Interface

What are the positive aspects of this development?

- Improving the quality of people's life and well being
- Independence of people with disabilities especially those who have suffered in military environments
- Saves money for a number of people
- Simulations can be useful to military training
- Employment and innovations promotes greater quality of work and creativity
- Can help people who suffer from PTSD/psychosis/flashbacks

What are the negative aspects of this development?

- Tech alone is not enough – decision makers make a huge collective difference and being clear about purpose (what is acceptable and what is not) is essential.
- People often do not trust that interventions/tampering in ytour head can be beneficial (could be very intrusive; e.g repression, tampering with memory etc)

Dilemmas and trade-offs:

- Amputees important to consider and allow for other needs e.g support aside from 'fixing' the person
- Cost – austerity and underfunding has potential to lead to greater inequality (who will be able to afford it? Who benefits?)
- Physical enhancement of soldiers - but also risks around transforming humans into robots.

Do the benefits outweigh the costs?

- Not clear that they do (at present) but with the right reassurances, framework, processes in place – they may well do so. There is much more work needed before that arrives – as well as clear boundaries around how fast/intrusively such approaches develop. Consent is also key – what approaches to consent will be deployed?

YELLOW TABLE, Medicine

What are the positive aspects of this development?

- End animal testing?
- Increase the country's workforce – healthier for longer which is better for government and companies
- Increased precision and accuracy in diagnosis

What are the negative aspects of this development?

- Risking humans as guinea pigs (especially in experimental phases)
- New side effects? Emotional suppression, longer term effects?
- Uncertainty around the kind of harm that could be caused to citizens

Dilemmas and trade-offs:

- Will we all be transformed into robots? Issues around human dignity and what makes us human.
- Worries that there will be parallels with the risk of venomous/poisonous substances developed inadvertently and harm/damage to person.
- We learn at our own speed – does this mean building a superhuman workforce at the expense of the human person?

Do the benefits outweigh the costs?

- This group felt that the benefits (safely developed and applied) did outweigh the potential risks and costs – this was different to their sense about BCI. Public health for humans and animals are given a greater weighting in the trade-off than issues of efficiency/effectiveness with AI/BCI.

Annex 3 – Translated templates from round 3

Key themes & questions suggested by the Blue Group:

*'Stakeholders' were defined by the groups as inclusive of:

Trade unions, civil society, other campaigning networks, defence and military organisations and companies; also politicians in the EU.

Themes suggested by the group	Policy-makers	Researchers	Stakeholders	Citizens
Determining the limits and the purpose for which such technologies are used	Where do you intend to take this and where are the limits? (26) Aimed at policymakers	Where do you intend to take this and where are the limits? (13) Aimed at researchers		What do you think the purpose is for tech? Aimed at 'Joe Bloggs' – member of the ordinary public
Transparency of the use of such approaches – information on these issues should be shared	How will you share information on these issues? (5)	How will you share information on these issues? (2)		What do you want to and need to know? (6)
Ethics	Responsibility and accountability (who is responsible and accountable?) – some said everyone is. (0)	Responsibility and accountability (who is responsible and accountable?) – some said everyone is. (0)	Responsibility and accountability (who is responsible and accountable?) – some said everyone is. (0)	Responsibility and accountability (who is responsible and accountable?) – some said everyone is. (2) What is the source of a common morality around

				such approaches when our societies are so different? How do we find a shared common ground? (8)

Key themes & questions suggested by the Red Group:

Themes suggested by the group	Policy-makers	Researchers	Stakeholders	Citizens
Money, finance and tax (who pays for this, and how?)	Who should pay for this, and how? (19) Aimed at policymakers	Who is funding these developments and to what extent does this funding align with people's and society's interests? (2)	What are people and society's interests? (4)	What are people and society's interests? Who should pay for this, and how?
Accountability	How can citizens have a more informed sense of input and influence? (16)	How can you get citizens to participate more in research?	Total lack of transparency – how do we know more about what is going on/how civil society will be affected? (6)	What input do we have as citizens, and how accountable a framework exists for ensuring we understand and can

				challenge? (8)
Mission & purpose of the project and organisations involved	Why and to what purpose is this being developed, who will benefit, and who will lose out? (aimed at regulators/government etc) (0)	Why and to what purpose is this being developed, who will benefit, and who will lose out? (4)	Why and to what purpose is this being developed, who will benefit, and who will lose out? (aimed at corporations) (3)	

Key themes & questions suggested by the Green Group

Themes suggested by the group	Policy-makers	Researchers	Stakeholders	Citizens
Risk	What is the risk that emerges here, and how will you manage the risk? (14)	How will you know if you are overstepping the boundaries of what is acceptable? (17)	Preventing risk from damaging people and making sure any risk taken benefits people – how will you do this? (0)	Preventing risk from damaging people and making sure any risk taken benefits people – how will you do this? (0)
Equality	Inequality of power – how will you stop being part of a system that distributes power unequally? (recurring q) (4)	Inequality of power – how will you stop being part of a system that distributes power unequally? (2)	Inequality of power – how will you stop being part of a system that distributes power unequally? (7)	Vulnerable and powerless, and poorer people – how can we make sure that everyone, not just those with the time, can benefit and participate?

Monitoring and regulating the use of data and technologies so that serve social good	What sense-check/approaches will you use to make sure that you know whether something is causing harm or not? (13) Things are changing quickly – how will you make sure you protect citizenry? (0)	What sense-check/approaches will you use ot make sure that you know whether something is causing harm or not? Getting ethical input before, not after you've made the system. How will you do it? (3)	What sense-check/approaches will you use ot make sure that you know whether something is causing harm or not? (aimed at corporations) (0)	Is there something we can do as people to oversee or given ethical sense check on the use of data? How can we be empowered to? (2)

Key themes & questions suggested by the Yellow Group:

Themes suggested by the group	Policy-makers	Researchers	Stakeholders	Citizens
Mission and purpose	What are your priorities for this work? What do you want to achieve through it? (11)

Aimed at policymakers | What are your priorities for investment, and developing these tech? Do you know where it is going to go? Do you want to?

(8) | | |
| Indirect discrimination and bias | How are you preventing this from being used to harm people? (9) | How can we be reassured that the development will not be used against and to the disadvantage of different groups in society? (4) | How can we be reassured that the development will not be used against and to the disadvantage of different groups in society? (aimed at companies mainly) (6) | |
| Privacy and personal data | Safeguarding of important personal and non-personal information from being hacked and/or used to wrong or non-consensual purposes – what measures exist to prevent this? | How do I get to 'opt out' if I want to really 'opt out'? (5) | | |

	(9)			
Access			Will civil society and other groups get to access the data and make sure it works for people? (3)	What can we all do to make sure all groups can access the benefits in society? (7)

Annex 4 – Results from morning survey

QUESTIONNAIRE ON NEUROSCIENCE AND DUAL USE

(mark the answers that you agree with the most with an X)

1) Does it make you concerned that the research from the Human Brain Project could be used by others for political, security, intelligence and military purposes? *(choose one option)*

Not concerned at all	Slightly concerned	Moderately concerned	Somewhat concerned	Extremely concerned
8	*6*	*3*	*14*	*0*

2) If publicly funded research have dual use potential, should it then be allowed? *(choose one option)*
   a. Yes
   b. No
   c. I don't know/do not wish to answer

13
9
9

3) As a European funded project we are not allowed to do military research. However, other research initiatives on the human brain may be funded by defence agencies. Should the project collaborate with other brain research initiatives or organisations that work for or receive financial support from defence agencies e.g. the American *"Brain Initiative"* or the Chinese *"China Brain Project"*? *(choose one option)*
   a. Yes, the most important thing is to make progress in the research.
   b. Yes, but only if it is based in another EU member state.
   c. Yes, but only if it is based in an allied country of the European Union
   d. Yes, but only initiatives or organisations in countries, who have signed and ratified international treaties on e.g. chemical or biological weapons
   e. No, the research project should not collaborate with initiatives or organisations funded by military or defence agencies.
   f. I don't know/do not wish to answer

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1
6

6

11

4) The European Commission has big focus on open science, where research data and analyses are public for everyone. Should this also be the case with research that could have dual use potential? *(choose one option)*

   a. Yes
   b. No
   c. I don't know/do not wish to answer

11
5
15

Annex 5 – Results from afternoon survey

QUESTIONNAIRE ON NEUROSCIENCE AND DUAL USE

(mark the answers that you agree with the most with an X)

1) Does it make you concerned that the research from the Human Brain Project could be used by others for political, security, intelligence and military purposes? *(choose one option)*

Not concerned at all	Slightly concerned	Moderately concerned	Somewhat concerned	Extremely concerned
4	*7*	*2*	*12*	*6*

2) If publicly funded research have dual use potential, should it then be allowed? *(choose one option)*
   a. Yes
   b. No
   c. I don't know/do not wish to answer

18
6
7

3) As a European funded project we are not allowed to do military research. However, other research initiatives on the human brain may be funded by defence agencies. Should the project collaborate with other brain research initiatives or organisations that work for or receive financial support from defence agencies e.g. the American *"Brain Initiative"* or the Chinese *"China Brain Project"*? *(choose one option)*
   a. Yes, the most important thing is to make progress in the research.
   b. Yes, but only if it is based in another EU member state.
   c. Yes, but only if it is based in an allied country of the European Union
   d. Yes, but only initiatives or organisations in countries, who have signed and ratified international treaties on e.g. chemical or biological weapons
   e. No, the research project should not collaborate with initiatives or organisations funded by military or defence agencies.
   f. I don't know/do not wish to answer

9
4
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9

4) The European Commission has big focus on open science, where research data and analyses are public for everyone. Should this also be the case with research that could have dual use potential? *(choose one option)*

4

   a. Yes
   b. No
   c. I don't know/do not wish to answer

13
7
11