

Title: UK Artificial Intelligence Regulation Impact Assessment IA No: RPC Reference No: RPC-DCMS-5260(1) Lead department or agency: Department for Science, Innovation & Technology Other departments or agencies: NA	Impact Assessment (IA)
	Date: 23/03/2023
	Stage: Consultation
	Source of intervention: Primary
	Type of measure: To establish a suitable regulatory regime to govern AI technologies in the UK.
Contact for enquiries: Digital and Technology Analysis Team - contactdigitalanalysis@dcms.gov.uk	

Summary: Intervention and Options	RPC Opinion:
--	---------------------

Cost of Preferred (or more likely) Option (in 2019 prices)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status Qualifying provision
-£351.1m	-£2.1.6m	£29.7m	

What is the problem under consideration? Why is government action or intervention necessary?

Artificial Intelligence (AI) creates opportunities for innovation, growth and prosperity but also creates a range of new risks. These risks include damage to physical and mental health, bias and discrimination, and infringements on privacy and individual rights. These risks must be proportionately addressed to benefit from the opportunities that AI provides and achieve a trusted, pro-innovation regulatory regime.

A number of market failures exist (information asymmetry, misaligned incentives, negative externalities, regulatory failure), meaning AI risks are not being adequately addressed. The UK government is best placed to put forward a suitable cross-sectoral regulatory regime to achieve these goals.

What are the policy objectives of the action or intervention and the intended effects?

Vision & objectives: Our AI regulatory approach will **drive growth and prosperity** by boosting innovation, investment and **public trust** to harness the opportunities and benefits that AI technologies present. It will **strengthen the UK's position as a global leader in AI**, by ensuring the UK is the best place to develop and use AI technologies. Example sub-objectives and metrics include:

Drive growth - Increase investment in UK AI SMEs, relative to international AI SMEs.
Increase public trust - Increase the proportion of the UK public positive about AI.
Global leader in AI - Maintain or improve the UK's position in Stanford Global AI Index.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 0 - Do nothing option - Assume the EU delivers the AI Act as drafted April 2021. The UK makes no regulatory changes regarding AI.

Option 1 - Delegate to existing regulators, guided by non-statutory advisory principles - Non-legislative option with existing regulators applying cross-sectoral AI governance principles within their remits.

Option 2 - Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions (Preferred option) - Existing regulators have a 'duty to have due regard' to the cross-sectoral AI governance principles, supported by central AI regulatory functions. No new mandatory obligations for businesses.

Option 3 - Centralised AI regulator with new legislative requirements placed on AI systems - The UK establishes a central AI regulator, with mandatory requirements for businesses aligned to the EU AI Act.

Option 2 addresses key existing regulatory challenges by providing clarity and certainty, whilst minimising regulatory burdens for businesses. Option 2 is expected to improve outcomes relative to option 1, whilst imposing substantially lower regulatory burdens on businesses than option 3.

Is this measure likely to impact on international trade and investment?					Yes				
Are any of these organisations in scope?				Micro -Yes	Small -Yes	Medium -Yes	Large -Yes		
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)					Traded: NA		Non-traded: NA		
Will the policy be reviewed? Yes. If applicable, set review date: Within 3 years of implementation.									

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible :

Alison Kilburn

Date:

23/03/2023

Table of Contents

Summary: Intervention and Options	1
Table of Contents	3
Summary: Analysis & Evidence Policy Option 1	5
Summary: Analysis & Evidence Policy Option 2	7
Summary: Analysis & Evidence Policy Option 3	9
Section 1 - Policy Background	11
Section 2 - Scope and terminology	12
Section 3 - Problem under consideration	12
3a - Information Failure	13
3b - Misaligned incentives	13
3c - Equity Argument	14
3d - Externalities	15
3e - Regulatory Failure	16
Section 4 - Current and future harms being tackled	17
4a - Risks, hidden costs and externalities	17
4b - Stifling investment, innovation and adoption	19
4c - Risk of reduced international competitiveness of the UK AI industry	21
Section 5 - Proportionality of evidence	23
5a - Regulatory effectiveness	23
5b - Labour markets	24
5c - Consultation stage impact assessment	24
Section 6 - Policy objectives	25
Section 7 - Policy options considered	26
7a - Option 0 - Do nothing (Counterfactual)	27
7b - Option 1 - Delegate to existing regulators, guided by non-statutory advisory principles (Do minimum)	28
7c - Option 2 - Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	29
7d - Option 3 - Centralised AI regulator with new legislative requirements placed on AI systems (Do maximum)	32
Section 8 - Preferred option	33
Section 9 - Monetised and non-monetised costs and benefits	35
9a - Costs	36
Costs to government	37
Direct costs to business	41
Indirect costs to businesses	50
Costs to consumers	50
Justice costs	51
9b - Benefits	51
Direct benefits to businesses	52
Indirect benefits to businesses	53
Benefits to consumers	55
9c - Analysis against policy objectives	58

Section 10 - Risks and assumptions	59
10a - Key Assumptions	59
10b - Key Risks	63
Sensitivity analysis	65
Section 11 - Impact on medium, small and micro businesses	69
11a - Small and Micro Business Assessment (SaMBA)	69
11b - Medium business exemption assessment	71
Section 12 - Wider impacts	72
12a - Competition impacts	72
12b - Innovation impacts	74
12c - Environmental impacts	75
12d - Public Sector Equality Duty impacts	76
12e - Trade and Investment	77
International trade and foreign direct investment	77
Domestic investment	80
12f - Productivity impacts	81
Section 13 - Monitoring and evaluation	81

Summary: Analysis & Evidence

Policy Option 1

Description: Delegate to existing regulators, guided by non-statutory advisory principles

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate: -167.6
COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)		Total Cost (Present Value)
Low	-		-		-
High	-		-		-
Best Estimate	2.7		23.7		203.4
Description and scale of key monetised costs by 'main affected groups'					
<ul style="list-style-type: none"> Transitional costs are limited to familiarisation costs for businesses. These costs impact all sizes of business, but are minimal and so do not create undue burden for smaller firms. No one-off set up costs are associated with option 1 as the government creates no new regulator or functions. The majority of costs accrue as ongoing costs to businesses from profit loss and compliance costs, and for government in the form of regulatory costs. These are nevertheless expected to be low in scale. 					
Other key non-monetised costs by 'main affected groups'					
<ul style="list-style-type: none"> Government is expected to face some limited enforcement costs and minimal justice costs. For businesses these costs relate to the indirect loss of profit, innovation and investment associated with higher compliance costs. Regulatory divergence, innovation and investment costs are also discussed in the wider impacts section. Consumers are expected to face low costs related to AI systems being inadvertently prohibited in certain contexts, as well as higher prices due to cost pass-through from business. 					
BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)		Total Benefit (Present Value)
Low	-		-		-
High	-		-		-
Best Estimate	0.0		4.3		35.9
Description and scale of key monetised benefits by 'main affected groups'					
<ul style="list-style-type: none"> For businesses, monetised benefits accrue in the form of greater demand for AI products and services due to increased public trust and adoption of AI. The associated scale of this benefit is expected to be low in option 1. This assessment does not monetise any other benefits expected to be derived from intervention. 					
Other key non-monetised benefits by 'main affected groups'					
<ul style="list-style-type: none"> Non monetised benefits for businesses come from greater regulatory clarity and certainty reducing the cost of regulatory compliance. Businesses are also expected to benefit from the development of new markets. For consumers, benefits include a reduction of AI risks and harm, as increased regulatory scrutiny would reduce the prevalence of harmful AI systems. Regulation is also expected to provide consumers with the benefit of more informed choice and higher quality AI systems. 					

Key assumptions/sensitivities/risks	Discount rate (%)	3.5
<ul style="list-style-type: none"> • Central estimate assumes 50% of 3,269 AI businesses and 5% of the estimated 431,671 businesses who have adopted AI take action to comply with regulation. • Compliance costs are assumed as 10% of option 3 costs per AI business. Lower costs are assumed for AI adopting businesses (50% of the costs for AI businesses in the relevant option). • Sensitivity analysis reflects uncertainty in key assumptions related to shares of businesses taking action, number of AI systems per business, categorisation of risk, and impact on trust. • Work, including this consultation, is being undertaken to provide more certainty on the quantification of impacts. 		

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 18.4	Benefits: 0.0	Net: 18.4	
			92.0

Summary: Analysis & Evidence

Policy Option 2

Description: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions.

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate: -351.1

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	-	-	-
High	-	-	-
Best Estimate	8.1	44.8	387.0

Description and scale of key monetised costs by 'main affected groups'

- Transitional costs in option 2 include, for government, one off set up costs, though these are low.
- Businesses are expected to face low familiarisation cost, at a similar low intensity as in option 1.
- Ongoing costs accrue to the government in the form of regulatory costs.
- Businesses will face ongoing compliance costs, which are expected to be low, and some loss of profit and related business closure from increased regulatory scrutiny from the implementation of a duty on regulators to regard the principles.

Other key non-monetised costs by 'main affected groups'

- Government is expected to face some limited enforcement costs and minimal justice costs.
- Businesses are expected to face some negative impact on profit following cost pass-through to consumers, reducing consumer demand. Regulatory divergence, innovation and investment costs are also discussed in the wider impacts section.
- Consumers are expected to face low costs related to AI systems being inadvertently prohibited in certain contexts, as well as higher prices due to cost pass-through from business.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	-	-	-
High	-	-	-
Best Estimate	0.0	4.3	35.9

Description and scale of key monetised benefits by 'main affected groups'

- For businesses, monetised benefits accrue in the form of greater demand for AI products and services due to increased public trust and adoption of AI. The expected scale of this is low.
- This assessment does not monetise any other benefits expected to be derived from intervention.

Other key non-monetised benefits by 'main affected groups'

- Businesses are expected to face benefits from greater regulatory clarity and certainty due to central AI regulatory functions. Sectoral growth in the sector following this improvement to regulation is also expected to contribute to the development of new markets.
- For consumers, benefits include a reduction of AI risks and harm, as increased regulatory scrutiny would reduce the prevalence of harmful AI systems. Regulation is also expected to provide consumers with the benefit of more informed choice and higher quality AI systems via

signalling effects of a more proactive regulatory stance. These are assumed to be larger than option 1 because regulators have greater ability to implement the regulatory principles.

Key assumptions/sensitivities/risks

Discount rate (%)

3.5

- Central estimate assumes 80% of 3,269 AI businesses and 10% of the estimated 431,671 businesses who have adopted AI take action to comply with regulation.
- Compliance costs are assumed as 10% of option 3 costs per AI business. Lower costs are assumed for AI adopting businesses (50% of the costs for AI businesses in the relevant option).
- Sensitivity analysis reflects uncertainty in key assumptions related to shares of businesses taking action, number of AI systems per business, categorisation of risk, and impact on trust.
- Work, including this consultation, is being undertaken to provide more certainty on the quantification of impacts.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 29.7	Benefits: 0.0	Net: 29.7	
			148.4

Summary: Analysis & Evidence

Policy Option 3

Description: Centralised AI regulator with new legislative requirements placed on AI systems

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate: -7,510.1
COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)		Total Cost (Present Value)
Low	-		-		-
High	-		-		-
Best Estimate	51.2		888.10		7,566.7
Description and scale of key monetised costs by 'main affected groups'					
<ul style="list-style-type: none"> In the transitional period, the government is expected to face one off set up costs associated with the set up of a new regulatory body. Businesses are expected to face some familiarisation costs, larger than in alternative options. Ongoing costs for business are significant regulatory costs. For business, ongoing costs include high compliance costs, large high loss of profit from AI systems being explicitly prohibited and a much higher cost of business closure. 					
Other key non-monetised costs by 'main affected groups'					
<ul style="list-style-type: none"> Government is expected to face some limited enforcement costs and minimal justice costs. Ongoing costs relate to businesses' loss of profit following more significant cost pass-through to consumers. Regulatory divergence, innovation and investment costs are also discussed in the wider impacts section. Consumers experience significant costs following cost pass-through from business. Consumers also face significant costs from the prohibition of AI systems in certain contexts. 					
BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)		Total Benefit (Present Value)
Low	-		-		-
High	-		-		-
Best Estimate	0.0		6.7		56.7
Description and scale of key monetised benefits by 'main affected groups'					
<ul style="list-style-type: none"> For businesses, monetised benefits accrue in the form of greater demand for AI products and services due to increased public trust and adoption of AI. The associated value of this benefit is highest in option 3, although still small relative to monetised costs. 					
Other key non-monetised benefits by 'main affected groups'					
<ul style="list-style-type: none"> For businesses, non-monetised benefits include significant benefits from the greater regulatory clarity and certainty, and low benefits from the development of new markets. For consumers, these include high benefits from the reduction of AI risks and harm, and high benefits from more informed choice. This policy option provides the greatest benefits to consumers. 					
Key assumptions/sensitivities/risks					Discount rate (%) 3.5

- Central estimate assumes 100% of 3,269 AI businesses and 40% of the estimated 431,671 businesses who have adopted AI take action to comply with regulation.
- Compliance costs are estimated based on explicit requirements per AI system. Lower costs are assumed for AI adopting businesses (50% of the costs for AI businesses in the relevant option).
- Sensitivity analysis reflects uncertainty in key assumptions related to shares of businesses taking action, number of AI systems per business, categorisation of risk, and impact on trust.
- Work, including this consultation, is being undertaken to provide more certainty on the quantification of impacts.

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 834.3	Benefits: 0.0	Net: 834.3	
			4,171.5

Section 1 - Policy Background

1. The Artificial Intelligence (AI) market is growing rapidly, with a US Department of Commerce report estimating global AI funding to have reached \$66.8 billion in 2021 - double 2020 figures.¹
2. The UK has been consistently ranked as one of the best places in the world to start an AI business and the UK's regulatory environment has supported this growth.² Annual investment in UK AI companies has increased from £252 million in 2015 to over £2.8 billion in 2021.³ DCMS analysis estimates that in 2020, over 15% of UK companies had adopted at least one AI technology.⁴ The number of UK AI companies has also increased to more than 3,100 according to recent DCMS research.⁵ UK business expenditure on AI technologies and AI-related labour was estimated at £62.8 billion in 2020, with expenditure projected to rise substantially over the next 20 years at a compound annual growth rate (CAGR) of 9.5% with faster growth in the first part of this period.⁶ For comparison, the UK cyber industry is forecast to grow at 9% CAGR.⁷
3. However, as AI technology continues developing rapidly and the use of AI becomes more prevalent, there are risks that should be addressed in order for the UK to continue its leadership in AI and benefit from the opportunities it offers. AI systems can exacerbate existing challenges (e.g. biases that are amplified by AI systems) and create entirely new risks (e.g. limited decision transparency, where it can be extremely difficult or impossible to gain basic insight into an AI system's decision making process and the factors that influence it). These issues are discussed in more detail in Section 4 of this impact assessment.
4. It is imperative that these risks are addressed in a proportionate manner to ensure the continued growth and development of AI in the UK. Evidence shows that building public and consumer trust supports the adoption of AI technologies.⁸ A risk-based and proportionate approach is aligned with government actions in the wider digital sector including the introduction of the National Security and Investment (NSI) Act, the establishment of the Digital Markets Unit, introduction of new cyber security regulation for consumer connectable products,⁹ and the Online Safety Bill.¹⁰ AI-related risks have also been identified by the UK's international allies and competitors, most of whom are working to address these.¹¹
5. AI is currently regulated through a complex patchwork of legal and regulatory requirements. Analysis identified at least 18 key legal frameworks that indirectly control the development and use of AI in the UK.¹² Consequently, there is no regulator or supervisory authority solely responsible for overseeing the use, development or effects of AI. Instead, AI is regulated indirectly by different frameworks and their associated regulators.
6. The 2021 National AI Strategy set the objective for the UK to be an AI superpower, requiring the UK to be a global leader in AI innovation, investment, global competitiveness, and safety.¹³ To meet the UK's superpower objectives, the current regulatory system needs to be updated to provide more certainty to businesses on current and future AI regulation, maintain or improve

¹ Top Global Artificial Intelligence Markets. US Department for Commerce (2022) - [Link](#)

² The Global AI Index, Tortoise Media (2021) [Link](#)

³ Beauhurst data, DCMS analysis

⁴ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁵ Artificial Intelligence Sector Study 2022, DSIT (2023) - [Link](#)

⁶ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁷ International Trade Administration, US Government (2021)[Link](#)

⁸ Trust in AI - A Five Country Study, KPMG (2021) - [Link](#)

⁹ Regulating consumer smart product cyber security, DCMS (2021) [Link](#)

¹⁰ Draft Online Safety Bill, DCMS (2021) [Link](#)

¹¹ Discussed in more detail in subsection 4c: 'Risk of reduced international competitiveness of the UK AI Industry'

¹² Legal analysis, DLA Piper (2021) - Not published

¹³ National AI Strategy, office for AI (2021) [Link](#)

public and consumer trust in AI, and maintain a competitive advantage in AI in the face of strong global competition. Acting now will therefore secure the UK's continued success in AI. The publication of an AI regulation white paper accompanying this impact assessment fulfils a commitment from the National AI Strategy and provides clarity on the regulation of AI in the UK.¹⁴

Section 2 - Scope and terminology

7. Defining AI is extremely difficult. A recent DCMS research report outlined multiple challenges with defining AI.¹⁵ For the purposes of this impact assessment, and the associated regulatory proposal, AI systems are described as computer systems that are both autonomous and adaptable. An autonomous system can take decisions and actions without human intervention. An adaptable system can continuously learn and change based on data and its environment. More details of this definition can be found in "Establishing a pro-innovation approach to regulating AI".¹⁶ Analysis, and stakeholder feedback, suggests that these are the distinctive features of AI systems that require a bespoke regulatory response.
8. AI is a general purpose technology¹⁷ - a technology with the potential to transform the whole of society and the economy. AI is already used in many everyday public and business activities (e.g. social media, transportation, identity verification, streaming services, forecasting, and many more). The varied applications of AI means there are many cross-cutting areas of government policy that are related to the use and development of AI. These policy areas include data, labour markets, innovation, competition, health and safety, security (including cyber security), judiciary, human rights and sustainability. As there is ongoing government work in these areas, the scope of this impact assessment needs clear delineation which is discussed in more detail in section 9.
9. It is proposed that the interventions will apply to all AI systems being designed or developed, made available or otherwise being used in the UK, whether they are developed in the UK or abroad. The regulatory proposals will apply to any AI system that is developed internally by a business, bought as an off-the-shelf product, or implemented by a third party. It will cover AI systems that are used in both business-2-business (B2B) and business-2-consumer (B2C) applications. To ensure clarity on the terminology used in this impact assessment it is useful to define certain terms upfront:
 - a. **AI or AI system or AI technologies:** products and services that are 'adaptable' and 'autonomous' in the sense outlined in the definition of AI above.
 - b. **AI supplier:** any company or individual who plays a role in the research, development, operation, maintenance or sale of AI systems.
 - c. **AI user:** any individual or company that uses an AI product.
 - d. **AI lifecycle:** all events and processes that relate to an AI system's lifespan, from inception to retirement, including its design, research, training, development, deployment, integration, operation, maintenance, sale, use and governance.
 - e. **AI ecosystem:** the environment on which the supply and use of AI systems depend, throughout their life cycles (including supply chains, markets, governance mechanisms, suppliers, users, impacted third parties).
 - f. **Impacted third party:** an individual or company that is impacted by the AI systems that they do not themselves use or supply.

Section 3 - Problem under consideration

AI poses a range of new risks and harms which impact on a wide range of UK values. The market failures that lead to these harms are summarised below.

¹⁴ A pro-innovation approach to AI regulation, DSIT (2023) - [Link](#)

¹⁵ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

¹⁶ Establishing a pro-innovation approach to regulating AI, DCMS (2022) - [Link](#)

¹⁷ General Purpose Technologies, Boyan Jovanovic and Peter L Rousseau (2005). In: Philippe Aghion & Steven Durlauf (ed.), Handbook of Economic Growth, Elsevier, pp. 1181-1224 - [Link](#)

3a - Information Failure

10. Information failure, stemming from information asymmetry (defined as a situation in which one party taking part in the same economic transaction has more information than another), exists between both:
 - *AI users and AI suppliers;*¹⁸ and
 - *AI suppliers and regulators of AI systems.*
11. Users of an AI system are not always aware that they are using AI. A study across 6,000 consumers in 6 countries identified that whilst only 34% of participants agreed to having ever used AI, 84% used AI-powered services or devices based on their responses.¹⁹ A more recent study by Ipsos MORI found that only 34% of GB respondents “know which types of products and services use artificial intelligence”.²⁰ AI users also do not know the methodology the AI system uses to determine decisions and actions (i.e. “black box” problem).²¹ Both of these scenarios cause issues because AI users are unable to fully and accurately assess the costs and benefits of their consumption and, therefore, do not consume an optimal quantity: either over-consuming if they are unaware of costs or under-consuming if unaware of benefits. An example of this may be businesses over-consuming AI-powered recruitment software that is biased against certain sub-groups.
12. This issue of information failure can be repeated at each stage of the supply chain, where AI systems may be bought off-the-shelf or implemented by businesses that did not themselves develop the AI system. This can increase the information asymmetry because those using the AI system may have even less information about the way in which it works.
13. Furthermore, this issue is replicated in the interaction between AI suppliers and regulators. Regulators do not have access to the same information as AI suppliers and are therefore not always aware of the way in which the AI system is making decisions and taking actions. This limits the ability of the regulator to identify where AI systems, or outcomes occurring from the use of AI systems, are non-compliant with regulatory rules. This can result in outcomes that do not achieve the current regulatory objectives.
14. Autonomy and adaptivity add complexity to information failure. As AI systems ‘learn’ from data the technology may change the way it makes decisions or takes actions. Where this is the case, it may not be clear to AI users, regulators, or AI suppliers how the AI system is ultimately working post market deployment. This poses risks that an AI system may be unknowingly non-compliant with regulation and laws, or may infringe on individual rights.
15. Information asymmetry also exists between AI suppliers and regulators but in the other direction, where AI suppliers are not always aware of, or do not fully understand, the relevant regulations they need to follow due to lack of clarity in the current regulatory regime. This is discussed in more detail in section 3e, ‘Regulatory Failure’.

3b - Misaligned incentives

16. The market for AI products and services is highly competitive and is estimated to grow significantly in the near future. This can lead to misaligned incentives between profit maximising AI suppliers and other parties. AI suppliers may take a reactive approach to providing information, resolving product safety defects, and ensuring ethical implications are considered in order to

¹⁸ AI Certification: Advancing Ethical Practice by Reducing Information Asymmetries, Cihon et al. (2021) - [Link](#)

¹⁹ What Consumers Really Think About AI: A Global Study, PEGA (2017) - [Link](#)

²⁰ Global Opinions and Expectations about AI, Ipsos Mori (2022) - [Link](#)

²¹ Examining the Black Box: Tools for assessing algorithmic systems, Ada Lovelace Institute and DataKind UK (2020) - [Link](#)

prioritise AI system functionality. However, these considerations should be taken into account prior to market deployment. This issue is referred to as AI robustness in the following text.

17. Strong competition may lead to lower robustness of AI systems because AI suppliers prioritise entering a new market to benefit from first mover advantage and gain substantial market share. In some instances this may come at the expense of rigorous testing, assessing of data accuracy and quality, or validating outcomes for bias, in order to minimise the time taken to develop AI. Given the iterative nature of the AI lifecycle, AI suppliers may then retrospectively identify issues after market deployment, in some cases leading AI suppliers to remove their products from use.²²
18. Another cause of misaligned incentives is due to the additional costs that AI suppliers may incur from providing information to users, ensuring their AI systems have meaningful human review and oversight, and conducting rigorous testing. As a result of price competitiveness, there are limited profit incentives for AI suppliers to adequately and comprehensively conduct these activities before deploying AI systems on the market.
19. AI suppliers do have some incentives to maintain robustness of AI systems to build consumer confidence and trust, however given the lack of understanding and knowledge AI users have of AI systems this is not a sufficient enough incentive for AI suppliers to change their behaviour.²³ Given this misalignment of incentives, and the expected continuation of the high levels of competition in the market for AI systems, these issues will not be adequately addressed without government intervention.

3c - Equity Argument

20. There is an equity argument that the use of AI systems, without requirements and transparency on the algorithmic methodology used, may knowingly or unknowingly produce unlawful discriminatory²⁴ and adverse outcomes for certain groups.²⁵ The Equality Act 2010 legally protects people from discrimination, in the workplace and in wider society, against a set of protected characteristics.²⁶ An individual can make a complaint if they believe they have been discriminated against because of a protected characteristic at work, as a consumer, in education, or when using public services.
21. When applied to the use of AI systems in the public sector, the Public Sector Equalities Duty and Seven Principles of Public Life states that public bodies “must act and take decisions impartially, fairly and on merit, using the best evidence and without discrimination or bias”.²⁷
22. There is no current mechanism for determining whether legal rights under the Equality Act 2010 are being met within the private or public sectors where an AI system is not suitably transparent or explainable. This means if AI systems are reinforcing pre-existing biases they may go undetected. The Commission on Race and Ethnic Disparities have recommended that AI systems should be able to accurately demonstrate that they are legally compliant under the Equality Act 2010.²⁸
23. A continuation of this argument arises if inequitable outcomes of AI systems are not addressed. In this case, there is likely to be a loss of trust in AI which can lead to weakened demand and public opposition to the use of AI in public services.²⁹ Given the potential benefits of AI, hindering

²² Amazon scrapped 'sexist AI' tool, BBC (2018) - [Link](#)

²³ Only 30% of the UK public know “a lot” or “a fair amount” about Artificial Intelligence. See: Public Attitudes Tracker Wave 34, BEIS (2020) - [Link](#)

²⁴ ‘Discriminatory’ here refers to the term as defined by the Equality Act 2010

²⁵ Amazon scrapped 'sexist AI' tool, BBC (2018) - [Link](#)

²⁶ Equality Act 2010: guidance, Government Equalities Office (2015)

²⁷ Ethical standards for providers of public services, Committee on Standards in Public Life (2014)

²⁸ Summary of Recommendations, Commission on Race and Ethnic Disparities, (2021) - [Link](#)

²⁹ 2020 Edelman Trust Barometer, Edelman (2020) - [Link](#)

trust and adoption would be detrimental to social welfare and may reduce the UK's economic productivity.

24. A 2021 survey of US and UK technology leaders evidenced this issue. 54% of respondents said they were very or extremely concerned with AI bias, up from 48% in the 2019 study. The study also confirms that issues of bias and discrimination are not hypothetical. 36% of respondents stated they had suffered due to an occurrence of AI bias, including lost revenue, lost customers, lost employees, or lost legal fees due to a lawsuit or legal action.³⁰

3d - Externalities

25. The production or consumption of AI can in some instances cause externalities. These occur through two separate but related channels: firstly, through the current use of AI systems that impose costs or deliver benefits on impacted third parties; secondly, through the existential impacts that are imposed on impacted third parties by the future development of Artificial General Intelligence (AGI).³¹ AGI is the development of 'more general and capable problem-solving systems' that can be applied in any field that requires human-level intelligence.³² The generalisability of AI systems can be seen as a spectrum, where an AI system can be "more general" than others due to its wider applicability in a greater range of contexts.
26. The first, and more widely encountered externalities, occur due to a range of costs or benefits imposed on Impacted third parties that are associated with the use and development of AI systems. These manifest in different ways, with some examples of negative externalities including behavioural manipulation (e.g. polarisation of views from recommendation systems causing "negative effects on social utility"),³³ widening inequality through labour market impacts, Impacted third party behaviour or preferences revealed by other consumers,³⁴ AI in warfare and the ability for mass-targeting, price discrimination,³⁵ and environmental impacts from the training of large AI models.³⁶ Most of these issues are not inherent to AI systems themselves, but are caused by the application or use-case in which an AI system is used.
27. Where negative externalities are not reflected by AI suppliers', it follows that there is overconsumption of these systems (societal costs are bigger than private costs in the presence of negative externalities, therefore social welfare is not maximised if societal costs aren't considered). Some overvalued AI systems (those which produce negative externalities) may be over-consumed whilst other undervalued AI systems (those that have positive externalities or benefits not observed by consumers) may be under-consumed. A preferred outcome can be achieved by reducing consumption of overvalued AI systems and increasing the consumption of undervalued AI systems. This argument has been made for automation technologies more generally and reflects that there may be a mismatch in the societal value of an AI system and the market value, due to the existence of externalities.³⁷
28. The second cause of externalities is the future cost or benefit from AGI to non-users. Many experts agree that AGI will be a reality at some point, although the range of forecasts for when this will happen vary widely.³⁸ The increasing generalisability of AI systems enhances the autonomous and adaptable characteristics, which can introduce the alignment problem. Author

³⁰ State of AI bias, DataRobot (2022) - [Link](#)

³¹ Defined as those risks which "could lead to human extinction or civilisational collapse" by the Cambridge Centre for the Study of Existential Risk - [Link](#)

³² Real-world challenges for AGI, Deepmind (2021) - [Link](#)

³³ Recommender systems and their ethical challenges, L Floridi (2020) - [Link](#)

³⁴ Notes from the AI frontier: Modelling the impact of AI on the world economy, McKinsey (2018) - [Link](#)

³⁵ Harms of AI, Daron Acemoglu (2021) - [Link](#)

³⁶ The carbon impact of artificial intelligence, P Dhar (2020) - [Link](#)

³⁷ Does the US Tax Code Favor Automation?, D. Acemoglu, P. Restrepo, A. Manera (2020) - [Link](#)

³⁸ Future of Life Institute - [Link](#)

and AI expert Brian Christian defines this as "When the systems we attempt to teach will not, in the end, do what we want or what we expect, ethical and potentially existential risks emerge".³⁹

29. Existential risks are generated from AGI via two likely scenarios:
 - a. AI is programmed to do something devastating
 - b. AI is programmed to do something beneficial, but it develops a destructive method for achieving its goal.⁴⁰
30. In scenario b, there is an alignment mismatch between that of the AGI and humans. Some examples of unintended consequences include excessive degradation of the environment, excessive resource usage, or an AGI system refusing to be 'turned off' in an attempt to accomplish its objectives more effectively.⁴¹
31. AGI may also deliver positive externalities to future generations that are not currently considered or priced in. If the risks mentioned are mitigated, AGI could materially change society for the better. Given the existential impacts that are associated with the emergence of AGI, it is prudent and sensible to take steps in order to build capacity and capability for regulating and mitigating these future risks and taking advantage of potential future benefits.

3e - Regulatory Failure

32. The current UK regulatory regime only partially addresses the challenges posed by the widespread adoption and use of AI. This can be summarised as 'regulatory failure', which arises due to the 'complex patchwork of legal and regulatory requirements' that are currently applied to AI systems.⁴² Two key issues summarise this regulatory failure. The first, legal and regulatory requirements are highly complex to understand and will become more so in the future. Secondly, rights, duties and responsibilities are not well defined.
33. ***Legal and regulatory requirements are highly complex to understand and will become more so in the future*** - The UK has no specific AI legislation with the primary purpose of regulating the development or use of AI. There are at least 18 legal frameworks (both pervasive and sector specific legislation) that indirectly control the development and use of AI (e.g. consumer rights law, data protection law, product safety law, etc.).⁴³ Within this there are over 50 individual pieces of primary legislation that must be considered. Additionally, case law interprets legislation and determines how it should be applied. This leads to a highly complex regulatory environment for AI systems that is extremely difficult to understand in its entirety for all relevant stakeholders.
34. The prevalence of AI technologies in everyday life is going to increase dramatically in the near-future, with new issues likely to emerge.⁴⁴ In the status-quo, the complexity of navigating a patchwork of requirements and their application to AI systems is expected to increase. Furthermore, the current regime suffers from the "pacing problem" in which there is a growing gap between the speed of advancements in emerging technologies, such as AI, and the pace at which regulator oversight and legal frameworks can keep pace.⁴⁵ A clear governance framework

³⁹ The Alignment Problem, Brian Christian (2020)

⁴⁰ Benefits and Risks of AI, Future of Life Institute (2015) - [Link](#)

⁴¹ Benefits and Risks of AI, Future of Life Institute (2015) - [Link](#)

⁴² Legal analysis, DLA Piper (2021) - Not published

⁴³ Pervasive legal frameworks that have been identified: consumer rights law, data protection law, employment law, health and safety law, product safety law, public law, equality law, human rights law, competition law, intellectual property law, tort law and contract law.

Key sector specific legal frameworks that have been reviewed: financial services regulation, medical research law, legal services regulation, accounting and audit services regulation, critical national infrastructure regulation, and digital services regulation.

⁴⁴ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁴⁵ The Growing Gap Between Emerging Technologies and Legal-Ethical Oversight, G. Marchant (2011)

for AI systems, with the agility to keep up with the rapid pace of technological change, will address current issues whilst future-proofing the regulatory regime from emerging risks.

35. **Rights, duties and responsibilities are not well defined** - Key gaps in the UK's current legal frameworks relate to individual rights, safety standards specific to AI, transparency, human involvement, accountability, and rights to redress. There are also issues with how to interpret the law which may lead to regulatory oversight, such as inefficient overlap between regulators' responsibilities. For example, both the Equality and Human Rights Commission (EHRC) and the Information Commissioner's Office (ICO) purport to regulate the discriminatory effects of AI. Gaps in the current regime include a lack of technical expertise in regulators and government, unclear regulator ownership of AI related issues, and varied regulator powers.
36. Legal analysis suggested that current frameworks do not adequately clarify liability for AI systems, due to a lack of legally defined actors in the AI system lifecycle.⁴⁶ This creates "considerable uncertainty regarding which party or parties might be liable for AI harms in a given scenario"⁴⁷. Unclear liability means businesses cannot be certain whether they may be liable for harms related to the implementation of an AI system. It can also create a lack of trust in AI systems by consumers, as they are not aware of who is ultimately responsible if an AI system causes harm. 2021 research found only 32% of the UK public surveyed trust business use of AI - the lowest proportion of the 27 countries included in the research.⁴⁸
37. Regulators have work underway to better understand the harms associated with the use of AI and how to tackle these. Examples of this include the Bank of England and FCA's AI Public-Private Forum,⁴⁹ the CMA's research on algorithms and how they can harm consumers,⁵⁰ and the work of the Medicines and Healthcare products Regulatory Agency (MHRA) on the use of AI as a medical device.⁵¹ However, without central guidance from the government there is a risk that these workstreams become divergent and may add additional complexity to the already fragmented regulatory regime. In the response to our call for evidence, stakeholders identified a lack of regulatory capability to ensure coherent compliance processes, difficulty operating across or between regulatory remits, and the need for more collaboration between regulators.⁵²

Section 4 - Current and future harms being tackled

38. The harms and issues arising from these market failures can be grouped into three key themes:
 - a. Risks, hidden costs and externalities
 - b. Stifling investment, innovation and adoption
 - c. Risk of reduced international competitiveness of the UK AI Industry.

4a - Risks, hidden costs and externalities

39. In many instances individuals are not aware that AI systems are being used. Key examples include use of chat-bots and voice assistants (e.g. Siri, Alexa), recommendation systems, and AI systems that support recruitment processes. Where this is the case, individuals are not aware of the rights that they may have (e.g. "the right not to be subject to a decision based solely on automated processing which have a legal or similarly significant effect on them", Article 22 UK GDPR)⁵³ and are therefore unable to exercise these rights effectively. Economic theory states

⁴⁶ Legal analysis, DLA Piper (2021) - Not published

⁴⁷ Artificial Intelligence as a Service: Legal Responsibilities, Liabilities, and Policy Challenges, J. Cobbe, J Singh (2021) - [Link](#)

⁴⁸ 2021 Edelman Trust Barometer Tech Sector Report, Edelman (2021) - [Link](#)

⁴⁹ The AI Public-Private Forum: Final Report, The Bank of England and the Financial Conduct Authority (2022) - [Link](#)

⁵⁰ Algorithms: How they can reduce competition and harm consumers, CMA (2021) - [Link](#)

⁵¹ Transforming the regulation of software and artificial intelligence as a medical device, MHRA (2021) - [Link](#)

⁵² Annex B: Stakeholder engagement - A pro-innovation framework for AI regulation, DSIT (2023) - [Link](#).

⁵³ What does the UK GDPR say about automated decision-making and profiling? ICO (2018) - [Link](#)

that when consumers do not have the relevant information on the costs and benefits of a good, they do not consume at the socially optimal point.

40. Research undertaken by the consumer group Which? highlights that the context in which an AI system is used determines the importance of the information asymmetry. In situations where an AI system is making 'life-altering decisions', study participants wanted greater information that AI was being used, the data being processed, and the methodology undertaken to come to a decision.⁵⁴ Issues relating to fairness, consumer choice, and ethics were also raised by consumers.
41. A cost associated with AI systems is that their use might decrease utility, if the AI system's personalisation does not model individual preferences effectively. For example, an individual using a recommendation system may be exposed to harmful content, have choices limited without their knowledge,⁵⁵ or experience distorted behaviour (e.g. addiction to certain activities).⁵⁶ If an individual is unaware of these costs - and research suggests AI users are unaware of costs⁵⁷ - they will overconsume the AI system.⁵⁸
42. New AI related risks will continue to emerge⁵⁹ due to the rapid pace of change in AI technologies and the digital business models this enables, as well as the increasing prevalence of AI across all sectors of the economy⁶⁰. These cross-cutting risks aren't confined to existing regulators' remits. Therefore, without increased coordination and harmonisation between regulators, society will face unaddressed risks.
43. Risks such as manipulation of behaviour can lead to both individual costs and wider impacts. One example is the use of synthetic media such as deepfakes. Deepfakes use AI to generate video and audio content that looks real but is not. It has been reported that deepfakes were used to influence politics in US presidential elections⁶¹ and spread disinformation.⁶² When combined with recommendation algorithms that personalise content, there is a risk that AI systems are manipulating individual behaviour in such a way that is detrimental to societal institutions such as democracy, healthcare, politics, and business.⁶³
44. CMA analysis highlights how AI-driven pricing decisions could lead to algorithmic collusion and reduce competition, ultimately reducing consumer welfare.⁶⁴ The research shows the use of pricing algorithms is widespread, estimating that "28 percent of respondents use software to track and subsequently adjust their own prices". Academic research finds that pricing algorithms can learn to charge prices above the competitive equilibrium without communication between firms, known as tacit collusion.⁶⁵
45. Some AI systems communicate information without context, human oversight or review to ensure that content is not harmful or misinformation. This can lead to content being shared widely without appropriate warnings or transparency regarding the legitimacy of information.
46. Tiktok has more than a billion worldwide users, including ~17 million UK citizens. The recommendation algorithm at the core of Tiktok's success has a programmed objective to

⁵⁴ The Consumer Voice: Automated Decision Making and Cookie Consents proposed by "Data: A new direction", Which? (2021) - [Link](#)

⁵⁵ Algorithms: How they can reduce competition and harm consumers, CMA (2021) - [Link](#)

⁵⁶ Recommender systems and their ethical challenges, S. Milano. L. Floridi (2020) - [Link](#)

⁵⁷ Public Attitudes Tracker Wave 34, BEIS (2020) - [Link](#)

⁵⁸ Algorithms: How they can reduce competition and harm consumers, CMA (2021) - [Link](#)

⁵⁹ DRCF Analysis, Frontier Economics (2021) - Not published

⁶⁰ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁶¹ Is seeing still believing? The deepfake challenge to truth in politics, Brookings Institute (2020) - [Link](#)

⁶² Deepfakes And Cheap Fakes - The Manipulation of Audio and Visual Evidence, Data & Society (2019) - [Link](#)

⁶³ Harms of AI, Daron Acemoglu (2021) - [Link](#)

⁶⁴ Algorithms: How they can reduce competition and harm consumers, CMA (2021) - [Link](#)

⁶⁵ Artificial Intelligence, Algorithmic Pricing and Collusion, E. Calvano et. al (2019) - [Link](#)

maximise ‘retention’ and ‘time spent’ on the platform.⁶⁶ This algorithm maximises advertising revenue and therefore drives profitability. However, there are consequent costs for consumers of these systems, which may be hidden given the lack of public awareness and understanding of AI recommendation systems. These costs can manifest as addiction to the platform, promotion of divisive and polarised content, and failure to ban harmful content that increases users’ ‘time spent’. These impacts may produce negative externalities such as additional costs for mental health or addiction services and the normalisation of extreme content.⁶⁷ Similar consumer harms relating to Instagram and Facebook were released in 2021.⁶⁸ Research by the 5Rights Foundation outlines these harms, with many of those interviewed expressing concern at the power of recommendation algorithms that are able to continually refine content to maximise time spent and interaction with a platform.⁶⁹ Issues such as addiction to platforms and recommendations of polarising content are not likely to be addressed by the Online Safety Bill. Given these are issues driven by the AI system rather than the content itself, these are best addressed through AI regulation.

47. It should be noted that AI systems can be used for many beneficial purposes, often to counteract the harms identified. An example of this is social media platforms using AI to screen advertisements, user-generated content, and comments to detect and remove those that are harmful or violate terms.⁷⁰ In these instances, regulation and softer governance arrangements are still important to ensure that well intentioned AI does not end up being discriminatory e.g. favouring certain types of content or removing certain content due to inherent biases.
48. In summary, consumers of AI systems face risks that impact and infringe on values that are important to the UK.⁷¹ These values include prosperity, safety, security, fairness, privacy, protection of fundamental rights and enhancing societal well-being. Risks to these values should be tackled in a proportionate manner whilst also enabling the UK to realise the opportunities that AI provides.

4b - Stifling investment, innovation and adoption

49. DCMS estimates UK businesses spent ~£63bn on AI technologies and AI-related labour in 2020, with analysis forecasting this will increase to £119bn by 2025 and £387bn by 2040 (in nominal terms).⁷² These estimates highlight the expected growth of AI-related expenditure, however these estimates are based on assumptions that many of the current barriers to adoption of AI technologies are overcome.
50. A study of European firms’ use of AI technologies found that 27% of UK firm’s thought “reputational risks linked to using artificial intelligence” was a barrier to adopting AI technologies, compared with an EU average of 17%. This evidence suggests that a clearer regulatory environment, that reduces the likelihood of reputational damage, could improve AI innovation and investment. The research also found that only 17% of UK businesses found “the need for new laws or regulation” to be an external barrier to AI adoption, vs 27% EU average.⁷³ Interviews undertaken with AI businesses found AI regulation was not perceived to be a barrier to growth, but uncertainty around regulation of and legislation is seen as a barrier.⁷⁴ These statistics demonstrate that whilst UK businesses are supportive of a clear regulatory environment that can limit reputational risks, there is a comparatively low appetite for a radical overhaul of the UK’s

⁶⁶ How TikTok Reads Your Mind, The New York Times (2021) - [Link](#)

⁶⁷ TikTok takes extra steps to curb dangerous challenges, BBC (2021) - [Link](#)

⁶⁸ Facebook revelations: what is in cache of internal documents?, The Guardian (2021) - [Link](#)

⁶⁹ Pathways: How digital design puts children at risk, 5Rights Foundation (2021) - [Link](#)

⁷⁰ Online advertising in the UK, Plum Consulting and DCMS (2019) - [Link](#)

⁷¹ Benefits and Harms of Algorithms: a shared perspective from the four digital regulators, DRCF (2022) - [Link](#)

⁷² AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁷³ European enterprise survey on the use of technologies based on artificial intelligence: final report, European Commission (2020) - [Link](#)

⁷⁴ Artificial Intelligence Sector Study 2022, DSIT (2023) - [Link](#)

current regulatory regime when compared internationally. This suggests that there is room for improvement in AI regulation, but an entirely new approach is unlikely to be optimal.

51. Investment in UK deep-tech companies received more VC funding than any other European country in 2020 (\$3.9bn), and ranked 3rd globally for investment behind America and China. However, investment was only a tenth of that invested in US companies.⁷⁵ This shows that although the UK has a comparative advantage over European countries with respect to investment, there is room for improvement for the UK to be an AI superpower.
52. Economic theory and empirical evidence show that business certainty is a key determinant of business investment.⁷⁶ Investment decisions are costly to reverse and are likely to depend on the certainty of a future outcome, therefore businesses often adopt a “wait and see” strategy under conditions of uncertainty.⁷⁷ Empirical evidence supports this argument⁷⁸ with relatively wide consensus by economists.⁷⁹ This relationship is also evidenced in investments, where a higher level of return is required to compensate for higher levels of investment risk.
53. Macroeconomic models evidence the link between innovation (technical progress) and growth.⁸⁰ Recent trends highlight static business investment in the UK, which is expected to have a slowing effect on innovation, especially given the high costs that are associated with many innovations in deep technologies such as AI.⁸¹ Whilst much of the recent uncertainty can be attributed to the Covid-19 pandemic and the UK's exit from the European Union, regulatory uncertainty is also likely to be a contributing factor. With countries around the world quickly developing approaches to AI governance, UK businesses face further uncertainty regarding how AI systems may be regulated across multiple jurisdictions.
54. The full productivity benefits that AI systems can deliver will only be realised through the widespread adoption of AI into UK businesses. Many UK businesses are not yet adopting AI technology due to unclear accountability, insufficient rules for robust and accurate testing, and uncertainty about transparency requirements.
55. In response to the government's call for views on the July 2022 policy paper ‘Establishing a pro-innovation approach to regulating AI’, industry argued that a clear allocation of legal responsibility would enable effective enforcement and unlock investment. Businesses also reported expensive, time-consuming confusion when there was not clear regulatory ownership of a technology or issue, with disproportionate effects on SMEs. Feedback stated that regulatory coordination would be essential to the success of the AI regulation framework and supported a central coordination function for existing regulators, as opposed to a new regulator for AI.⁸²
56. Recent evidence suggests that 15% of UK businesses have adopted at least one AI technology, with much higher rates for large and medium sized organisations.⁸³ A clearer regulatory regime that reduces businesses uncertainty is expected to support increased AI adoption throughout all regions and sectors of the UK.
57. Research from the Centre for Data Ethics and Innovation's AI Barometer finds several barriers that prevent the UK from capitalising on AI opportunities. “Most prominent among these barriers is ensuring data-driven technologies are trustworthy, and consequently trusted by users, organisations, markets and the public”.⁸⁴ 70% of surveyed businesses said they “desired more

⁷⁵ TechNation Report 2021 (2021) - [Link](#)

⁷⁶ Principles of Economic Regulation, BEIS (2011) - [Link](#)

⁷⁷ Investment under Uncertainty, R. Dixit & R. Pindyck (1994)

⁷⁸ Measuring Economic Policy Uncertainty, S. Baker et al. (2016)

⁷⁹ Fluctuations in Uncertainty, N. Bloom (2014)

⁸⁰ Technical progress and Growth, R. Solow (1957)

⁸¹ Figure 1 - Business investment in the UK: January to March 2022 revised result, ONS (2022) - [Link](#)

⁸² Annex B: Stakeholder engagement - A pro-innovation framework for AI regulation, DSIT (2023) - [Link](#)

⁸³ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

⁸⁴ AI Barometer 2021, CDEI (2021) - [Link](#)

information to help them navigate the often complex legal requirements around data collection, use and sharing”.

58. Examples of uncertainty include Big Brother Watch filing a legal complaint, with the ICO, against the use of facial recognition by Southern Co-operative in its stores.⁸⁵ Legal complaints show that there is still investment risk for businesses which disincentives them from innovating in this market.
59. In November 2021, Meta announced they were “shutting down the Facial Recognition system on Facebook” citing growing social concerns and unclear rules from regulators.⁸⁶ Similarly, IBM is to stop offering its own facial recognition software for certain activities.⁸⁷
60. These outcomes are suboptimal and miss an opportunity that enables businesses to invest and innovate in AI technologies in a way that is aligned to a clear trustworthy regulatory framework. Rather than reduce investment and innovation, it should be undertaken in a responsible manner that has public support and builds trust.
61. The UK has an opportunity to develop a clear, proportionate governance approach that addresses risks and improves consumer outcomes. Such a regime is expected to attract investment and encourage responsible innovation in AI technologies, driving growth and improving productivity throughout the UK.

4c - Risk of reduced international competitiveness of the UK AI industry

62. Global competition in AI is increasing rapidly, evidenced by the significant increase in funding for AI companies in recent years.⁸⁸ Countries around the world are racing to create the regulation and governance of AI systems that will help them capitalise on AI’s benefits.⁸⁹ For strategic, economic, and national security reasons, many countries are competing to ensure that their own norms and values are adopted globally as principles for regulating AI.
63. Proposals for regulating AI systems are progressing rapidly in the international landscape (e.g. EU AI Act proposal,⁹⁰ China’s ‘draft guidelines’ for algorithmic recommender systems,⁹¹ and the US Blueprint for an AI Bill of Rights⁹²). The wide ranging regulatory and societal systems across these jurisdictions means their approaches to AI regulation are based around different objectives. For example, the European Commission is aiming to make the rules for AI consistent across EU Member States and create a ‘level playing field’, and therefore has greater impetus to legislate to create legal certainty.
64. Governments must balance a trade-off between innovation and risk management: allowing AI systems to continue under current regulatory regimes means accepting the outlined harms as a by-product of progress, on the one hand, while potentially burdensome regulation of AI systems could stifle investment and limit global competitiveness, on the other. For example, initial estimates of compliance costs for the EU AI Act range between EUR 1.6 billion to EUR 3.3 billion in 2025.⁹³ However, there are benefits that the EU expects to balance these costs, including

⁸⁵ Addressing privacy concerns on the use of live facial recognition technology, ICO (2021) - [Link](#)

⁸⁶ An Update On Our Use of Face Recognition, Facebook (2021) - [Link](#)

⁸⁷ IBM abandons 'biased' facial recognition tech, BBC (2020) - [Link](#)

⁸⁸ Tracking AI Investments: Initial Findings from the Private Markets, Centre for Security & Emerging technology (2020) - [Link](#)

⁸⁹ The End of an Era: from Self-Regulation to Hard Law for the Digital Industry. L. Floridi (2021) - [Link](#)

⁹⁰ AI Act, European Commission (2021) - [Link](#)

⁹¹ No direct translation found. Summary: Understanding China’s Draft Algorithm Regulations, The Diplomat (YEAR) - [Link](#)

⁹² Blueprint For An AI Bill Of Rights - Making Automated Systems Work For The American People, Office for Science and Technology Policy (2022) - [Link](#)

⁹³ Study supporting the impact assessment of the AI regulation, European Commission (2021) - [Link](#)

reducing AI related harms and the hope of becoming the de-facto global regulatory standard for AI systems.

65. The characteristics of AI, including its ability to scale at little cost, mean that states or regions that effectively regulate AI first are likely to benefit from a larger and more mature market share. This 'winner takes all' effect poses economic risks.⁹⁴ If the EU is one of those regions, there is a risk that the "Brussels effect" will influence AI suppliers globally to adopt the requirements for AI systems outlined in the proposed EU AI Act in order to minimise trade frictions, reduce duplicative processes, and meet the highest regulatory standards as an indication of quality. This phenomenon has been seen with the implementation of GDPR and similar requirements adopted globally.⁹⁵
66. Research conducted by Frontier Economics on behalf of DCMS, found industry stakeholders agreed that investment was expected to go to the jurisdiction with the most "pro-innovation approach", including low costs of compliance and least prohibitive regulation.⁹⁶ This indicates it is unlikely that the EU AI Act will become the de facto standard due to the large costs imposed by the regulation. Acting quickly to create a credible strategy for regulating AI increases the likelihood that the UK can act as a rule maker rather than a rule taker and design a framework tailored to the UK's unique position in the global economy that works for businesses and society. In response to the government's call for views, industry stressed the importance of an internationally competitive approach to AI regulation. Many businesses felt tools for trustworthy AI, like international standards, and cross-border agreements, such as a Memorandum of understanding, would be key to successful market interoperability.
67. Burdensome AI regulation in other regions may support the UK to extend its international competitiveness through a proportionate regulatory regime. Generally, the UK's regulatory regime is seen as attractive to businesses globally, attracting entrepreneurs and start-ups that drive the UK's economy.⁹⁷ Extending this leadership to the regulation of AI systems will ensure the UK benefits from AI related opportunities. The UK should act quickly to clearly outline a credible alternative to the burdensome AI regulation being implemented internationally. Iteratively and incrementally building the approach allows for more flexibility in the system to adapt to changes in the technology and international regulatory landscape - as well as new emerging risks and opportunities. For example, ChatGPT was not released when the EU AI Act was proposed - so it is not set-up to deal with these types of issues and is now very hard to change at this stage of negotiation, even before it is in law.
68. The UK is already seen as a leader in the AI regulation space, utilising initiatives such as the UK's AI Standards Hub, which is the first of its kind, to shape the global AI technical standards development discussions and CDEI's world-leading work on AI Assurance techniques.⁹⁸ The Alan Turing Institute has also been brought in to advise on a number of AI governance tools being developed by multilateral organisations - such as UNESCO and the Council of Europe.⁹⁹ In order to maintain global competitiveness, the UK's regulatory regime should not unintentionally restrict innovative AI research and scientific development or reduce the UK's ability to combat global AI threats. An example of this would be to ensure that any regulatory proposal does not hinder the ability of the UK to counter threats that may stem from others' use of these technologies.
69. International fora, such as the Global Partnership on AI (GPAI), of which the UK is a founding member, and ad hoc Committee on Artificial Intelligence (CAHAI), aim to reduce the pre-emptive

⁹⁴ Economic impacts of artificial intelligence, European Parliament (2019) - [Link](#)

⁹⁵ 'The Brussels Effect: How the GDPR Conquered Silicon Valley', Simon Gunst and Ferdi De Ville, European Foreign Affairs Review (2021) 26:3, 437-458 - [Link](#)

⁹⁶ Evidence to Support the Analysis of Impacts for AI Governance - Report Annexes, Frontier Economics (2023) - [Link](#)

⁹⁷ Tech Nation 2021 Report, Tech Nation (2021) - [Link](#)

⁹⁸ AI Standards hub - [Link](#)

⁹⁹ Artificial intelligence, human rights, democracy, and the rule of law - A primer (2021). Council of Europe (2021) - [Link](#)

escalation of combat AI technologies by multilaterally agreeing the ways in which AI can be deployed in a trustworthy manner. The UK is working collaboratively with these bodies to ensure UK values and principles are embedded in their approach. The UK's proposals for AI regulation will align with the principles and agreements made in these important international fora.

70. The current regulatory framework means that while some AI-related risks are not being adequately addressed, there are also opportunities for investment and innovation that the UK is not benefitting from. The current regulatory regime is suboptimal for consumers, businesses, regulators and society as a whole. Businesses lack incentives to change the status quo whilst consumers and regulators lack information to make informed decisions. The proposed intervention can drive growth and prosperity, by improving trust in AI and ensuring the UK strengthens its position as a global leader.

Consultation question 1: Do you agree that the rationale for intervention comprehensively covers and evidences current and future harms?

Section 5 - Proportionality of evidence

71. The widespread application of AI technologies in many day-to-day activities has largely occurred over the last 10 years. Many of the risks posed by AI are therefore relatively new and in many cases still developing.
72. Where possible, evidence has been used to assess the likely impacts of the policy options. This evidence gathering has been in the form of desk research, commissioned studies, stakeholder roundtables with industry representatives, regulator discussions, and 1-1 interviews held by third parties to ensure responses to the government were anonymous. However, there remain some areas in which current evidence is not sufficient to break down the expected impacts by each policy option. Where this is the case, assumptions have been clearly identified and impacts are summarised at an overall level. This consultation will help gather further evidence to ensure a robust assessment is possible by the final stage impact assessment.

5a - Regulatory effectiveness

73. While many countries are developing frameworks for the regulation of AI, these approaches are not mature enough to have been evaluated. As evidence on the effectiveness of different policy interventions is very limited, this assessment relies on stakeholder input and expert opinions rather than robust evaluation findings.
74. The impact assessment for the proposed EU AI Act¹⁰⁰ and the feedback on that analysis¹⁰¹ provides the most comprehensive and publicly available analysis of AI regulation to date. Where appropriate, that analysis has been considered within this report.
75. The UK government currently sees the advantages of a 'test and learn' approach given the novelty of regulation in this policy area. This means evidence gathering, monitoring and evaluation will continue throughout the implementation of the framework. This approach has been supported strongly by stakeholders across industry, society, government and regulators themselves.

¹⁰⁰ Study to support an impact assessment of regulatory requirements for Artificial Intelligence in Europe, European Commission (2021) - [Link](#)

¹⁰¹ EI AI Act - Consultation responses, European commission (2021) - [Link](#)

5b - Labour markets

76. The impact of new technology on labour markets has a long history, with much research assessing the long term impacts of technological changes and their impacts on employment. In general there are three effects of technological change on labour markets:
- Displacement effect* - Technology takes over tasks previously performed by labour and demand for this labour decreases.
 - Productivity effect* - Automation technologies can improve productivity, therefore increasing demand for labour in non-automated tasks.
 - Reinstatement effect* - Creation of new tasks, in which labour has a comparative advantage.
77. The resulting impact on employment is the net of these 3 individual effects. Using data from US wage bills, Acemoglu and Restrepo's analysis evidences a stronger displacement effect and weaker reinstatement effects in the most recent 30 years than the previous four decades.¹⁰² This trend shows that the impact of automation technologies on labour may be changing as these technologies are able to conduct more sophisticated tasks.
78. BEIS analysis concludes that the net impact of AI on employment is unclear, with the most plausible assumption being a "broadly neutral long-term effect".¹⁰³ This analysis also looked at distributional impacts and found that lower paid and lower skilled jobs were more likely to face negative employment effects, with the opposite being true for high skilled jobs. Regional impacts on employment are also variable, with higher income regions such as London and the South East more likely to see positive net effects and lower income regions such as Northern England and the Midlands more likely to see negative net employment impacts.
79. The proposed regulatory changes are only expected to impact employment and labour markets indirectly, through the increased or decreased development and deployment of AI technologies. Given it is unclear whether increased use of AI technologies will have a positive or negative impact on employment, it also remains unclear what the net impact of the proposed interventions will be on employment and labour markets more generally. The impacts are not expected to vary materially between the policy options outlined.

5c - Consultation stage impact assessment

Given this is a consultation stage impact assessment, the evidence base will continue to be developed before a final stage impact assessment. This will be through the commissioning of external research, continued engagement with stakeholders, and internal analysis on areas of limited evidence.

80. In line with RPC guidance, where some policy decisions will be finalised at a later stage and there is limited evidence or data, the analysis is qualitative. The analysis has tried to quantify impacts where possible, however some of the assumptions used to quantify the impacts do not have sufficient supporting evidence. The consultations and subsequent analysis will work to improve these assumptions for the final stage impact assessment. The decision has been taken to include this quantified analysis to demonstrate the proposed approach for quantifying impacts.
81. The main objectives of this consultation stage impact assessment are to demonstrate the case for change and provide transparency into the policy analysis that has been undertaken to determine the preferred option. The consultation process is designed to inform subsequent thinking on these topics and gather additional evidence to support further policy development. Given the broad range of impacted regulators, businesses, systems and consumers, this impact assessment aims to provide an overarching assessment of the short-listed policy options and

¹⁰² Automation and New Tasks: How Technology Displaces and Reinstates Labor, D. Acemoglu and P. Restrepo (2019)

¹⁰³ The Potential Impact of Artificial Intelligence on UK Employment and the Demand for Skills, BEIS (2021) - [Link](#)

their expected material impacts. Calculation of these impacts is challenging in the case of this impact assessment. This is due to:

- a. the heterogeneity of AI systems that are in scope of the framework;
- b. changes in AI systems and applications over time limiting longitudinal data on the impact of AI use ;
- c. the novelty of the proposed policy measures, which means there is a lack of relevant precedent in other sectors or countries;
- d. the scale of AI deployment and the multiple ways in which it is used meaning that it is not possible to run trials, experiments or surveys in a way that can be robustly scaled;
- e. the rate of change in the sector and the way people use AI technology; and,
- f. limited government knowledge of subsequent actions given that, in the preferred option, the regime will be implemented and operated by existing regulators.

82. In summary, the potential impacts can not be accurately estimated at this stage. While regulatory interventions will be guided by government objectives, they will be determined and delivered by existing regulators. The government will continue to analyse and work with regulators to assess the potential impacts in greater detail. The iterative nature of the preferred option will help to proactively identify any areas of the framework that are not working effectively, and determine whether any further interventions are required.

Section 6 - Policy objectives

83. The Government has set out a strong pro-growth vision, as outlined in the UK’s National AI Strategy.¹⁰⁴ Work to establish a proportionate, pro-innovation and internationally competitive regulatory approach for AI supports this ambition by unlocking growth and innovation across the UK AI ecosystem. This is reflected in the vision statement:

84. *Our AI regulatory approach will drive growth and prosperity by boosting innovation, investment and public trust to harness the opportunities and benefits that AI technologies present. It will strengthen the UK’s position as a global leader in AI, by ensuring the UK is the best place to develop and use AI technologies.*

85. This vision is underpinned by three key objectives which will guide the development and assessment of the policy options. The corresponding metrics provide a set of indicators to measure the progress on each objective and will be used to underpin the monitoring and evaluation (see more detail in section 13). Given this is a consultation stage impact assessment, specific targets or timings for these metrics have not yet been agreed. These will be developed as further progress on the implementation of the proposal is made.

Table 6a: Policy Objectives and Metrics

Objectives	Metrics
<p>1. Driving growth and prosperity. This will be achieved by:</p> <ol style="list-style-type: none"> a. Ensuring responsible innovation to unlock unrealised opportunities. b. Encouraging investment in the development and use of AI. 	<ul style="list-style-type: none"> ● Increase investment in UK AI SMEs, relative to investment into international AI SMEs (excl. USA and China). ● Increase participation in innovative regulatory tools for AI, for UK-based SMEs e.g. regulatory sandboxes. ● Increase in the proportion of UK businesses adopting AI technologies and the average number of AI technologies used by UK companies.
<p>2. Increasing public trust. This will be achieved by:</p> <ol style="list-style-type: none"> a. Addressing key AI risks and protecting our fundamental values. b. Unlocking consumer benefits. 	<ul style="list-style-type: none"> ● Increase the proportion of the UK public positive about AI. ● Reduce the proportion of UK citizens that have experienced harms associated with AI, and the perceived severity of those harms.

¹⁰⁴ National AI Strategy, Office for AI (2021) - [Link](#)

	<ul style="list-style-type: none"> • Increase the usage of AI-enabled products and services by individuals e.g. in the home, at work etc.
<p>3. Strengthening the UK's position as a global leader in AI. This will be achieved by:</p> <p>4. Engaging in international efforts to develop approaches to regulating AI.</p> <p>5. Ensuring the UK approach remains attractive to AI innovators and investors in the international context.</p>	<ul style="list-style-type: none"> • Maintain or improve the UK's position in the Stanford Global AI Index. • Improve the regulatory 'Readiness Self-Assessment Tool' score to an average of 4 ("Fairly confident" - ATI Regulatory Capacity report). • Negotiate a Council of Europe position that enables the UK to implement its own regulatory position for AI, not bound to other international approaches.

Consultation question 2: Do you agree that increased trust is a significant driver of demand for AI systems?

Section 7 - Policy options considered

86. When developing the framework for AI regulation, the government considered a range of options for different parts of the regime. Rather than detailing options for each component part, the impact assessment analyses three policy options and a do nothing option. Some of the policy options that were initially considered have now been deprioritised and are not assessed in this impact assessment. Below is a brief summary of these options and why they are no longer being considered as standalone options:
- a. **Minimum regulatory requirements for all AI systems** - Mandating a set of minimum requirements for all AI systems does not constitute a risk-based approach, which is a key characteristic of the desired regime. The government assessed that this would place additional burdens on businesses without focussing on reducing the biggest and most impactful AI risks. Further details on the analysis of minimum regulatory requirements can be found in the report: Evidence to Support the Analysis of Impacts for AI Governance.¹⁰⁵
 - b. **Quality ratings for AI systems** - Given the wide ranging variability of AI systems and their use-cases, it was deemed impossible to provide a quality rating that could be interpreted across all potential applications and use-cases. This is because quality is usually a context-based assessment, meaning quality ratings might be suitable within a certain sector (e.g. finance) or for a technical feature of an AI system (e.g. bias). However, the government assessed that it was not appropriate or feasible to centrally define quality ratings that could apply to all AI systems. There are also outstanding technical questions that need to be addressed in order to provide quality ratings for certain technical features of AI systems (e.g. explainability). Quality ratings could form part of an overall regulatory framework to AI.
87. Following extensive industry engagement, analysis of available evidence, discussions with regulators, and legal analysis, the following shortlisted policy options have been prioritised for analysis:
- a. Do nothing (Counterfactual)
 - a. Delegate to existing regulators, guided by non-statutory advisory principles (Do Minimum)
 - b. Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions
 - c. Centralised AI regulator with new legislative requirements placed on AI systems (Do Maximum)

¹⁰⁵ Evidence to Support the Analysis of Impacts for AI Governance, Frontier Economics (2023) - [Link](#)

88. Table 7a summarises the key components of each policy option:

Table 7a - Summary of policy options

Regulatory components	Option 0: Do nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
New legislation required	No.	No.	Yes. Legislation required to give regulators a 'duty to have due regard' to the principles.	Yes. New AI specific primary legislation for the AI regulator and the mandatory requirements.
Additional requirements for regulators	No.	Partially. Regulators will voluntarily consider the principles.	Yes. Regulators have a duty to regard the principles.	Yes. The AI regulator must enforce the new legislation.
Additional requirements for UK businesses	No.	Partially. New voluntary requirements.	Partially. There may be new requirements following regulators' interpretation and implementation of the principles.	Yes. New mandatory risk-based requirements for businesses
Penalties or fines introduced for non-compliance	No.	No.	No.	Yes.
Centralisation of some functions	No.	No.	Yes. Central AI regulatory functions are established.	Yes. An AI regulator is established.
Additional funding requirements	No.	Yes. Additional capacity required in existing regulators.	Yes. Required to establish central AI regulatory functions.	Yes. Required to establish a new AI regulator.

89. It is assumed all options would be implemented in 2023. Whilst this is an analytical simplification, due to legislative options taking time to obtain royal assent and pass through parliament, it improves the comparability of options in the analysis whilst remaining a reasonable assumption.

7a - Option 0 - Do nothing (Counterfactual)

90. Option 0, the 'do nothing' option, sets the baseline against which the expected impacts of the other policy options are assessed. It assumes the continuation of current arrangements as if the intervention under consideration were not to be implemented. AI-specific regulation does not currently exist in the UK, however AI systems are regulated under multiple existing regulations

e.g. AI systems as a medical device, Article 22 of UK GDPR, the Equality Act 2010, and many more. In option 0, this status-quo will continue. Engagement with regulators found substantial variation in the capability and capacity of regulators to address AI related risks. In some industries, such as financial services, regulators are already taking proactive steps to address AI related risks through publication of guidance and the use of innovative regulatory tools such as sandboxes.¹⁰⁶ In other areas, regulators do not have the required skills or capacity to proactively consider these risks. Businesses reported that the variation in approaches to AI across regulators makes compliance measures unclear. Industry reported that un-coordinated reporting obligations are resource-intensive and burdensome, with disproportionate negative impacts on SMEs. Businesses noted that the current lack of regulatory certainty and coherence prevented business confidence and stifled investment in innovation.¹⁰⁷

91. Countries around the world are quickly developing approaches to AI regulation. However, only the EU AI Act is mature enough to include substantially in the impact assessment at this time.¹⁰⁸ In the counterfactual option, it is assumed that the EU implements the EU AI Act as published in April 2021. More recent versions have been proposed but none of these have undergone the same level of analysis or scrutiny as the initial proposal and the key components remain the same. Some UK businesses trade AI products and services internationally with the EU, and therefore will have to comply with the EU AI Act for these goods. However, these firms represent a minority of UK AI businesses (details in Section 12 on International Trade). Other UK firms are not expected to take voluntary action given the substantial increase in costs expected with the implementing the EU AI Act.¹⁰⁹
92. Many UK regulators are already taking steps to investigate and analyse the use of AI systems within their own regulatory remits. In the counterfactual option, it is assumed that the incremental steps taken by regulators do not have significant impacts for the regulation of AI systems in the future.
93. Potential impacts in the absence of intervention include: divergence in regulators' approaches to addressing AI risks, leading to a lack of regulatory coherence; unaddressed AI risks materialising, which cause harm and lead to a lack of trust in AI systems; and the UK losing its position as a leader in AI, reducing the ability to compete internationally for talent and investment. Evidence suggests that AI use is growing rapidly, meaning the consequences of delaying intervention are expected to grow.¹¹⁰
94. All costs and benefits estimated in the analysis are in addition to those assumed in the do nothing option. Impacts are assessed against baseline estimates and growth forecasts for AI sector revenues, venture capital and internal investment, and AI technology adoption.

7b - Option 1 - Delegate to existing regulators, guided by non-statutory advisory principles (Do minimum)

95. Option 1 is a non-legislative alternative to introducing new regulation. It outlines a set of cross-sector principles for regulators to consider without a legally binding enforcement mechanism. Existing regulators will continue to be responsible for the regulation of AI systems in the UK by enforcing existing legislation. The option would not give regulators any new legal powers or duties and would not impose additional legal burdens on AI suppliers or AI users. The

¹⁰⁶ DP5/22 - Artificial Intelligence and Machine Learning, Bank of England and FCA (2022) - [Link](#)

¹⁰⁷ Annex B: Stakeholder engagement - A pro-innovation framework for AI regulation, DSIT (2023) - [Link](#)

¹⁰⁸ Laying Down Harmonised Rules On Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts, European Commission (2021)

¹⁰⁹ Evidence to Support the Analysis of Impacts for AI Governance - Report Annexes, Frontier Economics (2023) - [Link](#)

¹¹⁰ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

non-statutory principles in option 1 are supplementary to existing legislation, and should support the implementation of existing legislation in the context of AI.

96. Guidance developed in consultation with key stakeholders would be published by the government, outlining how regulators should interpret and implement the principles. Whilst this option does not extend any legal mechanisms to address AI-related risks, regulators would be encouraged to ensure compliance with the principles to the extent that this is possible, given their existing enforcement powers. While this option does not give regulators any new enforcement powers, it would likely cause them to be more proactive in enforcing existing regulations that are applicable to AI systems. Regulators may continue to voluntarily collaborate in forums such as the Digital Regulation Cooperation Function (DRCF), however there are no additional mechanisms to support regulatory coordination.
97. In this option the direct costs to business arise from familiarisation and compliance costs, where a proportion of businesses are assumed to familiarise with the regulatory principles and implement changes as a result of this. A direct cost to the government is assumed to provide additional funding for existing regulators. There are many indirect costs and benefits expected in this option, discussed in more detail in section 10.

7c - Option 2 - Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions

98. Option 2 also outlines a set of cross-sector principles for organisations to follow for the governance of AI systems, with regulators given a duty to have due regard for the principles. In this scenario, newly established central AI regulatory functions will support and empower existing regulators to implement these principles. As with option 1, this option does not create any additional legal obligations on AI suppliers or AI users, but it does require legislation to give regulators a 'duty to have due regard' to the principles, incentivising regulators to apply them appropriately in their respective remits.¹¹¹
99. Existing regulators will remain responsible for regulating the supply and use of AI in their respective remits by enforcing relevant existing legislation. As with option 1, this option does not give regulators any new enforcement powers but will likely cause them to become more proactive in their enforcement of regulations that are applicable to AI. This activity could include: assigning higher priority to the investigation and remediation of potential regulatory breaches by AI suppliers and users; being more proactive in issuing guidance; creating guidance on how the AI principles interact with existing legislation in their area; or producing good practice templates to support businesses to implement the principles into their business processes. The principles in option 2 are supplementary to existing legislation and should support the application of existing legislation in the context of AI. As the duty to regard gives regulators an additional incentive, it is expected that regulator proactivity is more significant than in option 1. Crucially, we also anticipate that the duty to regard combined with new central functions designed to support regulatory implementation of the principles, including through monitoring and evaluation, would give regulators a clear incentive to engage with government proactively and collaboratively including in respect of monitoring levels of adherence to the principles by organisations within their remits. This, together with other central monitoring and evaluation activity would allow the government to assess and adjust the regulatory framework in light of this information. We believe a focus on monitoring and evaluation of the impact of the framework will incentivise regulated organisations to comply to some extent, with behaviour shifting in order to avoid anticipated increased future regulatory intervention and potential enforcement activities. Businesses may also be incentivised to act to demonstrate compliance and build trust with customers, with the knowledge that trust is a driver of demand and AI adoption.¹¹²

¹¹¹ A pro-innovation approach to AI regulation, DSIT (2023) - [Link](#)

¹¹² Artificial Intelligence Sector Study 2022, DSIT (2023) - [Link](#)

100. To illustrate how this option would work in practice, consider a regulator's duty to have due regard to the 'fairness' principle and accompanying guidance. Regulators would be expected to enforce compliance with this principle to the extent that this is possible, given its existing legal powers. But because the fairness principle does not impose new mandatory requirements on AI suppliers or AI users, there may be cases where an AI supplier acts in a way that seems contrary to it, but nonetheless breaks no existing law. Regulators would not be expected to go beyond their existing legal powers. One focus of the central monitoring and evaluation function would be to identify where regulatory remits are inadequate to allow risks to be properly mitigated, encouraging regulators to engage with government to explain that their existing legal powers do not allow them to fully enforce compliance with the fairness principle. Regulators' engagements with the central monitoring and evaluation function would inform improvements to the framework by government, including legislative measures to address regulatory gaps. If compliance with existing laws conflicted with adherence to the fairness principle, the law would take precedence. Regulators would be expected to exercise their discretion in applying the principle, but we would expect the principles to inform their prioritisation of enforcement or investigatory action (i.e. potential breaches of regulations involving AI systems would, other things being equal, be of high priority if they also involved deviation from the principles).
101. The proposed approach also differs from Option 1 in including new central functions to coordinate, monitor and adapt the framework as a whole. These functions include:
- a. **Monitoring and evaluation of the overall regulatory framework's effectiveness** and the implementation of the principles, including the extent to which implementation supports innovation. This will allow government to remain responsive and adapt the framework if necessary, including where it needs to be adapted to remain effective in the context of developments in AI's capabilities and the state of the art.
 - b. **Support coherent implementation of the principles** by identifying and resolving barriers to the effective implementation of the principles. This could include resolving issues with the scope of existing regulatory remits, improving inadequate regulatory powers, building regulator capability.
 - c. **Assessing and monitoring risks** across the economy arising from AI.
 - d. **Conducting horizon scanning and gap analysis**, including by convening industry, to inform a coherent response to emerging AI technology trends.
 - e. **Supporting testbeds and sandbox initiatives** to help AI innovators get new technologies to market faster, and enable government to identify practical issues with the overall regulatory frameworks.
 - f. **Providing education and awareness** to give clarity to businesses and empower citizens to make their voices heard as part of the ongoing iteration of the framework.
 - g. **Promoting interoperability** with international regulatory frameworks.
102. As well as promoting innovation, these centralised functions are designed to enable the government to adapt the overall regulatory framework in response to emerging risks or opportunities, and in light of a thorough evaluation of how the proposed regulatory framework is operating in practice. The central AI regulatory functions would support regulators to tackle AI risks that do not fit within existing regulatory remits and coordinate to produce joint guidance, where appropriate, on AI risks that span multiple regulatory remits. The central AI regulatory functions are also expected to play a role in convening and sharing AI expertise to support regulators where needed, provide monitoring and evaluation of the AI regulatory regime across

regulators, and engage internationally to maximise alignment and compatibility with international partners.

103. A key feature of option 2 is its iterative regulatory approach. Given the novelty of AI regulation and the fast-changing landscape, rigid statutory approaches could quickly become cumbersome and out-dated. An iterative approach can adapt as the AI ecosystem changes. An iterative approach also ensures policy objectives are achieved on a continuous basis, decreasing the delay between policy analysis and real-world benefit, and maintaining value for money for public investments. It also avoids the need to introduce rigid, wide-ranging new legislation in response to new, rapid technological developments whose implications are not yet fully understood - an approach that risks disrupting the AI innovation landscape. We recognise the risk that, by avoiding the introduction of new legal requirements on AI regulators suppliers and users, option 2 may not fully address all the risks associated with AI. Although AI suppliers and users are bound by existing legislation, there is a risk that existing legislation will not fully ensure compliance with the principles. However, option 2 builds in the mechanisms needed to assess and respond effectively and in a targeted, proportionate way to these risks as they emerge or escalate.
104. Option 2 uses the AI regulatory principles to articulate a vision of what responsible AI should look like. It then puts in place measures to support adherence to the principles and to monitor levels of adherence. Where there is significant divergence from the principles and where existing regulatory powers are inadequate to rectify this situation, government would build the case for targeted reforms (for example, changes to regulators' remits, updates to the Regulators' Code, or legislative changes) to rectify these issues. As a mechanism for introducing targeted legislative reform as the AI landscape evolves, the UK sovereign parliamentary system is, by international standards, fast and reliable. It is therefore a key enabler for an iterative approach to AI regulation. There would still be some lag between the emergence of a risk unaddressed by existing laws and the introduction of new legislation to mitigate it. We judge this disadvantage to be on balance acceptable, as it would not be appropriate to introduce rigid new requirements until a more thorough analysis of the existing AI risk and regulation landscape has been conducted.
105. The exact legislative vehicle by which the duty to regard would be introduced has not yet been determined, but the legislation would not introduce any new legal obligations on AI suppliers or users. It would also not introduce any new law-making powers, for example powers to create new secondary legislation.¹¹³ As such, if existing regulators or their sponsoring departments felt they needed new powers to ensure compliance with the principles, they would need to make a separate case for their introduction, including a new impact assessment (collaborating with and supported by the central functions).
106. While option 2 is the preferred option, government has committed to ongoing consultation to inform decisions on both the nature of the central functions to be developed and the need for a duty to regard the principles. The framework will initially be launched on a non-statutory basis. If monitoring and evaluation of the initial, non-statutory framework suggests that a statutory duty to regard the principles is unnecessary (i.e. if the framework is effective without it), government would not introduce it. Further details on the specifics of option 2 can be found in the accompanying AI regulation white paper.¹¹⁴
107. In option 2 there are direct costs to business related to familiarisation and compliance, as businesses will be required to read and understand the regulatory principles. Compliance costs are also included because additional compliance activity is expected as a direct consequence of the regulatory proposal. There is a direct cost to the government to fund central AI regulatory

¹¹³ What is Secondary Legislation? UK Parliament - [Link](#)

¹¹⁴ A pro-innovation approach to AI regulation, DSIT (2023) - [Link](#)

functions. There are many indirect costs and benefits expected in this option, discussed in more detail in section 10.

7d - Option 3 - Centralised AI regulator with new legislative requirements placed on AI systems (Do maximum)

108. Option 3 proposes a regulatory regime governed by a newly established AI regulator. This approach uses a centralised definition of an AI system applied in all contexts and proposes a range of new legislative requirements that AI systems must adhere to based on an AI system’s centrally defined risk level.

109. This option mirrors the requirements put forward by the European Commission in the draft EU AI Act.¹¹⁵ A summary of the risk-based assessment and the requirements for AI systems are set out in the table below:

Risk Level	AI systems in scope	Requirements
Unacceptable	AI systems that: <ul style="list-style-type: none"> ● Deploy subliminal techniques to materially distort a person’s behaviour causing physical or psychological harm ● Exploit the vulnerabilities of a specific group of people (e.g. children) to materially distort their behaviour causing physical or psychological harm ● Are used by public authorities for social scoring (i.e. evaluating people’s trustworthiness) ● Are used by law enforcement in public spaces to conduct “real-time” remote biometric identification 	These AI systems will be prohibited
High Risk Systems	<ul style="list-style-type: none"> ● Safety components of products or products themselves, falling within the scope of certain EU harmonised legislation (e.g. toys, motor vehicles) ● Stand-alone AI systems which pose a high risk of harm to the health and safety or the fundamental rights of persons (e.g. traffic management AI systems, exam scoring) 	Ex-ante conformity assessment, ensuring compliance with minimum requirements including: <ul style="list-style-type: none"> ● Risk Management System ● High quality of data used by the AI system ● Technical documentation ● Activity logging ● Clear information to the user ● Human oversight ● Robustness and security measures There are also requirements for ex-post market monitoring requirements

¹¹⁵ European Union AI Act, European Commission - [Link](#)

Limited risk system	AI systems directly interacting with natural persons	Transparency obligations
Minimal risk	All other AI systems	Voluntary code of conduct

110. Penalties for non-compliance are also proposed under this option. These include fines for up to £26.4 million / 6% of global revenue for non-compliance with either unacceptable or high risk requirements, £17.6 million / 4% of global revenue for any other regulatory requirement under the proposal, and £8.8 million / 2% of global revenue for incorrect provision of information relevant to the requirements.¹¹⁶
111. It should be noted that as the EU AI Act is not yet finalised and agreed by EU member states it is subject to change. This analysis is based on the most comprehensive detail available, published in the initial text. Furthermore, the EU AI Act may be updated and introduce new requirements where new AI techniques and risks are identified.
112. The AI Act has been designed to be complementary to cross-sectoral EU legislation and sectoral safety legislation which is currently harmonised under the New Legislative Framework. The AI regulation is complemented by an updated Regulation for Machinery Products – a revision of the 2006 Machinery Directive – which classifies AI systems that are used as a safety component as ‘high risk’. All such systems will need to undergo mandatory third-party conformity assessments. The AI Act also has close interactions with the product liability reforms, Digital Services Act, Digital Markets Act and Digital Governance Act. The EU AI Act will overlap, but not replace, GDPR protections - but will be more expansive as not restricted to personal data.
113. In option 3 there are direct costs to business related to familiarisation as businesses are required to read and understand the new legislation. Businesses also face compliance costs whilst implementing the mandatory requirements for their AI systems. There is a direct cost to the government to fund a new AI regulator. There are many indirect costs and benefits expected in this option, discussed in more detail in section 9.

Section 8 - Preferred option

114. **The preferred policy option is option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions.**
115. Option 2 establishes central AI regulatory functions. A simplifying assumption in this impact assessment is that these are set up under a central body, however the AI regulation white paper proposes these as central functions but does not make an assumption that a new central body is required.¹¹⁷ The government has identified several activities that would benefit from central coordination (listed in Section 7c above). In this proposal, regulators would continue to regulate AI within their existing remits. The approach benefits from the domain expertise of regulators, whilst supporting regulators that have been slower to address AI risks.
116. The government's expectation is that the regime will launch on a non-statutory basis. When parliamentary time allows, the government intends to introduce a statutory obligation on regulators as a ‘duty to regard’ the principles. This would enable the government to flexibly update the principles and support regulators to act on them. The timeline for the introduction of a statutory duty to regard will need to be considered in tandem with potential developments in the form and status of the central AI regulatory functions also being proposed.
117. Central functions will take time to establish, the regime will be launched without them in place. The government will adapt existing institutional arrangements to serve its core functions in the

¹¹⁶ All GBP amounts converted from EUR at an exchange rate of 0.88 EUR to GBP.

¹¹⁷ A pro-innovation approach to AI regulation, DSIT (2023) - [Link](#)

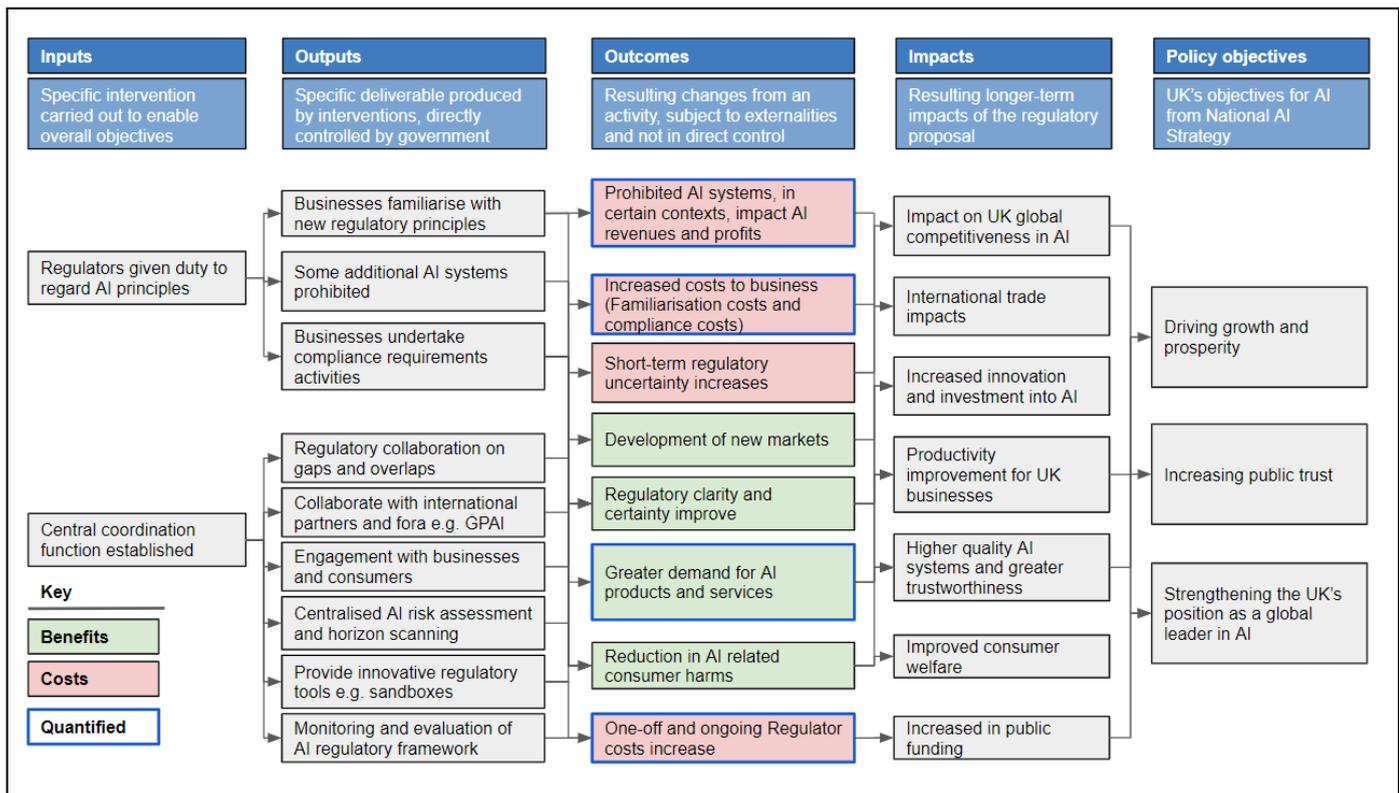
interim. This will enable a faster launch of the framework and allow policymakers to incorporate initial learnings into the final institutional design. This framework is designed to be iterative in nature, adjusting and improving using stakeholder feedback and evaluation against the policy objectives. Final decisions on the detailed structure and delivery model for these interim arrangements are yet to be made and will be informed by feedback received via the consultation. The current planning assumption is that this will require the establishment of AI regulation functions within DCMS to deliver the functions and activities identified. These functions will coordinate the input of other organisations and bodies who will support the delivery of certain functions.

118. This regulatory proposal is expected to clarify AI regulation, build a framework capable of identifying and addressing high priority cross-cutting risks, while minimising additional regulatory burdens for UK businesses. The analysis supports the decision that this option balances the need for additional regulatory scrutiny of AI systems whilst not introducing burdensome regulation that can stifle innovation. This approach, with closer monitoring as a central focus of the framework, will provide better information on whether risks are being adequately addressed and enable more informed decisions on whether further regulatory steps are required. Stakeholders agreed that a principles-based approach is more likely to keep pace with an emerging technology like AI than a more rigid statutory approach.¹¹⁸
119. This option diverges from the EU AI Act¹¹⁹. However, given there are no additional obligations for businesses in this option and both frameworks are grounded in the OECD AI principles, we do not expect duplicative regulatory activities to be introduced. Aligning UK regulation with the EU AI Act would introduce burdensome costs for businesses, whilst introducing regulatory divergence from non-EU countries. The government has assessed that this option best achieves the policy objectives whilst providing value for money and being deliverable.
120. The theory of change in figure 8a summarises the impacts that the preferred option is expected to have. This demonstrates how the proposed intervention will achieve the policy objectives.

Figure 8a: Theory of change for preferred option

¹¹⁸ Annex B: Stakeholder engagement - A pro-innovation framework for AI regulation, DSIT (2023) - [Link](#)

¹¹⁹ As drafted April 2021



Section 9 - Monetised and non-monetised costs and benefits

121. This section analyses the potential impacts of each policy option. Where possible, the analysis identifies which components of each policy option might be expected to result in the respective impact and evidence is provided for these assumptions. This analysis does not contain detailed policy analysis (e.g. on the content of the regulatory principles) as this is undertaken in the accompanying policy white paper.¹²⁰
122. This impact assessment covers the direct and indirect impacts of changes to AI governance. It does not include analysis on the use of personal data and the changes outlined in the Data Protection and Digital Information Bill 2022-23.¹²¹ Whilst this impact assessment does not include competition issues as a driver for regulatory intervention, analysis of the impact of changes to AI governance on competition will be assessed. There is ongoing work by the Competition and Markets Authority (CMA) which is taking into account how AI, amongst a range of other factors, might impact competition in broader digital markets.¹²²
123. The Office for Product Safety and Standards (OPSS) are conducting research on the impact of AI in regards to safety.¹²³ The OPSS worked closely with DCMS on the policy development for AI governance, although this analysis does not assess the impacts of changes specific to product safety regulation. The Online Safety Bill proposes that Ofcom regulate certain internet activities.¹²⁴ The bill proposes rules for illegal and harmful but legal content, ensuring platforms that fail to protect people will have to answer to Ofcom. Whilst many of the recommendation algorithms used on these platforms are driven by AI, they are not the focus of the bill. The bill focuses on the

¹²⁰ A pro-innovation approach to AI regulation, DSIT (2023) - [Link](#)

¹²¹ The Data Protection and Digital Information Bill 2022-23, House of Commons Library (2022) - [Link](#)

¹²² Digital Markets Unit, CMA (2021) - [Link](#)

¹²³ Study on the Impact of Artificial Intelligence on Product Safety, Office for Product Safety & Standards (2021) - [Link](#)

¹²⁴ Online Safety Bill, DCMS (2022) - [Link](#)

content that is being delivered. This impact assessment considers the implications of the Online Safety Bill for AI regulation, whilst remaining conscious that the bill is not yet delivered.

124. The National Security and Investment Act 2021 regime enables government intervention on national security grounds arising from the acquisition of certain entities and assets.¹²⁵ A transaction will require notification to the BEIS Secretary of State to consider for intervention if it involves an acquisition of a qualifying entity that undertakes AI activities in the UK as AI is an area of the economy where HMG considers that national security risks are more likely to arise. Any impacts arising from the NSI Act are not covered within this impact assessment.
125. The analysis categorises impacts on business as direct or indirect. Direct impacts are costs or benefits which are an immediate and unavoidable result of the regulation, with relatively few steps in the logic chain (first round). Indirect impacts are generally second round costs or benefits which occur as a result of a number of additional steps in the logic chain between regulation and impact.¹²⁶
126. Unless stated otherwise, all costs and benefits have been estimated across a 10 year appraisal period and discounted for time preferencing (3.5% discount rate) and inflationary effects in line with Green Book guidance. Total impacts are shown in 2019 prices and 2020 present values. Where this is not the case, it is to show more detailed examples of impact calculation workings and estimates are shown in 2023 prices. Where summary figures and detailed estimates do not sum perfectly this is due to rounding. An assumptions log in section 10 has further details on all assumption used in the analysis
127. Table 9a below summarises the estimated quantitative impacts of each policy option, including key regulatory metrics. Further detail on monetised impacts, non-monetised impacts and an assessment of each policy option against the policy objectives are in subsequent sub-sections.

Table 9a: Summary of monetised costs and benefits, 10 year evaluation period present values in 2019 prices, 2020 present value (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Direct costs to business	-	158.4	255.4	7181.4
Indirect costs to business	-	-	-	-
Other costs	-	45.0	131.6	385.3
Direct benefits to business	-	-	-	-
Indirect benefits to business	-	35.9	35.9	56.7

¹²⁵ National Security & Investment Act 2021, BEIS (2022) - [Link](#)

¹²⁶ Business Impact Target specific issues: direct versus indirect impacts, Regulatory Policy Committee (2019) - [Link](#)

Net Present Social Value (NPSV)	-	-167.6	-351.1	-7,510.1
Business Impact Target (BIT)	-	92.0	148.4	4,171.5
Equivalent Annual Net Direct Cost to Businesses (EANDCB)	-	18.4	29.7	834.3

9a - Costs

128. This analysis provides estimates or indicative sizing of the costs associated with each policy option. These figures are not intended to anticipate or inform future government decisions on funding. Whilst all costs estimates are indicative, there is greater certainty over the direct costs as these are determined by the regulatory proposal itself. Indirect costs depend on actions taken by other parties. These actions are assumed to follow the theory of change outlined in section 9, but there is less confidence in these estimates due to the level of uncertainty in predicting other parties' behaviour.
129. Table 9b summarises the 10 year present discounted costs and qualitative assessments for each cost category. These do not match the example calculation boxes throughout the next section, which are used to provide transparency into the annual calculations and workings behind these figures.

Table 9b: Summary of costs, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Government				
One-off set up costs	-	-	2.9	17.5
Ongoing regulatory costs	-	45.0	128.6	367.9
Enforcement costs	-	Low	Low	Low
Businesses (Direct)				
Familiarisation costs	-	2.7	5.2	33.7
Compliance costs	-	107.4	201.9	6,664.0
Lost profit from prohibited AI systems and business closures	-	48.4	48.4	483.7
Businesses (Indirect)				

Profit impacts from cost pass-through to consumers		Low	Low	Medium
Consumers				
Non-harmful outcomes prevented	-	Low	Low	High
Cost pass-through from businesses	-	Low	Low	Medium

Note: Where quantitative assessments are not possible, indicative sizing for the impact has been provided. This is intended to be comparable for an individual cost category across different policy options. These are not comparable across different cost categories due to uncertainty.

Costs to government

130. There are costs to undertaking any new activity, whether this is undertaken by existing regulators, central AI regulatory functions or a new AI regulator. Costs are associated with day to day operations of the regulatory regime and include both one-off set up costs and ongoing operating costs. As decisions on the funding model for the regime are still to be taken, it is not yet possible to clarify who these costs will ultimately be borne by.
131. **One off set up costs** - Where a new function or regulator is being established there are associated set up costs (e.g. purchasing equipment, building purchase, recruitment costs). These costs are relevant in options 2 and 3. The analysis undertook a review of newly established regulatory functions and government bodies and found a broad range of estimated set up costs, ranging from 10% to 100% of annual operating costs.¹²⁷ This analysis estimates one-off set up costs to be 50% of annual ongoing regulatory costs of the new function or regulator (calculation shown in next sub-section). Whilst in reality this will vary depending on the individual circumstances of the function being established (e.g. whether they already have a building to use), this assumption is reasonable and in line with the midpoint of existing evidence. Further details on assumptions are found in section 10. Table 9c shows an example of how this cost estimate was calculated for all options.

Table 9c: One-off regulator set up costs example calculation 2023

Option 1
No set-up costs required as all activity is undertaken by existing regulators
Option 2
(Annual ongoing regulatory cost estimate for central AI regulatory functions) x (Factor for one off set up costs) = One off set up costs estimate
(£5.8m) x (50%) = £2.9m
Option 3
(Annual ongoing regulatory cost estimate) x (Factor for one off set up costs) = One off set up costs estimate
(£34.9m) x (50%) = £17.5m

132. The total present discounted value of one off set up costs over 10 years are shown in table 9d.

Table 9d: Total present discounted one off set up costs (£ millions)

¹²⁷ The evidence review of regulators' costs included the Digital Markets Unit, Payment Systems Regulator, Consumer Credit Regulatory Framework and Financial Ombudsman Service.

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Government (Direct)				
One-off set up costs	-	-	2.9	17.5

133. **Ongoing regulatory costs** - Some regulator and function costs will be incurred on an ongoing annual basis (e.g. salaries, non-wage labour costs, overheads). Average FTE costs per regulator were estimated using National Audit Office (NAO) data on regulator costs.¹²⁸ The NAO report includes data from 9 individual regulators' annual reports. A weighted average estimates ~£106k per FTE.¹²⁹ Whilst this estimate is higher than a bottom-up estimation using ONS salaries and associated non-wage uplifts, this likely reflects the additional costs faced by a regulator that may be overlooked (e.g. legal costs) when undertaking a bottom-up FTE cost estimation (e.g. ONS salary estimate x non-wage employer costs uplift). The FTE cost is assumed constant across all policy options. All ongoing regulatory costs include an additional optimism bias of 10%, to factor in the over-optimism apparent in cost benefit analysis.
134. Assumptions are used to estimate the number of FTE required for each policy option. In option 1 a 0.2% increase in FTE is assumed, across 61 existing regulators that were identified as having potential for AI risks within their remit.¹³⁰ This increase was assumed for regulators considering the AI principles on a voluntary basis. The analysis also assumed an average number of FTE for each of these regulators (300 FTE) given lack of exact FTE data. In option 2, bottom-up policy development and expert input supported an estimate of 50 FTE for central AI regulatory functions with the responsibilities identified in the AI regulation white paper. In addition, the analysis assumed an increase in existing regulators costs of 0.3%. This was assumed as a 0.2% increase as per option 1, with an additional 0.2% increase to account for the duty to have due regard to the principles. Economies of scale delivered by the central AI regulatory functions were assumed to reduce regulator costs by 0.1%, resulting in a net increase of 0.3% for regulator costs. Option 3 analysed the number of FTE in a variety of regulators and assumed an AI regulator would be relatively small in size. An estimate of 300 FTE was chosen, comparable to the size of the Office for Rail and Road and less than 10% of the size of the Financial Conduct Authority.¹³¹ Table 9e shows an example of the 2023 annual regulator costs calculated for option 1, 2 and 3.

Table 9e: Ongoing regulator costs example calculation for 2023

Option1

(Average number of FTE per regulator) x (Number of regulators that increase AI activity) x (increase in regulatory FTE) x (Average FTE cost for a regulator) x (Optimism bias) = Annual Regulator cost

$$(300 \text{ FTE}) \times (61 \text{ Regulators}) \times (0.2\%) \times (£106\text{k}) \times (110\%) = £4.3\text{m}$$

¹²⁸ A Short Guide to Regulation, National Audit Office (2017) - [Link](#)

¹²⁹ Average of the minimum and weighted average of costs per employee calculated for selected regulators. Data from: A Short Guide to Regulation, National Audit Office (2017) - [Link](#)

¹³⁰ Evidence to Support the Analysis of Impacts for AI Governance - Report Annexes, Frontier Economics (2023) - [Link](#)

¹³¹ A Short Guide to Regulation, National Audit Office (2017) - [Link](#)

Option2

$((\text{Average number of FTE per regulator}) \times (\text{Number of regulators that increase AI activity}) \times (\text{increase in regulatory FTE})) + (\text{Number of FTE required in central AI regulatory nit}) \times (\text{Average FTE cost for a regulator}) \times (\text{Optimism bias}) = \text{Annual Regulator cost}$

$((300 \text{ FTE}) \times (61 \text{ Regulators}) \times (0.3\%)) + (50 \text{ FTE}) \times (£106\text{k}) \times (110\%) = £12.2\text{m}$ (of which £5.8m is for the central AI regulatory functions)

Option 3

$(\text{Average FTE cost for a regulator}) \times (\text{Number of FTE required}) \times (\text{Optimism bias}) = \text{Annual Regulator cost}$

$(£106\text{k}) \times (300 \text{ FTE}) \times (110\%) = £34.9\text{m}$

135. Ongoing regulatory costs are estimated to increase as AI sector revenues grow. Government expects that, as the number of AI systems grows, the increase in associated risks will require greater regulatory resources. This growth rate in regulatory FTE is assumed to be the same for regulatory policy options 1, 2 and 3, equal to 50% of the estimated growth rate in the AI sector. This incorporates some economies of scale for regulatory resources and only applies to the additional FTE required as a result of the proposal.
136. The total present discounted value of one off set up costs over 10 years are shown in table 9f. The government will use the consultation to improve and refine these estimates, working with regulators to establish credible assumptions for the increase in activity.

Table 9f: Total present discounted ongoing regulator costs (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Government (Direct)				
Ongoing regulatory costs	-	45.0	128.6	367.9

Consultation question 3: Do you have any additional evidence to support the following estimates and assumptions across the framework?

- The proposals will impact an estimated 431,671 businesses who adopt/consume AI products and services significantly less than the estimated 3,170 businesses who produce/supply AI products and services.
- Those who adopt/consumer AI products and services will face lower costs than those who produce and/or supply AI solutions products and services.
- Familiarisation costs (here referring to the cost of businesses upskilling employees in new regulation) will land in the range of £2.7m to £33.7m.
- Compliance costs (here reflecting the cost of businesses adjusting business elements to comply with new standards) will land in the range of £107m to £6.7bn.

137. **Enforcement costs** - As this analysis assumes compliance with regulation, it does not estimate the impact of penalties or other non-compliance costs such as enforcement. The below analysis highlights relevant enforcement costs and provisions in each policy option.
138. In option 1 and 2, regulators will not be required to enforce any new legislative requirements and are not given any new enforcement powers. But we expect that by considering, or having a duty to regard the principles, they will have an additional incentive to enforce existing regulations that are applicable to AI systems and will consider the principles in the context of such enforcement. For example, the ICO recently fined Clearview AI £7.5 million for collecting data for use with facial recognition software which was a breach of UK data protection laws and if this same scenario were to arise in the future, the ICO would consider the AI regulatory principles alongside data protection law (many of the principles are reflected in data protection law), when investigating and enforcing against Clearview AI.¹³² Whilst it is difficult to estimate, an increase in similar enforcement activity across other regulators is expected to occur in these options.
139. In option 3, the AI regulator is given new enforcement powers to impose fines for non-compliance (up to £26.4 million / 6% of global revenue for non-compliance with either unacceptable or high risk requirements, £17.6 million / 4% of global revenue for any other regulatory requirement under the proposal, and £8.8 million / 2% of global revenue for incorrect provision of information relevant to the requirements). Whilst it is unclear how often these fines would be imposed, the enforcement powers are comparable to those of the ICO. The ICO can issue fines of up to £17.5 million, or 4% of a company's total worldwide annual turnover, whichever is higher. In 2020/21 the ICO issued fines worth £42 million.¹³³ This is comparable to the expected level of fines for an AI regulator in the UK with the enforcement powers proposed.

Direct costs to business

140. The regulatory framework will apply to all AI systems being designed or developed, made available or otherwise being used in the UK, whether they are developed in the UK or abroad. Both businesses that develop and deploy AI, "AI businesses", and businesses that use AI, "AI adopting businesses", are in scope of the framework. The analysis distinguishes between these two types of firms given their expected costs per business are expected to differ significantly.
141. **AI businesses** - DCMS estimates there were ~3,200 UK AI businesses in 2022.¹³⁴ The government expects the proposals to have a more substantial impact on these businesses as AI systems make up a significant proportion of their business activity. Figure 9g shows the estimated growth in the number of UK AI businesses and the number of AI systems per AI business over the 10 year appraisal period.

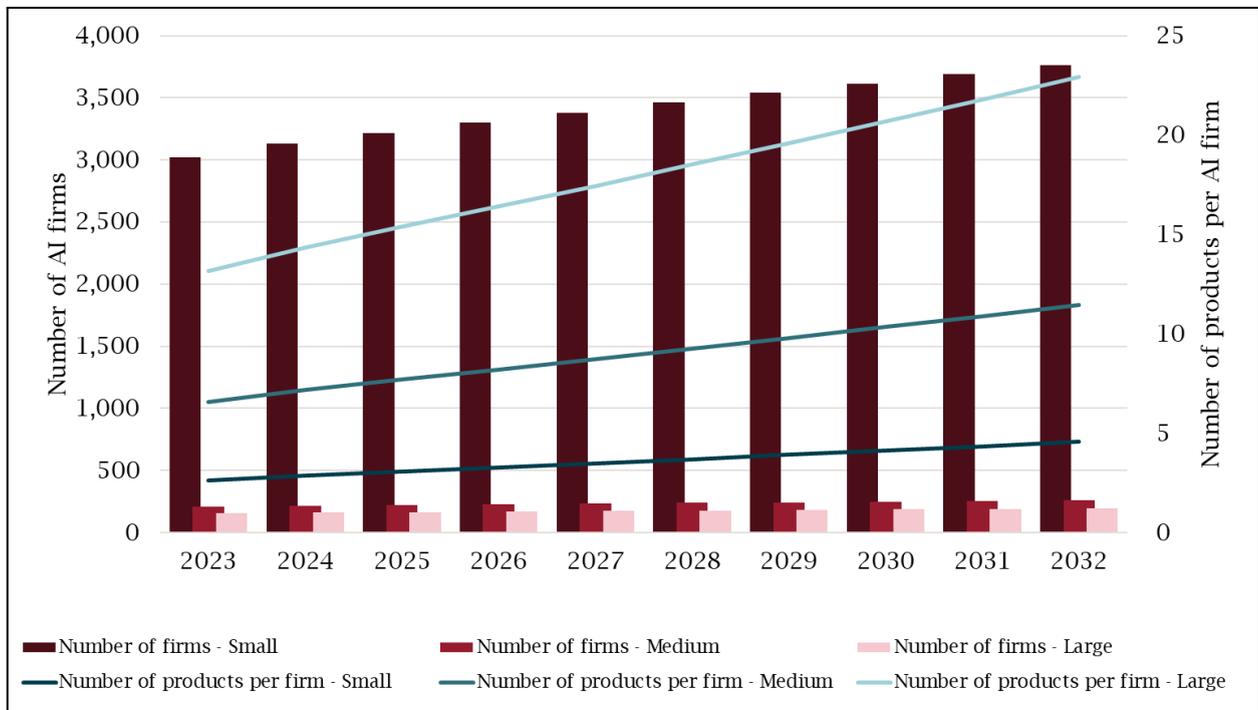
Figure 9g: Baseline number of AI businesses and assumed number of AI systems per AI business¹³⁵

¹³² ICO fines facial recognition database company Clearview AI Inc more than £7.5m and orders UK data to be deleted, ICO (2022) - [Link](#)

¹³³ The ICO issued £42m in fines last year - 1,580% increase on the previous year - RPC, (2021) - [Link](#)

¹³⁴ Artificial Intelligence Sector Study 2022, DSIT (2023) - [Link](#)

¹³⁵ Evidence to Support the Analysis of Impacts for AI Governance, Frontier Economics (2023) - [Link](#)

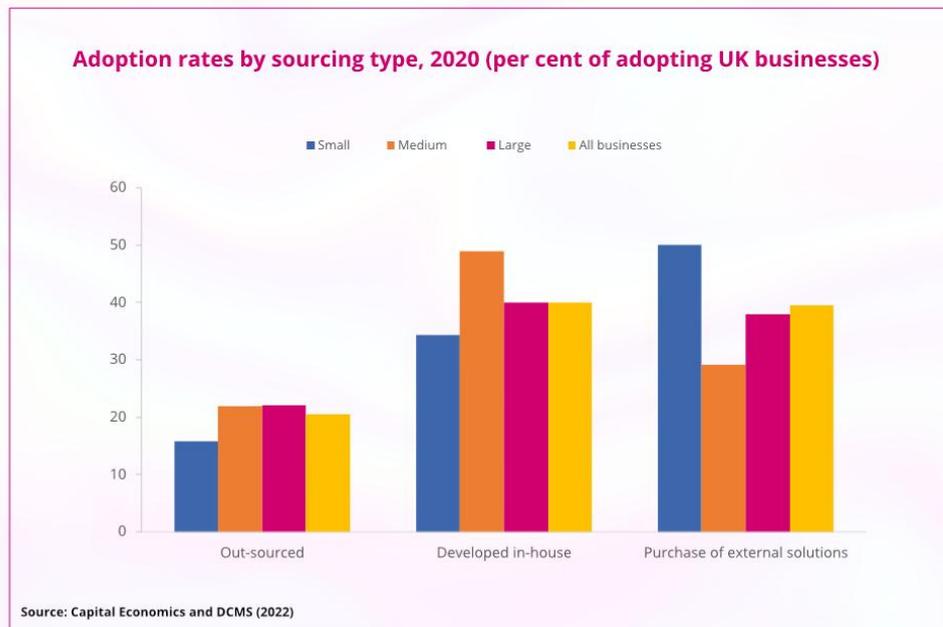


142. **AI adopting businesses** - DCMS analysis on the adoption of AI estimated that, in 2020, 15% of all UK businesses had adopted at least one AI technology, ~432,000 companies.¹³⁶ This analysis predicted large variation in the use of AI between businesses (a small business might use an off-the-shelf AI finance software compared to a large retailer with a dedicated data science team). Of these AI adopters, it is estimated that 96% are small and micro (~414,000 businesses), 3% are medium (~12,000 businesses) and 1% are large (~5,000 businesses). This research also estimated the number of businesses adopting AI to grow, forecasting ~573,000 businesses by 2023.

143. AI adopters source AI in different ways. 40% of businesses developed AI in-house, 40% purchased off-the-shelf AI systems, and 20% outsourced the development of AI. While AI adopters are in scope of the regulatory framework, they are expected to be impacted to a lesser extent because the use of AI systems is complementary to their main business activities. Figure 9h shows the proportion of AI adopters using each sourcing strategy by size.

Figure 9h: AI adopting businesses sourcing strategies by size, 2020

¹³⁶ AI Activity in UK Businesses, DCMS (2022) - [Link](#)



144. Direct costs to businesses are driven by changes that firms undertake as a direct consequence of the regulatory proposal. This includes changes that may be imposed by regulators as a result of the regulatory framework. In the regulatory proposals outlined, AI businesses and AI adopting businesses are assumed to incur direct costs. The three types of costs assessed are:
- a. **Familiarisation costs** - One off, transitory costs required for firms to be aware of the regulatory changes imposed. This will require employees to read about the regulatory changes and reflect on how this may affect their business. This can also include legal and training costs.
 - b. **Compliance costs** - Both one off and ongoing costs associated with designing and implementing the necessary changes to become compliant and undertake any additional processes that may be required as a result of the proposal.
 - c. **Lost profit from prohibited AI systems and business closures** - Where certain AI systems are prohibited, the firms that previously produced them will lose any profits associated with those AI systems. This includes firms that are no longer entering the market as well as those firms leaving the market.
145. Key assumptions are applied to each regulatory option to estimate the direct costs to businesses. Table 9i summarises the assumptions for the proportion of AI businesses and AI adopting businesses that are assumed to take action and the proportion of per business costs faced by AI adopters. In option 1, which is voluntary, a relatively small proportion of businesses are expected to take action as a result of the proposal. A higher proportion of AI businesses are expected to take action which reflects that AI is key to the business model of AI businesses whilst it is more complimentary to AI adopting businesses. In option 2, a higher proportion of businesses are expected to take action (80% of AI businesses and 10% of AI adopting businesses). This takes into account that whilst no new obligations for businesses are being imposed, the regulatory duty to regard the principles is likely to incentivise more businesses to take proactive action. In option 3 there are new mandatory requirements for both AI businesses and AI adopting businesses. It is therefore assumed that all AI businesses, and those AI adopting businesses that develop AI in-house (~40%) will incur regulatory costs.
146. Due to uncertainty in estimating the actions taken by businesses as a result of the regulatory proposals in options 1 and 2, the direct costs to business have been estimated as a percentage of the costs applied in the EU AI Act. Whilst the regulatory approach is different in these options, this assumption reflects that a proportion of businesses are expected to undertake actions as a

response to these regulatory frameworks. In both options per business compliance costs are assumed as 10% of the EU AI Act costs, because no new mandatory obligations are imposed but many businesses will undertake activity to align with the regulatory principles outlined. This consultation will be used to engage impacted stakeholders and improve the robustness of these estimates for the final Impact Assessment. In each option, AI adopting businesses are expected to face 50% of the compliance costs of AI businesses in that option, to reflect that AI is not as central to the business models of AI adopting businesses when compared to AI businesses. Table 9i shows these assumptions, with more details found in the section 10 assumptions log.

Table 9i: Key cost assumptions

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
% of AI businesses that take action	-	50%	80%	100%
% of AI adopting businesses that take action	-	5%	10%	40%
% of EU compliance costs faced, per business	-	10%	10%	100%
% of per business costs faced by AI adopting businesses (reduction is additional to the % of EU costs faced in options 1 and 2)	-	50%	50%	50%

Consultation question 4: Do you agree with the estimates associated with the central functions?

- The average FTE cost for a regulator is estimated to be £106k.
- A central AI regulatory coordination function would require 50 full time workers.
- A central AI regulator would require 300 full time workers.
- The average number of AI systems developed per small business is 2.
- The average number of AI systems developed per medium business is 5.
- The average number of AI systems developed per large business is 10.
- The proposals will impact an estimated 431.671 businesses who have adopted/consume AI products and services, and an estimated 3,170 businesses who produce/supply AI products and services.

Consultation question 5: Are you aware of any alternative metrics to measure the policy objectives?

147. **Familiarisation costs** - Familiarisation costs are assumed across all options, impacting a proportion of AI businesses and a smaller proportion of AI adopting businesses (see table 9i for details). Familiarisation costs per business are assumed to be the same in options 1 and 2, although option 3 has larger familiarisation costs per business based on the length of the EU AI Act regulatory proposal compared to the UK's AI governance white paper (Length of initial draft used. The final version length may change). Table 9j shows the relevant costs per business size.

Table 9j: Estimated familiarisation costs per business size (£)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Small AI business	-	£109	£109	£197
Medium AI business	-	£1,094	£1,094	£1,968
Large AI business	-	£2,187	£2,187	£3,937

148. There are a range of additional familiarisation costs such as training and legal costs. As there is insufficient evidence to estimate these components, these figures should be viewed as minimum familiarisation costs per business. The consultation will be used to seek evidence on the likely size of these costs in each of the options proposed. Familiarisation costs are calculated using the calculations in table 9k.

Table 9k: Option 1, 2 and 3 Familiarisation costs example calculation

<p>Option 1</p> <p>Cost for AI businesses</p> <p>(Time spent reading) x (Number of employees reading) x (Hourly total cost of labour estimate) x (Number of AI businesses) x (Proportion of AI businesses taking action) = Familiarisation cost for AI businesses</p> <p>((60 pages * 0.05 hours per page)) x (1-20 employees, depending on size) x (£36.45) x (3,388 AI businesses) x (50%) = £0.5m</p> <p>Cost for AI adopting businesses</p> <p>(Time spent reading) x (Number of employees reading) x (Hourly total cost of labour estimate) x (Number of AI adopting businesses) x (Proportion of AI adopting businesses taking action) x (Proportion of per business costs faced by AI adopting businesses) = Familiarisation cost for AI adopting businesses</p> <p>((60 pages * 0.05 hours per page)) x (1-20 employees, depending on size) x (£36.45) x (573,095 AI businesses) x (5%) x (50%) = £2.2m</p> <p>Total Familiarisation costs</p> <p>Cost for AI businesses + Cost for AI adopting businesses</p> <p>£0.5 + £2.2m = £2.7m</p>
<p>Option 2</p> <p>Familiarisation cost for AI businesses</p> <p>((60 pages * 0.05 hours per page)) x (1-20 employees, depending on size) x (£36.45) x (3,388 AI businesses) x (80%) = £0.7m</p> <p>Familiarisation cost for AI adopting businesses</p> <p>((60 pages * 0.05 hours per page)) x (1-20 employees, depending on size) x (£36.45) x (573,095 AI adopting businesses) x</p>

$$(10\%) \times (50\%) = \text{£}4.5\text{m}$$

Total Familiarisation costs

Cost for AI businesses + Cost for AI adopting businesses
 $\text{£}0.7 + \text{£}4.4\text{m} = \text{£}5.2\text{m}$

Option 3

Familiarisation cost for AI businesses

$$((60 \text{ pages} * 0.05 \text{ hours per page})) \times (1-20 \text{ employees, depending on size}) \times (\text{£}36.45) \times (3,388 \text{ AI businesses}) \times (100\%) = \text{£}1.6\text{m}$$

Familiarisation cost for AI adopting businesses

$$((60 \text{ pages} * 0.05 \text{ hours per page})) \times (1-20 \text{ employees, depending on size}) \times (\text{£}36.45) \times (573,095 \text{ AI adopting businesses}) \times (40\%) \times (50\%) = \text{£}32.1\text{m}$$

Total Familiarisation costs

Cost for AI businesses + Cost for AI adopting businesses
 $\text{£}1.6 + \text{£}32.1\text{m} = \text{£}33.7\text{m}$

149. The total present discounted value of familiarisation costs over 10 years are shown in table 9l.

Table 9l: Total present discounted familiarisation costs (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Familiarisation costs	-	2.7	5.2	33.7

Consultation question 6: Do you believe that some AI systems would be prohibited in options 1 and 2, due to increased regulatory scrutiny?

150. **Compliance costs** - Business compliance costs are estimated in all policy options, applying to a proportion of AI businesses and a smaller proportion of AI adopting businesses (see table 9i for details). Compliance costs are applied on a per AI system basis, with the number of AI systems per business assumed based on stakeholder interviews.

151. In options 1 and 2, businesses would be expected to ensure that their AI systems are compliant with the cross-sector principles. On both options 1 and 2, compliance with the principles and accompanying guidance will not be legally mandated. However, regulators will be expected to ensure compliance with the principles, to the extent that existing legal powers allow them to do so. As a result, we expect increased regulatory scrutiny of AI systems. This will likely increase the cost to businesses both of ensuring that their AI systems are compliant and in demonstrating this compliance. While regulatory scrutiny may be higher under Option 2 (where regulators have a duty to have regard to the principles), the requirements for businesses will be the same as those imposed under option 1. For example, the 'appropriate transparency and explainability' principle will give regulators an additional incentive to ensure transparency from AI suppliers, to the extent that this is possible given existing enforcement powers. As a result, AI suppliers may have to be more proactive in actions to demonstrate appropriate level of transparency and explainability, and

to show that they are complying with existing legal requirements in this respect. We expect that this will increase their compliance costs, on average.

152. In option 3, businesses would need to gain a detailed understanding of a wide range of new legal requirements, change their systems in light of these requirements, and put in place governance mechanisms to ensure ongoing compliance. Given the likely legal complexity of the requirements imposed under option 3, and the business risks associated with non-compliance, we would expect businesses to spend significantly more on ensuring compliance under this option.
153. In option 1 and 2, whilst there are no new regulatory obligations on businesses, compliance costs are assumed (~10% of the compliance costs estimated in option 3) to be incurred where businesses determine it necessary to undertake changes due to regulators implementing the cross-sector principles. This is assumed to occur as a result of increased regulatory scrutiny on existing legislative requirements with regards to AI, additional clarity on business requirements provided through regulatory guidance, and collaborative business and regulator interaction to identify and address regulatory gaps and overlaps. In option 2, the increased regulatory coherence provided by central AI regulatory functions could reduce compliance costs for businesses by ensuring regulators are aligned in their implementation of the framework. However, evidence does not exist to include these efficiencies in the quantification of costs.
154. In option 3 there are new regulatory requirements for businesses with respect to AI (see section 8d). The modelling undertaken is largely based on the assumptions used in the EU AI Act impact assessment and supporting study, applied to a UK context.¹³⁷ Further work with regulators and impacted businesses is being undertaken as part of this consultation to gain more robust evidence on business compliance costs in option 1 and 2.
155. Option 3 compliance costs are made up of transparency requirements, training data, documentation, human oversight, robustness and accuracy testing, and conformity assessments. The analysis assumed an average number of AI systems for small, medium and large AI businesses. It also assumed a proportion of AI systems would fall into each of the risk-based categories (unacceptable risk, High Risk Systems (HRS), interaction with natural persons, low risk). Costs per AI system, in each of the risk categories, were multiplied by the number of AI systems per business and the total number of businesses impacted. A summary of the key assumptions used to determine costs per AI system are shown in table 9m. Please note, these are modelling assumptions and do not reflect the different approaches to risk assessment between the proposed options.

Table 9m: Key assumptions for AI system costs

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
% of businesses that provide High Risk Systems (HRS)	-	8.1%	8.1%	8.1%

¹³⁷ Study to support an impact assessment of regulatory requirements for Artificial Intelligence in Europe. CEPS and European Commission (2021) - [Link](#)

Cost of compliance per HRS	-	£3,698	£3,698	£36,981
% of businesses that AI systems that interact with natural persons (non-HRS)	-	39.0%	39.0%	39.0%
Cost of compliance per non-HRS	-	£330	£330	£3,305
Assumed number of AI systems per AI business (2020)	-	Small - 2 Medium - 5 Large - 10		
Assumed number of AI systems per AI adopting business (2020)	-	Small - 1 Medium - 2 Large - 3		

Note: The number of AI systems per firm is assumed to grow at 72% of AI sector revenue growth. This is constant across all options and was identified in internal DCMS analysis on AI sector revenues.

Consultation question 7: Do you agree with our assessment of each policy option against the objectives?

Consultation question 8: Do you have any additional evidence that proves or disproves our analysis in the impact assessment?

156. An example of the annual calculations for each option is shown below in table 9n.

Table 9n: Compliance costs, example calculation 2023

Option 1

Compliance cost for AI businesses

(Cost per AI system) x (proportion of businesses in each risk category) x (Number of AI systems per AI business) x (Number of AI businesses) x (Proportion of AI businesses taking action) = 2023 Annual compliance cost

(£330-£3,698, depending on risk category) x (8-39%, depending on risk category) x (3-13 AI systems, depending on business size) x (3,388) x (50%) = £2.4m

Compliance cost for AI adopting businesses

(Cost per AI system) x (proportion of businesses in each risk category) x (Number of AI systems per AI adopting business) x (Number of AI adopting businesses) x (Proportion of AI adopting businesses taking action) x (Proportion of costs faced by AI adopting businesses) = 2023 Annual compliance cost

(£330-£3,698, depending on risk category) x (8-39%, depending on risk category) x (1-3 AI systems, depending on business size) x (573,059) x (5%) x (50%) = £6.4m

Total compliance costs

Cost for AI businesses + Cost for AI adopting businesses
£2.4m + £6.4m = £8.9m

Option 2

Compliance cost for AI businesses

((£330-£3,698, depending on risk category) x (8-39%, depending on risk category) x (3-13 AI systems, depending on business size) x (3,388) x (80%) = £3.9m

Compliance cost for AI adopting businesses

$(£330-£3,698, \text{ depending on risk category}) \times (8-39\%, \text{ depending on risk category}) \times (1-3 \text{ AI systems, depending on business size}) \times (573,059) \times (10\%) \times (50\%) = £12.8\text{m}$

Total compliance costs
 Cost for AI businesses + Cost for AI adopting businesses
 $£3.9\text{m} + £12.8\text{m} = £16.7\text{m}$

Option 3

Compliance cost for AI businesses
 $(£3,305-£36,981, \text{ depending on risk category}) \times (8-39\%, \text{ depending on risk category}) \times (3-13 \text{ AI systems, depending on business size}) \times (3,388) \times (100\%) = £48.8\text{m}$

Compliance cost for AI adopting businesses
 $(£3,305-£36,981, \text{ depending on risk category}) \times (8-39\%, \text{ depending on risk category}) \times (1-3 \text{ AI systems, depending on business size}) \times (573,059) \times (40\%) \times (50\%) = £512.8\text{m}$

Total compliance costs
 Cost for AI businesses + Cost for AI adopting businesses
 $£48.8\text{m} + £512.8\text{m} = £561.6\text{m}$

Note: The majority of AI systems are classified as low risk and the majority of AI businesses are small, therefore the weighted averages are at the lower end of the range.

157. The total present discounted value of compliance costs over 10 years are shown in table 9o.

Table 9o: Total present discounted compliance costs (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Compliance costs	-	107.4	201.9	6,664.0

158. **Lost profit from prohibited AI systems and business closures** - Where AI systems are prohibited, this will impact the ability of businesses selling these AI systems to make profit. Whilst prohibited AI systems are expected to be limited to a small proportion, the impact on firms producing these systems would be large. There is a benefit to consumers that results directly from the prohibition of any 'bad practice' AI systems that are incapable of complying with the framework, details in the benefits section. It is assumed that some firms would cease to exist due to the prohibition of some AI systems. It is assumed that this cost is only applicable to AI businesses that sell AI systems.
159. Businesses may also incur costs associated with the disposal of prohibited AI systems. Examples of these costs could include a notification to consumers that certain AI systems will no longer be in use or physical disposal of physical AI-enabled products. These have not been quantified due to lack of available data but are assumed to be minimal given the digital nature of most AI products and services. It is assumed many products could be updated rather than disposed of.
160. Whilst option 1 and 2 does not create any new prohibitions for AI systems, it is expected that increased focus from regulators to clarify and enforce existing regulations may result in the prohibition of AI systems currently in use in certain contexts. Existing regulators will decide whether an AI system is prohibited under existing regulation in a decentralised manner, with

support from central AI regulatory functions in option 2. This makes accurate estimates difficult given the decision on which systems, if any, are to be prohibited is not yet clear. Best estimates are provided in these policy options using a proportion of the prohibited percentage of AI systems in option 3 (10% of EU AI Act estimate). This approach accounts for the fact that no new prohibitions are included in options 1 and 2, but greater regulatory scrutiny of AI systems is likely to improve enforcement of existing legislation in relation to AI. Responses to the call for evidence, from industry and regulators, support the assumption that a significantly smaller proportion of systems will be prohibited under option 2.

161. In option 3, the list of prohibited systems and contexts is decided by the AI regulator. This enables an estimate of the proportion of AI systems that will be prohibited in this policy option. Bottom-up analysis of businesses in the AI sector was undertaken, with corresponding estimates for the proportion of businesses in each sector that may fall into the unacceptable risk category from the AI Act. This analysis estimated 3.25% of all AI firms may be prohibited. 2.8% of AI businesses self-assessed as potentially in the ‘unacceptable’ category in a 2022 survey, validating government analysis as reasonable, if potentially conservative.¹³⁸ Table 9p shows example calculation for 2023.

Table 9p: Prohibited AI systems cost, example calculation for 2023

Option 1 and 2
(Number of prohibited firms in option 3) x (% prohibited firms in options 1 and 2 vs. option 3) x (Weighted average revenue for firms prohibited) x (Average profit margin of each firm) = Impact on profits
(3.25% x 3,388 AI firms = 110 firms prohibited in option 3) x (10%) x (£3.4m) x (10%) = £3.7m reduced profits
Option 3
(Number of prohibited firms in option 3) x (Weighted average revenue for firms prohibited) x (Average profit margin of each firm) = Impact on profits
(3.25% x 3,388 AI firms = 110 firms prohibited in option 3) x (£3.4m) x (10%) = £37.1m reduced profits in 2023

Note 1: For modelling purposes, prohibited AI systems were calculated at a firm level. E.g. a firm was either prohibited or not, based on an estimated proportion of firms in each sector that may be deemed unacceptable risk in option 3. In reality we would expect prohibitions to be at an AI system level.

162. The total present discounted value of lost profit from prohibited AI systems over 10 years shown in table 9q below.

9q: Total present discounted value of prohibited AI systems cost (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Lost profit from prohibited AI systems and business closures	-	48.4	48.4	483.7

¹³⁸ AI Act Impact Survey: Exploring the impact of the AI Act on Startups in Europe, Initiative for Applied Artificial Intelligence (2022) - [Link](#)

Indirect costs to businesses

163. In all proposed policy options, businesses may face indirect costs as a consequence of actions taken due to the regulatory proposals. As net impacts are unclear due to insufficient evidence, qualitative analysis is included.
164. Some costs, such as those relating to potentially conflicting rules by regulators and the costs associated with overcoming these, are not included in the assessment as they are assumed to exist in the do nothing option (the counterfactual).
165. **Profit impacts from cost pass-through to consumers** - Where businesses pass on costs to consumers through higher prices, some consumers will decide not to buy the AI systems whilst others will continue to purchase at the new higher price. The change in aggregate consumer spending, and therefore the impact on profit for AI businesses, is dependent on the price-elasticity of demand for AI systems. Where demand is more elastic, a price increase will reduce net profits, whereas if demand is inelastic a price change will increase profits (all other things being equal). Limited supporting evidence was found to estimate the price elasticity of demand for AI systems. The elasticity of computer spending between 1955-1984 was estimated between -0.3 and -0.6, however this data is outdated.¹³⁹ A review of demand for consumer spending found that price elasticity is most commonly between -0.5 and -1.5.¹⁴⁰ Estimating this for AI systems is inherently difficult because of the wide variety in AI systems.
166. Businesses are assumed to pass on a proportion of the increase in compliance costs to consumers. Whilst no AI or software specific data is available, an empirical review of cost pass-through findings for the Office of Fair Trading found high fluctuations with cost pass-through rates between 20-100% depending on many factors including market concentration and product differentiation.¹⁴¹
167. Since option 3 has substantially higher compliance costs for businesses, a more significant indirect impact on cost pass through is expected, although quantification has not been possible. This consultation will be used to gather additional evidence to support estimation of the impact of cost pass through on AI businesses and consumers.

Costs to consumers

168. **Non-harmful outcomes inadvertently prevented** - Whilst prohibiting some AI systems can be effective at reducing AI related risks and harms, it is likely that some non-harmful AI systems may also be prevented. This would reduce the positive impact that AI can have in low-risk beneficial applications. For example, prohibiting the use of AI for social scoring may inadvertently reduce the opportunity of AI systems used in financial products, which may have consequences for financial inclusion and innovation in financial services.
169. Where these beneficial outcomes are prevented for 'illogical or disproportionate responses', regulations can lose credibility to businesses.¹⁴² Where this is the case, mechanisms for iteratively amending regulations based on stakeholder feedback will prove beneficial. Policy options 1 and 2, that do not add prohibitions for AI systems and take a more context specific approach, are expected to have substantially lower costs than option 3. Option 3 determines prohibited AI systems centrally, which stakeholders validated was likely to increase the likelihood of blanket bans without considering the context of the AI systems use.

¹³⁹ Price Elasticity and the Growth of Computer Spending, K. Y. Tam and K. L. Hui (1999) - [Link](#)

¹⁴⁰ Price Elasticity of Demand, P. L. Anderson et al. (1997) - [Link](#)

¹⁴¹ Cost pass-through: Theory, measurement, and potential policy implications, RBB Economics (2014) - [Link](#)

¹⁴² Challenges businesses face when complying with regulation, BEIS (2020) - [Link](#)

170. **Lost consumer surplus from cost pass-through to consumers** - Where businesses have incurred additional costs from the regulation, they are assumed to pass on a proportion of these costs to consumers through higher prices. This may deter some consumers from purchasing, resulting in lost business profits and a loss of utility for consumers no longer purchasing. Additionally, there will be lost consumer surplus for those consumers continuing to purchase at a new higher price. This impact has not been estimated given the large variability in AI systems' prices and quantities. In line with previous analysis, the impact for consumers is considered to be larger in option 3 because the increase in business compliance costs is substantially higher in this policy option.

Justice costs

171. In some cases the regulatory proposals may require involvement from the UK courts to enforce guidance and resolve legal disputes or appeals. This would incur time and resource costs for the courts. Where appropriate, these costs will be explored further in a separate justice impact test which will be included in the final stage impact assessment.

9b - Benefits

172. This analysis provides estimates or indicative sizing of the benefits associated with each regulatory policy option. It will first assess the direct benefits delivered by the regulatory policy options, then outline any indirect benefits. Table 9r summarises the identified benefits across all policy options.

Table 9r: Summary of benefits, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Businesses (Direct)				
Greater regulatory clarity and certainty	-	Low	Medium	Medium
Businesses (Indirect)				
Greater demand for AI products and services	-	35.9	35.9	56.7
Development of new markets	-	Low	Low	Low
Consumer				
Reduced AI risks and harms	-	Low	Medium	High
More informed choice	-	Low	Low	High
Higher quality AI systems and greater trustworthiness	-	Low	Low	High

Direct benefits to businesses

173. **Greater regulatory clarity and certainty** - Stakeholder engagement has highlighted that many businesses do not have clarity on the UK's regulatory framework for AI. The proposals outlined are expected, to a greater or lesser extent, to improve clarity and certainty on the UK's regulatory approach to AI. Extensive industry engagement supports the view that a clear direction of travel for an AI regulatory framework, and the roles and responsibilities required within that framework, would be beneficial for businesses. The government acknowledges that some short term uncertainty may arise from the introduction of a new framework. However, in the long term there are expected to be persistent benefits from providing additional regulatory clarity and certainty for AI.
174. A clear policy statement is the first step to providing greater clarity and certainty. However, the resulting impacts will depend on how each framework is implemented. Stakeholder responses to the call for evidence and regulatory roundtables suggest policy options 1, 2 and 3 will benefit businesses through increased clarity, although option 2 and 3 are expected to produce a greater impact due to their coordinated nature across regulators.¹⁴³ Industry feedback highlighted that many AI businesses work across regulatory remits and interact with multiple regulators, with a risk of regulatory inconsistency in the absence of coordination.
175. In option 1, some benefit is delivered through a consistent policy statement and cross-sectoral principles that support regulatory consistency and apply to all AI systems. However, there is no additional coordination to support businesses across multiple regulators or those not in a regulated sector. In option 2, central AI regulatory functions are expected to play a coordination role and support regulators to bring clarity where AI systems fall outside or across multiple existing regulatory remits. Greater coordination and clarity across regulators is expected to deliver significant benefits for businesses and has received strong support during engagement with industry, regulators and academia. Additionally, the iterative 'test-and-learn' nature of option 2 allows the framework to determine what is working well and what challenges exist so the framework can be improved upon. Option 3 is expected to deliver greater clarity and certainty by bringing together all AI related regulation into a single regulator, however this would require a degree of complex consolidation from existing regulatory remits into a central AI regulator. Stakeholders have stressed that a new AI regulator may increase regulatory complexity and burdens on businesses.
176. Clarity and certainty are intermediate impacts that are expected to lead to a range of indirect benefits for businesses such as reducing regulatory costs, reducing search costs, minimising legal costs, incentivising investment and innovation, and building sustainable long-term growth in the UK AI sector. As it is difficult to quantitatively estimate benefits for each of the options outlined, qualitative analysis has been undertaken with orders of magnitude described below.
177. DCMS research on AI activity in the UK has been used to establish an order of magnitude estimate for the potential benefits for UK businesses. Scenario analysis forecast total UK business expenditure on AI technology and AI-related labour in 2025 at £119 billion in a central scenario.¹⁴⁴ The upside scenario forecast 2025 expenditure at £139 billion, showing a £20 billion difference in expenditure between the central and upside scenarios. The analysis identified regulation as one of 6 key barriers to increased AI adoption in the UK. If it is assumed that improving the UK's regulatory framework for AI is expected to deliver between 10% to 20% of the difference between central and upside scenarios, this could lead to additional expenditure on AI technology and AI-related labour of £2 to £4 billion annually by 2025. This difference between upside and central scenario expenditure is forecast to grow, therefore the benefits that a clear

¹⁴³ A pro-innovation approach to AI regulation - Annex B, DSIT (2023) - [Link](#)

¹⁴⁴ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

and certain regulatory environment can deliver would also be expected to grow as AI becomes more important to the UK economy.

Indirect benefits to businesses

178. **Greater demand for AI products and services** - Reducing AI risks and improving the regulation of AI systems is expected to increase trust in AI systems, leading to an increase in the demand for AI goods and services and an increase in data sharing.¹⁴⁵ In responses to the call for evidence, stakeholders identified the current lack of trust in AI products and services as a limiting factor for growth in the AI sector. Demand from businesses and individual consumers is expected to increase as a consequence of good regulation, leading to increased revenues and profits for AI businesses. The alternative framing of this argument is that in the absence of good regulation, the likelihood of a serious negative event involving AI is higher. Such an event could lead to product boycotts and long term deterioration in the acceptance of AI, which would weaken demand.
179. The government has categorised greater demand as an indirect impact because there are more steps in the logic chain between an increase in trust and increased demand for AI systems. As businesses reallocate resources to comply with regulation, the trustworthiness of AI systems improves and therefore increases demand. This categorisation is based on Regulatory Policy Committee (RPC) guidance.¹⁴⁶
180. Government analysis modelled two channels by which trust impacted AI sector profits. Profits are the RPC's preferred measure for impacts on sales that result from a regulatory measure.¹⁴⁷ The first channel is through increased consumer spending on AI systems. The second, from increased data sharing which improves productivity of AI businesses. Using a Likert scale (1-5) an assumed level of consumer trust in the baseline scenario is established (assumed at 4). Government consulted experts to estimate how each regulatory aspect would impact trust and how much of the market this impact applied to. Government used these estimates to calculate the impact for each of the identified channels. More details on the assumptions can be found in section 10, whilst further details on this approach are documented in the supporting study by Frontier Economics on behalf of DCMS.¹⁴⁸
- a. **Consumer spending** - A baseline level of perceived risk is assumed on a Likert scale (3). The estimated change in trust (total 0.05 Likert points in option 2) from each policy option is then applied to calculate a weighted perceived risk level, also on a Likert scale. Literature identifies 5 sources of risk, of which 2 are relevant for AI regulation (social risk and security risk) therefore the impact on weighted perceived risk level is 40% of the change in trust level (0.02). Finally, the change in perceived risk level is associated with a change in purchasing intention via a coefficient estimated using econometric analysis in relevant literature (+0.12).¹⁴⁹ The change in purchase intention is assumed to increase revenues of AI businesses and a standard profit margin is used to determine the net impact on profits.
 - b. **Data sharing** - Using research from the Open Data Institute (ODI) and Frontier Economics, a level of data sharing is established at the baseline level of trust.¹⁵⁰ The increase in trust is then estimated to increase data sharing and the data availability score, using estimates from Nesta analysis.¹⁵¹ Combining this increase with the baseline data

¹⁴⁵ The Economic Impact of Trust in Data Ecosystems, The Open Data Institute (2021) - [Link](#)

¹⁴⁶ Business Impact Target specific issues: direct versus indirect impacts, RPC (2019) - [Link](#)

¹⁴⁷ Other business impact target methodology issues, RPC (2019) - [Link](#)

¹⁴⁸ Evidence to Support the Analysis of Impacts for AI Governance, Frontier Economics (2023) - [Link](#)

¹⁴⁹ Effects of perceived service quality, website quality, and reputation on purchase intention: The mediating and moderating roles of trust and perceived risk in online shopping. A. Quality et al. (2021) - [Link](#)

¹⁵⁰ The Economic Impact of Trust in Data Ecosystems, The Open Data Institute (2021) - [Link](#)

¹⁵¹ The analytical firm: Estimating the effect of data and online analytics on firm performance, Nesta (2014) - [Link](#)

availability score provides a new weighted data availability score. The increase in data availability score is multiplied by the productivity impact of a 1 Likert point change in the score (8% impact on productivity per Likert point), estimated as part of the Nesta analysis. AI sector revenues are increased by the change in productivity and a standard profit margin is used to determine the net impact.

181. This analysis is an attempt to quantify the impact of a complex causal chain. Where estimates do exist in the literature (e.g. coefficient of purchase intention from change in perceived risk), there is not always robust data to validate these assumptions in the context of AI. In some instances (e.g. determining baseline Likert score) no data is available. This means there is a large degree of residual uncertainty in the estimates. The consultation is being carried out to provide additional evidence to validate the assumptions within this analysis and support improvements in the quantification of impacts for the final stage impact assessment. Whilst qualitative in nature, stakeholders agreed that greater regulatory clarity on risk would improve public trust and support the adoption of AI in businesses.
182. Options 1 and 2 were assumed to have similar impacts on public trust and therefore consumer demand. This is based on the assumption that both options are delivered through existing regulators and do not directly introduce new regulatory requirements on AI systems. Experts considered these to have similar impacts on the average level of consumer trust. Additionally, neither option specifically prohibits the use of certain AI systems which was identified by experts as a strong determinant of consumer trust.
183. Option 3 was considered to have a larger impact on consumer trust and therefore consumer demand. The additional requirements for businesses and mandatory assessments for higher risk AI systems led experts to estimate this option would have a larger beneficial impact on consumer trust and therefore demand. In table 9s and 9t, example annual calculations for option 1, 2 and 3 are outlined for the two impact channels.

Table 9s: Increased profits from consumer spending, example 2023 calculation

Option 1 and 2
(Total change in Trust, on Likert scale) x (% of risk relating to AI regulation) x (coefficient of intention to purchase) x (Baseline 2023 AI revenues) x (10% profit margin) = Impact on profits
$(0.05) \times (40\%) \times (0.12) \times (£11,232 \text{ million}) \times (10\% \text{ profit margin}) = £2.7\text{m increased profits in 2023}$
Option 3
$(0.08) \times (40\%) \times (0.12) \times (£11,232 \text{ million}) \times (10\% \text{ profit margin}) = £4.2\text{m increased profits in 2023}$

Table 9t: Increased profits from more data sharing, example 2023 calculation

Option 1 and 2
(Total change in Trust, on Likert scale) x (Impact of point change in Trust on data sharing) x (data sharing as proportion of data availability score) x (baseline data availability score) x (Impact on productivity from change in data availability score) x (Baseline 2023 AI revenues) x (10% profit margin) = Impact on profits
$(0.05) \times (6.75\%) \times (2/21) \times (3) \times (8\%) \times (£11,232 \text{ million}) \times (10\%) = £0.1\text{m increased profits in 2023}$
Option 3
$(0.08) \times (6.75\%) \times (2/21) \times (3) \times (8\%) \times (£11,232 \text{ million}) \times (10\%) = £0.1\text{m increased profits in 2023}$

184. The total present discounted value of greater demand for AI products and services over 10 years is shown in table 9u.

Table 9u: Total present discounted value of greater demand for AI products and services

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Greater demand for AI products and services	-	35.9	35.9	56.7

185. **Development of new markets** - Whilst new regulation can introduce challenges for businesses, it can also accelerate growth in markets that support businesses to address these challenges, like AI assurance. The Centre for Data Ethics and Innovation (CDEI) expects an AI assurance market, providing a range of services to build justified trust in AI, to grow substantially.¹⁵² Similar markets like cyber security and audit have developed to support businesses to comply with regulatory requirements.
186. Estimating the growth of the business support industry is difficult. The CDEI proposes it could be equal to the size of the cyber security industry in the future - contributing multiple billions in Gross Value Added (GVA) to the UK economy.¹⁵³ Whilst there are signs of an emerging assurance market in the UK and globally, evidence does not exist to analyse how this market is likely to develop in each of the policy options outlined. Therefore, it is assumed that all policy options will deliver the same relatively small benefit in comparison to the do nothing option.

Benefits to consumers

187. **Reduced AI risks and harms** - Reducing AI related consumer risks and harms is a key element of the rationale for intervention. The regulatory policy options, other than the do nothing option, provide greater guidance and direction for regulators and businesses to address AI risks. In some contexts this may be achieved through prohibiting AI systems that are deemed too high risk. Other elements of the regulatory framework that can reduce harm are associated with businesses considering best practice principles when implementing AI systems or following more context specific guidance on using AI systems appropriately.
188. The range of AI related risks that will be impacted is large and each risk is context specific in nature. Additionally, many of these harms are non-financial and do not have monetised estimates in literature (e.g. bias). This makes quantification of a reduction in risk and harm challenging. A case study on reducing discrimination against protected characteristics is shown in table 9v. This case study illustrates specific consumer harms from unlawful AI discrimination, provides quantification of some of these harms, and identifies how these harms could be addressed through the regulatory proposals.

Table 9v: Case study on reducing discrimination against protected characteristics

<p>Discrimination in relation to protected characteristics</p> <p>Analysis undertaken by Frontier Economics to support the impact assessment identified</p>
--

¹⁵² The roadmap to an effective AI assurance ecosystem, CDEI (2021) - [Link](#)

¹⁵³ Cyber Security Sector Analysis 2022, DCMS (2022) - [Link](#)

discrimination against protected characteristics as the most frequently mentioned area of consumer harms from AI systems. The following analysis is taken from the supporting study.¹⁵⁴

Numerous studies have identified discrimination from AI systems with regards to protected characteristics.¹⁵⁵ These arise in applications of AI such as hiring decisions,¹⁵⁶ access to bank loans,¹⁵⁷ healthcare,¹⁵⁸ housing,¹⁵⁹ and more. This discrimination can either be conscious or unconscious and can arise through many channels including:

- Unrepresentative training data
- Biased programmers designing the AI system
- Biased input or outcome data
- Feedback loops that can perpetuate existing biases.¹⁶⁰

Harmful events like discrimination are intrinsically difficult to estimate accurately, as their impact on the economy and society is not always immediately captured by monetary values. With these limitations in mind, some studies have tried assessing the economic impact of discrimination. A 2018 study by the Centre for Economics and Business Research (CEBR) estimated that the economic cost of workplace discrimination to the UK economy was £127 billion. Using this study as a point of reference, if AI were responsible for 1% of the discrimination currently occurring in the workplace, and a regulatory framework could reduce the probability of a discriminatory outcome by 10%, it would be reasonable to expect an economic benefit of roughly £100m.¹⁶¹

Separately, the Equality and Human Rights Commission (EHRC) uses the Vento Scale to produce a range of monetary value for different degrees of discrimination:¹⁶² from £900-£8,600 for minor and isolated episodes to £25,700-£42,900 for more serious violations.¹⁶³ These values are regularly used to award damages in litigation claims related to discrimination and put into context the beneficial effects that AI regulation may have in preventing episodes of harm from discrimination.

The white paper outlines cross-sector principles to guide how regulators approach risk. The 'contestability' principle gives impetus to regulators to provide clear guidance on the routes to contest a decision made by an AI system. The principles also include the 'appropriate transparency and explainability' of AI systems, meaning appropriate details about how those decisions were made will be required. The interpretation and implementation of these principles is expected to reduce the risk and harm associated with discrimination, by increasing transparency and accountability of decisions and outcomes arising from AI systems.

189. Option 1 is likely to deliver benefits over and above the do nothing option, although these benefits are expected to be relatively low because there are no new mandatory requirements for businesses to implement and additional protections for consumers will come through

¹⁵⁴ Evidence to Support the Analysis of Impacts for AI Governance, Frontier Economics (2023) - [Link](#)

¹⁵⁵ Discrimination, Artificial Intelligence, And Algorithmic Decision Making. Prof. F Z Borgesius, commissioned by the Council of Europe (2018) - [Link](#)

¹⁵⁶ All the Ways Hiring Algorithms Can Introduce Bias. Harvard Business Review (2019) - [Link](#)

¹⁵⁷ A.I. Bias Caused 80% Of Black Mortgage Applicants To Be Denied. Forbes (2021) - [Link](#)

¹⁵⁸ Algorithmic Bias in Health Care Exacerbates Social Inequities — How to Prevent It. Harvard School of Public Health (2021) - [Link](#)

¹⁵⁹ Locked Out By Big Data: How Big Data, Algorithms And Machine Learning May Undermine Housing Justice. V Schneider (2020) - [Link](#)

¹⁶⁰ Algorithmic Fairness and Economics. B Cowgill, C Tucker (2019) - [Link](#)

¹⁶¹ The report is not currently accessible online and therefore this analysis is unable to specify a time period for these benefits.

¹⁶² The Vento scale is used to quantify harm above and beyond any financial or economic loss suffered by the claimant as a result of the discriminatory conduct, known as 'injury to feelings'.

¹⁶³ How to work out the value of a discrimination claim, EHRC (2018) - [Link](#)

consideration of the principles by existing regulators. Given regulators do not have a specific duty or legislative change to implement the principles this impact may be limited. Some benefits over and above the do nothing are likely to be realised through businesses voluntarily taking additional consideration of the principles in order to reduce the risks of AI systems, although these are expected to be low. In the call for evidence, some stakeholders were concerned that a non-statutory approach would be unenforceable and would not lead to a substantial reduction in AI risks and harms.¹⁶⁴

190. In option 2 regulators have a 'duty to regard' the principles, which provides greater confidence that they will interpret and implement changes to ensure business compliance. This is expected to lead to a greater reduction in AI risks and harms because regulatory action is more likely. Further, the central AI regulatory functions are expected to support regulators to identify and address risks and harms that are across or outside of existing regulatory remits. This additional activity is reflected in the assessment of a medium sized benefit in this option. It should be noted that this impact is largely expected to be indirect under option 2, given it relies on actions taken by regulators and subsequently businesses.
191. In option 3, there are a range of additional new requirements that businesses will have to comply with that are designed to reduce AI risks. These requirements are expected to have a more substantial impact on reducing consumer risks and harms given they are subject to regulatory enforcement. This is reflected in a relatively high assessment of the expected benefit from reduced AI risks under option 3.
192. DCMS is researching the impact of ranking and recommendation algorithms on digital consumer choice in an e-commerce setting using an experimental design to estimate quantitative and qualitative impacts. These estimates will help quantify changes to consumer harms associated with each policy option in the final stage impact assessment. Whilst this does not capture the full scope of the reduction in harm expected, it will provide some quantification of consumer benefits in a specific application of AI.
193. **More informed choice** - Consumers are expected to make more informed decisions when there is a clearer regulatory framework and greater provision of information. Greater regulatory scrutiny provides confidence that AI systems are meeting requirements and can have a signalling effect of high quality. All of the options proposed are expected to make the risks associated with AI systems clearer to consumers. This allows consumers to make decisions that are better informed and align more closely with their preferences.
194. More informed choice is expected to improve the utility that individuals get from AI systems and could, in turn, have positive implications for the market as feedback loops incentivise businesses to develop products with these preferences in mind. This benefit is expected to be delivered, to a greater or lesser extent, in all of the options outlined. Option 3 has specific transparent and explainability requirements, therefore is expected to provide a greater amount of information to consumers regarding the use of AI systems. Options 1 and 2 may include information provision to consumers but these will be decided by existing regulators based on the context in which the AI system is used. There are no mandatory requirements for information provision as part of the options 1 and 2. For this reason, option 3 is assumed to deliver larger benefits.
195. **Higher quality AI systems and greater trustworthiness** - Regulatory improvements are expected to ensure that a greater proportion of AI systems are of high quality. This could be due to signalling effects that the government is taking a more proactive stance on AI systems, or through direct obligations for businesses. This has benefits for consumers as they use higher quality AI systems. Improvements in quality can be achieved through greater accuracy, safer AI systems, wider applicability, or reduced bias.¹⁶⁵ Higher quality AI systems will improve the

¹⁶⁴ Annex B: Stakeholder engagement - A pro-innovation framework for AI regulation, DSIT (2023) - [Link](#)

¹⁶⁵ Challenges businesses face when complying with regulation, BEIS (2020) - [Link](#)

trustworthiness of AI systems, supporting a feedback loop of greater consumer trust that leads to higher demand and greater innovation.

196. Similarly to the analysis of informed consumer choice, option 3 has clearly defined regulatory requirements that are expected to improve the quality of AI systems. This is expected to have a greater impact on trustworthiness and deliver larger benefits. Options 1 and 2 are expected to improve the quality of AI systems but to a lesser extent than Option 3. This is because regulatory requirements are assumed to be less stringent and applied to a narrower set of AI systems in options 1 and 2.

9c - Analysis against policy objectives

197. The cost benefit analysis above identifies the expected impacts of each regulatory policy option. However, the analysis of each policy option against the policy objectives is also valuable to assess the relative strengths and weaknesses of each approach.
198. A Red-Amber-Green (RAG) assessment is provided to summarise the expected achievement of policy objectives. The rationale for this assessment is based on the cost benefit analysis, with the overall assessment based on the balance of all impacts. Table 9w summarises an assessment of the pros and cons for each policy option against the policy objectives.

Table 9w: Analysis of policy options against policy objectives

Policy Objective	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Driving growth and prosperity	<p><i>Pros</i></p> <ul style="list-style-type: none"> No change to the status quo for businesses <p><i>Cons</i></p> <ul style="list-style-type: none"> Lack of regulatory clarity and certainty remain 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Regulatory certainty and clarity provided Only small regulatory burdens for businesses Context specific requirements used to address risks <p><i>Cons</i></p> <ul style="list-style-type: none"> Lack of coordination across regulatory framework can cause an inconsistent approach by regulators In some contexts, regulatory burdens will increase 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Regulatory certainty and clarity provided Only small regulatory burdens for businesses Context specific requirements used to address risks Coordination between regulators to support businesses <p><i>Cons</i></p> <ul style="list-style-type: none"> In some contexts, regulatory burdens will increase 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Regulatory certainty and clarity provided <p><i>Cons</i></p> <ul style="list-style-type: none"> Large regulatory burdens for businesses Inflexible regime Lack of context specificity Likely to deter innovation
Increasing public trust	<p><i>Pros</i></p> <ul style="list-style-type: none"> NA <p><i>Cons</i></p> <ul style="list-style-type: none"> AI risks remain unchanged 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Greater regulatory focus on AI systems 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Greater regulatory focus on AI systems 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Single regulatory 'front door' for AI risks and harms

	<ul style="list-style-type: none"> Some regulator's unable to address AI risks May damage long-term demand for AI systems in the UK 	<ul style="list-style-type: none"> Principles provides some consistency across regulators <p><i>Cons</i></p> <ul style="list-style-type: none"> Regulators may not be able to implement the principles if they're non-statutory AI risks between regulators remain unaddressed No new rights for consumers No increased powers for regulators 	<ul style="list-style-type: none"> Support for less experienced regulators to address AI risks Iterative framework expected to prioritise highest risks <p><i>Cons</i></p> <ul style="list-style-type: none"> No explicit new rights for consumers to protect against harms No new powers to address regulatory gaps 	<ul style="list-style-type: none"> Prohibited AI systems and mandatory requirements expected to reduce AI related risks significantly New rights for consumers <p><i>Cons</i></p> <ul style="list-style-type: none"> Potential confusion on regulatory responsibility
Strengthening the UK's position as a global leader in AI	<p><i>Pros</i></p> <ul style="list-style-type: none"> NA <p><i>Cons</i></p> <ul style="list-style-type: none"> UK risks falling behind other countries Expectation that the UK will adopt another regulatory framework by default 	<p><i>Pros</i></p> <ul style="list-style-type: none"> Limited requirements aren't expected to increase trade barriers Empower the UK's world leading regulators <p><i>Cons</i></p> <ul style="list-style-type: none"> Inconsistency risks regulatory effectiveness Compatibility with EU model requires work 	<p><i>Pros</i></p> <ul style="list-style-type: none"> International support for UK model received AI regulatory functions able to support international fora Limited requirements aren't expected to increase trade barriers Empower the UK's world leading regulators <p><i>Cons</i></p> <ul style="list-style-type: none"> Compatibility with EU and other rigid models requires work 	<p><i>Pros</i></p> <ul style="list-style-type: none"> NA <p><i>Cons</i></p> <ul style="list-style-type: none"> UK is susceptible to changes made to EU regulation Imposes trade barriers with countries outside the EU Duplicative skills and activities in central AI regulator and existing regulators

199. This analysis shows that on balance, option 2 is most likely to achieve the policy objectives. The analysis finds this option provides the best balance of addressing AI risks whilst minimising regulatory burdens for businesses, empowering regulators to act, and facilitates learning and continuous improvement in a fast changing environment that will support the UK in being a global leader in AI.

Section 10 - Risks and assumptions

10a - Key Assumptions

200. Much of the quantitative analysis relies on assumptions and estimates from research and academic literature as well as assumptions outlined in HM Treasury (HMT) Green Book guidance. Some of the qualitative analysis also requires forecasting how future circumstances will

develop. Key assumptions have been captured in table 10a, grouped together for brevity where appropriate.

201. The confidence assessment highlights the level of certainty in the assumption and how that assumption has been used in the analysis. A red or amber rating identifies where there are gaps in the current evidence base, with the largest uncertainty regarding indirect impacts. A green rating demonstrates where the evidence is relatively strong.

Table 10a: Key assumption in analysis

Assumption	Estimate	Confidence	Source	Comments
Launch of framework/ start date for regulation	2023	Green	Office for AI estimate	This is a best estimate but uncertainty remains on parliamentary timing.
Appraisal period	10 years	Green	Office for AI analysis	Most appropriate given the fast moving environment and Green Book guidance.
Factor for regulator set up costs	50% of annual regulator running cost	Green	Office for AI analyst evidence review	A wide range of estimates were identified in comparable regulators. 50% was near the mid-point of these estimates.
Cost per regulator FTE	£106,000	Green	A Short Guide to Regulation, National Audit Office (2017) - Link	2017 NAO paper focussed only on a subset of regulators.
Regulatory FTE increase	Option 1 - 0.2% uplift to existing regulators FTE estimate (assumed at 300 FTE in 61 in scope regulators). Option 2 - 0.3% uplift to existing regulators FTE estimate (assumed at 300 FTE in 61 in scope regulators), plus an additional 50 FTE in central AI regulatory functions Option 3 - 300 FTE in AI regulator	Amber	Office for AI internal analysis and evidence review	Work is continuing to validate these assumptions with regulators.
Increase in ongoing regulator costs	50% of growth rate of AI Sector revenues	Amber	Office for AI internal analysis	Regulator costs are assumed to be 50% fixed costs and 50% variable costs, with some economies of scale estimated for

				variable costs.
Hourly cost of labour	£29.88	Green	ONS, ASHE 2022 data - Link	75th percentile for salary in the IT sector chosen, assuming highly skilled individuals required in impacted businesses.
Non-wage labour cost uplift (e.g. National Insurance, pension, overheads)	22%	Green	RPC guidance note on 'implementation costs', RPC (2019) - Link	Standard assumption used in many other UK government IAs.
Optimism bias for regulatory costs	10%	Green	Green Book	Takes into consideration the over-optimism evident in cost benefit analysis.
Number of AI businesses	3,269 - 2022 estimate	Green	Artificial Intelligence Sector Study 2022, DSIT (2023) - Link	The research is due to be published in March 2023.
Number of AI adopting businesses	431,671 - 2020 estimate	Green	DCMS, AI Activity in UK businesses - Link	It is difficult to determine if all of these businesses would be impacted by the new regulatory framework.
Number of AI systems per AI business	Small business - 2 AI systems Medium business - 5 AI systems Large business - 10 AI systems	Amber	Office for AI analysis	Assumed and validated in industry stakeholder interviews.
Number of AI systems per AI adopting business	Small business - 1 AI systems Medium business - 2 AI systems Large business - 3 AI systems	Amber	Office for AI analysis	Assumed and validated in industry stakeholder interviews.
Number of employees reading new regulation	Small business - 1 employee Medium business - 10 employees Large business - 20 employees	Amber	Office for AI analysis and Network Information Systems PIR - Link	Increased estimate based on PIR of Network Information Systems regulation that identified the assumption of 1 individual per company was too low.
Compliance cost per AI system (Option 3 only)	HRS - Small business - £37k HRS - Medium business - £37k	Green	Study to support an impact assessment of regulatory requirements for Artificial Intelligence	Based on assumptions in the EU AI Act supporting study, costs converted into

	HRS - large business - £37k Transparency requirements (Non HRS) - £3k		in Europe. CEPS and European Commission (2021) - Link	GBP and UK wage assumptions used.
Proportion of EU AI Act per business compliance costs faced	Option 1 - 10% Option 2 - 10% Option 3 - 100%	Red	No evidence to support this estimate	The office for AI are working with industry stakeholders to gather evidence to validate these assumptions
% of AI businesses that take action	Option 1 - 50% Option 2 - 80% Option 3 - 100%	Red	No evidence to support this estimate	The office for AI are working with industry stakeholders to gather evidence to validate these assumptions
% of AI adopting businesses that take action	Option 1 - 5% Option 2 - 10% Option 3 - 40%	Red	No evidence to support this estimate	The office for AI are working with industry stakeholders to gather evidence to validate these assumptions
% of per business costs faced by AI adopting businesses (reduction is additional to the % of EU costs faced in options 1 and 2)	Option 1 - 50% Option 2 - 50% Option 3 - 50%	Red	No evidence to support this estimate	The office for AI are working with industry stakeholders to gather evidence to validate these assumptions
Proportion of prohibited AI systems	Option 1 - 0.32% Option 2 - 0.32% Option 3 - 3.2%	Amber	Office for AI analysis. Option 3 estimate validated by: AI Act Impact Survey: Exploring the impact of the AI Act on Startups in Europe, Initiative for Applied Artificial Intelligence (2022) - Link	Based on estimates of prohibited % of AI systems in each sector, and the number of AI firms in each sector. Option 1 and 2 estimates assume regulatory activity in a future state therefore cannot currently be known.
VC Investment into UK AI Sector	£1.3 billion, 2022 estimate	Green	Beauhurst	This data requires a paid subscription to access.
UK AI sector revenues	£11.4 billion, 2023 estimate	Green	DCMS, AI Activity in UK businesses - Link	Assumed as non-import and non in-house proportion

				of total AI technology expenditure (~47% of total expenditure).
Business profit margin	10%	Green	ONS, Profitability of UK companies – rates of return and revisions - Link	Assuming a cost-to-revenue threshold is equal to the profit margin.
Total change in Trust, on Likert scale, from policy options	Option 1 - 0.05 Option 2 - 0.05 Option 3 - 0.08	Red	Evidence to Support the Analysis of Impacts for AI Governance - Report Annexes, Frontier Economics (2023) - Link	See supporting study for more details.
Coefficient of perceived risk level on intention to purchase	0.12	Red	Effects of perceived service quality, website quality, and reputation on purchase intention: The mediating and moderating roles of trust and perceived risk in online shopping. A. Quality et al. (2021) - Link	Weak assumption based on e-commerce purchases, rather than software or AI specific.
Impact of Likert point change in Trust on data sharing	6.75%	Amber	The Economic Impact of Trust in Data Ecosystems, The Open Data Institute (2021) - Link	There is strong confidence in the estimate used, but it was not designed to be applied to AI systems specifically.
Baseline Data availability score, on Likert scale	3	Red	Office for AI analysis	No reasonable estimates found to use as evidence.
Impact of 1 standard deviation increase in data use on productivity	8%	Amber	The analytical firm: Estimating the effect of data and online analytics on firm performance, Nesta (2014) - Link	There is strong confidence in the estimate used, but it was not designed to be applied to AI systems specifically.

10b - Key Risks

202. The analysis has used quantitative and qualitative techniques to assess the costs and benefits of regulating AI under alternative policy options. AI is a new and complex regulatory field meaning uncertainty is a key risk to this analysis. Some key risks are identified below with mitigating actions. It should be noted that some risks remain even after mitigating actions have taken place. The government will continue researching and engaging stakeholders to gain greater confidence and reduce the risks associated with analysis.

Table 10b: Key risks to analysis

Risk	Source	Mitigation	Impact
------	--------	------------	--------

The assumed theory of change is incorrect.	Uncertainty	Close monitoring and evaluation of the proposed approach.	Impacts and associated estimates are inaccurate as businesses do not behave as expected. This could under or overestimate the impacts.
Underestimated direct costs to business.	Inaccurate estimate of impacted businesses.	Validated estimates with multiple data sources and undertook sensitivity analysis.	Actual business costs exceed estimates, because more businesses are in-scope or per business costs are higher than assumed in the central estimate.
The EU AI Act materially changes.	Ongoing negotiations in the European Commission.	Close monitoring of developments in the EU AI Act text and final agreement.	The impacts estimated in option 3 could be outdated and no longer accurate.
New AI related risks require an updated regulatory response.	Technological developments	The preferred option is based on an iterative approach that will develop over time. This is supported by close monitoring and evaluation of the framework.	The regulatory approach may need to be updated to address new AI related risks. The analysis undertaken could be outdated.
Macroeconomic factors outside of AI regulation have substantial impacts on the AI sector and the wider economy	Macroeconomic risk	Monitoring and evaluation using identified metrics and horizon scanning for future risks to analysis.	Impact estimates are inaccurate as figures substantially change due to external factors.
International trade barriers persist due to regulatory fragmentation.	Trade agreements.	The UK is supporting efforts to develop interoperable regimes through the Global Partnership on AI, Council of Europe and other international fora.	Significant barriers to trade will exist in options 1, 2 and 3. This would cause an increase in compliance costs for businesses operating in multiple jurisdictions.
Assumptions used in the model do not hold in reality.	Uncertainty	Our preferred option is an iterative, 'test and learn' approach that starts with small changes needed to gather evidence to inform decisions on whether further changes are needed. Close monitoring and evaluation of the approach and measurement of the impacts. Final stage Impact Assessment to be updated with more accurate estimates where additional data is available.	Impacts and associated estimates are inaccurate as assumptions are incorrect.

The funding required to implement each policy option is not available.	Government spending review decisions	Discussion with HMT and funding options appraisal.	Each of the options considered could be infeasible without additional funding. This may limit the achievability of the options, therefore making the analysis of those options of limited use.
--	--------------------------------------	--	--

203. These risks will be monitored as the preferred option is taken forward, and will be assessed in a subsequent final stage impact assessment.

Sensitivity analysis

204. As a mitigating action for risks associated with incorrect assumptions in the model, sensitivity analysis has been undertaken. This has focussed on the assumptions with the greatest impact and highest uncertainty. This analysis also prioritised direct impacts, where there is greater certainty that an impact will occur.

Number of impacted businesses

205. To address the risk of mis-estimation in the number of impacted businesses, sensitivity analysis has been undertaken for both familiarisation costs and compliance costs in all three options. Table 10c below shows how the assumptions have been varied for a low and high estimate.

10c: Sensitivity analysis for number of impacted businesses

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Low estimate				
% of AI businesses that take action	-	30%	60%	80%
% of AI adopting businesses that take action	-	2%	5%	20%
High estimate				
% of AI businesses that take action	-	75%	100%	100%
% of AI adopting businesses that take action	-	15%	20%	60%

206. Table 10d shows that the change in present value discounted costs over a 10 year appraisal period. In the high estimate, the costs are substantially larger than in the central estimate. Given the absolute size of the cost estimates in option 3, the costs are more sensitive to changes in assumptions. This provides rationale for not implementing options 3 due to the uncertainty in

business costs and the risk that business burdens could be larger than those estimated in the central analysis.

Table 10d: Summary of impacted businesses sensitivity analysis, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Businesses (Direct) - Low estimate				
Familiarisation costs	-	1.2	2.8	17.3
Compliance costs	-	49.4	113.8	3,524.5
NPSV (and change vs. Original)	-	-108.0 (+59.6)	-260.6 (+81.6)	-4,354.2 (+3,155.9)
EANDCB (and change vs. Original)	-	11.5 (-6.9)	19.2 (-9.5)	467.7 (-366.6)
Businesses (Direct) - High estimate				
Familiarisation costs	-	7.4	9.8	49.8
Compliance costs	-	274.0	365.3	9,675.1
NPSV (and change vs. Original)	-	-338.8 (-172.2)	-519.2 (-168.1)	-10,537.3 (-3,027.2)
EANDCB (and change vs. Original)	-	38.3 (+20.4)	49.2 (+19.5)	1,186.0 (+351.7)

Number of AI systems per firm

207. An AI business may develop and / or deploy a number of different AI systems. Estimates were developed following discussion with AI businesses, however these represent averages across many heterogeneous types of firm.
208. The sensitivity analysis tests the impact of adjusting the number of AI systems assumed per firm. A high estimate is presented given there is a greater risk the analysis has underestimated the impact. The sensitivity analysis increases the number of AI systems in each business size, shown below in table 10e.

Table 10e: Change in number of AI systems for sensitivity analysis

Size of business	Central analysis assumption - Number of AI systems per AI business	Sensitivity analysis high assumption - Number of AI systems per AI business	Central analysis assumption - Number of AI systems per AI adopting business	Sensitivity analysis high assumption - Number of AI systems per AI adopting business

				business
Small AI businesses	2	4	1	2
Medium AI businesses	5	10	2	4
Large AI businesses	10	20	3	6

209. Table 10f shows there is a linear relationship between the increase in the number of AI systems per firm and the estimated compliance costs for businesses.

Table 10f: Summary of number of AI systems sensitivity analysis, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Businesses (Direct) - High estimate				
Compliance costs	-	214.7	403.8	13,327.9
NPSV (and change vs. Original)	-	-274.9 (-107.3)	-553.0 (-201.9)	-14,174.1 (-6,664.0)
EANDCB (and change vs. Original)	-	30.9 (+12.5)	53.1 (+23.4)	1,608.5 (+774.2)

210. Neither of the above assumption sensitivities tested have a material impact on the assessment of the preferred option. The analysis shows that the impact is far greater in option 3, where there are higher direct costs to business. The current uncertainty of impacts provides a stronger rationale for an iterative, pro-innovation, approach that does not substantially increase costs to business. It also increases the importance of detailed monitoring and evaluation of the proposal to ensure better evidence is gathered to support impact estimation.

Proportion of AI systems categorised as High Risk Systems

211. 2022 analysis on the potential impacts of the EU AI Act finds that many SMEs believe the proportion of AI systems that may be categorised as High Risk Systems (HRS) is much higher than originally proposed in the EU's AI Act Impact Assessment.¹⁶⁶ 33% of respondents suggested they could be classed as HRS under the current definitions.

212. Sensitivity analysis is conducted using the proportion of HRS as 33%, instead of 8% used in the central assumption. Table 10g shows the expected compliance costs for businesses could be much larger (~3 times central estimated business compliance costs) if the proportion of AI systems classified as HRS is in line with the survey findings. This provides more evidence to the conclusion that option 3 is likely to impose substantial regulatory burdens on businesses given the uncertainty around the actual proportion of AI systems that will be classified as high risk.

¹⁶⁶ AI Act Impact Survey: Exploring the impact of the AI Act on Startups in Europe, Initiative for Applied Artificial Intelligence (2022) - [Link](#)

Whilst the risk remains in option 1 and 2, the impact of the underestimation is much smaller in absolute costs.

Table 10g: Summary of proportion of HRS sensitivity analysis, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Businesses (Direct)				
Compliance costs	-	338.6	636.7	21,015.0
NPSV (and change vs. Original)	-	-398.8 (-231.1)	-785.9 (-434.8)	-21,861.1 (-14,351.0)
EANDCB (and change vs. Original)	-	45.3 (+26.9)	80.2 (+50.5)	2,501.5 (+1,667.2)

Greater demand for AI products and services

213. Greater demand for AI products and services is the only quantified benefit in the analysis. This quantification relies on multiple causal links, each with uncertainty on the assumptions used. Sensitivity analysis is undertaken using assumptions for a low and high estimate. Table 10h highlights the assumptions used in each of the sensitivity scenarios.

Table 10h: Change in number of AI systems for sensitivity analysis

Assumption	Low scenario	Central scenario (Used in main analysis)	High scenario
Total change in trust (on Likert scale)	0.01 - option 1 and 2 0.02 - option 3	0.05 - option 1 and 2 0.08 - option 3	0.1 - option 1 and 2 0.16 - option 3
Change in purchase intention	0.05	0.117	0.2

214. Using the assumptions above, table 10i shows there is large variability in the expected benefits from relatively small changes in assumptions. In the high estimate scenario, the indirect benefits to businesses increases by ~3.3x in options 1, 2 and 3. In the low estimate scenario, the indirect benefits represent only 12% to 13% of the benefits estimated in the central scenario. This sensitivity shows that these assumptions can have a significant difference on the quantitative analysis for options 1, 2 and 3. This provides greater rationale for using a mixed-methods assessment of the policy options and ensuring that qualitative analysis is strongly considered when evaluating the policy options. Further work will be undertaken to gain greater confidence on the assumptions underlying the benefits estimates before the final stage impact assessment.

Table 10i: Summary of greater demand sensitivity analysis, 10 year evaluation period present values (£ millions)

Option	Option 0: Do Nothing	Option 1: Delegate to existing regulators, guided by non-statutory advisory principles	Option 2: Delegate to existing regulators with a duty to regard the principles, supported by central AI regulatory functions	Option 3: Centralised AI regulator with new legislative requirements placed on AI systems
Businesses (Indirect) - Low estimate				
Greater demand for AI products and services (Low scenario)	-	4.2	4.2	7.6
NPSV (and change vs. Original)	-	-199.3 (-31.7)	-382.8 (-31.7)	-7,559.1 (-49.1)
Businesses (Indirect) - High estimate				
Greater demand for AI products and services (High scenario)	-	121.6	121.6	187.8
NPSV (and change vs. Original)	-	-81.9 (+85.7)	-265.4 (+85.7)	-7,379.0 (+131.1)

Section 11 - Impact on medium, small and micro businesses

11a - Small and Micro Business Assessment (SaMBA)

215. This analysis has considered the impact of the policy options on businesses that are small (10-49 employees) and micro (9 or less employees) in size. The regulatory regime proposed would apply to all AI systems, with no exceptions for those developed or used by small or micro businesses. This decision ensures that the regulatory proposal meets the key policy objectives.
216. Analysis shows the number of employees at an AI business is not an effective way to assess the risk of AI systems and, therefore, does not provide rationale for exclusion from the regulatory regime. Some small and micro businesses (SMBs) develop and use AI systems in areas that are likely to have substantial risks. Examples include SMBs working with the NHS AI Lab,¹⁶⁷ national critical infrastructure applications such as the National Grid,¹⁶⁸ or Connected and Autonomous Vehicles in transport.¹⁶⁹ To achieve the policy objectives and build public trust by addressing AI-related risks, the regulatory regime should be applicable to AI systems in all contexts, regardless of the size of business.
217. The “Establishing a pro-innovation approach to regulating AI” policy paper outlines that the regulatory approach is designed to be proportionate and pro-innovation, with context-specific and risk-based regulatory requirements.¹⁷⁰ This means that low risk applications of AI (e.g. file compression), will have minimal regulatory requirements regardless of the size of business that is

¹⁶⁷ £36 million boost for AI technologies to revolutionise NHS care. DHSC (2021) - [Link](#)

¹⁶⁸ The age of AI: National Grid to trial futuristic automated corrosion inspection of electricity transmission pylons. National Grid (2022) - [Link](#)

¹⁶⁹ Connected & Automated Mobility 2025: Realising the benefits of self-driving vehicles in the UK, Department for Transport (2022) - [Link](#)

¹⁷⁰ Establishing a pro-innovation approach to regulating AI, DCMS (2022) - [Link](#)

responsible for their development or use. AI systems in higher risk applications (e.g. healthcare scans) will be subject to a more rigorous regulatory regime. The approach proposes that regulators themselves are best placed to determine the level of risk and the regulatory requirements necessary to address these risks in their respective remits. In some high risk contexts regulators have already developed a more rigorous regulatory approach. For example, the MHRA and Regulatory Horizons Council work on regulating AI as a medical device with conformity assessments undertaken by approved bodies.¹⁷¹ In contrast, far less rigorous regulatory requirements are envisaged for AI systems that recommend TV shows, given these AI systems make less impactful decisions.

218. In 2019, 98.8% of businesses in the digital sector had less than 50 employees.¹⁷² When looking specifically at the standard industrial classification most closely related to the AI sector, 'computer programming, consultancy and related activities', this proportion increased to 99.1%. This highlights the importance of ensuring SMBs remain in-scope of the proposed regulatory regime given they represent the vast majority of the business population. Additionally, to exempt small and micro businesses would require changes to many existing legislative frameworks that currently govern AI. This would be overly complex to deliver and would prevent the achievement of policy objectives.
219. Recent DCMS analysis of the UK AI sector shows there are an estimated 2,339 micro UK AI businesses (72% of total) and 578 small UK AI businesses (18% of total). These businesses represent 7% and 22% percent of the total AI sector revenues in 2022.¹⁷³ This shows that a substantial proportion of AI sector activity would not be covered by the regulatory proposals if micro and small businesses were exempt, significantly limiting the ability of the proposal to achieve the desired policy objectives.
220. Analysing businesses adopting AI, DCMS estimates that in 2020 15% of small and micro firms (< 50 employees), 34% of medium firms (< 250 employees), and 68% of large firms (250+ employees) were using at least one AI technology.¹⁷⁴ This shows a positive relationship between company size and AI adoption rates. This analysis suggests that a higher proportion of large businesses are expected to be impacted by the proposed changes, however, when looking at absolute numbers, the majority of businesses adopting AI are expected to be small or micro (~415,000 businesses out of a total ~432,000 total AI adopting businesses) given they represent the vast majority of all UK businesses.
221. Whilst the proposed approach makes every effort to be pro-innovation and proportionate to the level of risk, the nature of regulatory burdens means they often disproportionately impact small and micro businesses. Some activities, such as familiarisation costs are mainly fixed costs. This makes them relatively more expensive for small firms, as a larger proportion of their total costs. However, given option 2 is not imposing any new direct regulatory obligations on AI providers the analysis estimates the direct costs for small and micro businesses will be insignificant at a per business level. In option 2, direct costs per AI business in 2023 are estimated at £1,000 for a small and micro business, £3,100 for a medium business and £6,300 for a large business.
222. Analysis showed the percentage of costs borne by each business size was constant across policy options therefore this is only shown for option 2 in detail. Table 11a shows the proportion of direct business costs by each business size, split by AI businesses and AI adopting businesses. For AI businesses, it is estimated that 70% of the total direct business costs are borne by small businesses, 12% by medium sized businesses and 18% by large businesses. Comparing this to the proportion of AI sector revenues for each business size shows that the costs do fall disproportionately on small businesses. For AI adopting businesses, direct business costs are

¹⁷¹ The Regulation of Artificial Intelligence as a Medical Device, Regulatory Horizons Council (2022) - [Link](#)

¹⁷² DCMS Sectors Economic Estimates 2019: Business Demographics. ONS (2022) - [Link](#)

¹⁷³ Artificial Intelligence Sector Study 2022, DSIT (2023) - [Link](#)

¹⁷⁴ AI Activity in UK Businesses, DCMS (2022) - [Link](#)

borne 92% by small businesses, 5% for medium and 2% for large businesses. This provides the same finding that smaller businesses face a disproportionately large impact from the proposal.

Table 11a: Proportion of familiarisation and compliance costs that fall on each size of business, option 2

Proportion of familiarisation and compliance business costs	Small and micro businesses	Medium businesses	Large businesses
AI businesses	70%	12%	18%
AI adopting businesses	92%	5%	3%

Note: Where percentages do not add to 100 this is due to rounding

223. However, taking into account the small absolute size of the costs and the significant impact business exemptions would have on achieving policy objectives, this analysis determines that the regulatory proposal should still apply to SMBs.
224. The proposed approach in option 2 aims to minimise burdens for businesses, especially small and micro businesses, by ensuring consideration of these impacts in the regulatory framework design and the principles that are given to regulators. To do this, the regulatory regime proposes clear and implementable guidance from regulators for organisations' developing or using AI systems. The proposal also includes central AI regulatory functions supporting regulators to ensure the regulatory environment is clear, coherent and simple for businesses to understand. This is designed to reduce uncertainty and duplicative regulatory activities identified by businesses during stakeholder engagement, therefore reducing regulatory burdens for businesses. This is expected to have a disproportionate positive impact on reducing costs for small businesses that do not have dedicated regulatory, public policy or legal teams.
225. The approach will also seek to make use of innovative regulatory tools that reduce costs and uncertainty for SMBs, like regulatory sandboxes. Sandboxes help AI suppliers navigate regulatory complexity to bring their products and services to market. These regulatory innovations are strongly supported by regulators and industry stakeholders alike. Evidence suggests sandboxes can have a positive economic impact, with increased investment in firms participating in the FCA's regulatory sandboxes.¹⁷⁵ FCA analysis highlights positive indicators on increased competition, market entry, and partnerships across the industry.¹⁷⁶ The FCA's digital sandbox pilot evaluation also identified accelerated product development, validating and improving AI and machine learning models, refining business plans, and networking within the pilot ecosystem as benefits of the sandbox, although it is unclear whether these benefits are short-term or persistent.¹⁷⁷ The consultation will seek more views from small and micro businesses to ensure regulations are proportionate and do not impose any unintended regulatory burdens for these businesses.

11b - Medium business exemption assessment

226. Following recent guidance, this analysis has also considered the impact of the policy options on medium sized businesses (50 to 249 employees). Similar to the above conclusion, the analysis suggests that these businesses should not be exempt from the regulatory proposals as this would substantially prevent the achievement of policy objectives.
227. The level of risk from an AI system is not determined by the size of business. Foundation models, some of which are developed by medium sized businesses, are associated with a range of risks

¹⁷⁵ Inside the regulatory sandbox: effects on fintech funding, Bank for International Settlements (2020) - [Link](#)

¹⁷⁶ Regulatory sandbox lessons learned report. FCA (2017) - [Link](#)

¹⁷⁷ Supporting innovation in financial services: the digital sandbox pilot. FCA (2021) - [Link](#)

that can permeate throughout many AI powered products and services. These risks include sexist and racist biases or providing false information.¹⁷⁸ Providing exemptions for medium sized businesses would prevent the policy options from achieving the objective of increasing public trust as the regulatory framework for many AI systems would remain unchanged from the status quo.

228. Recent research identified 201 medium sized AI businesses (6% of the total) in the UK AI sector, representing 17% of total AI sector revenues in 2022. While medium sized AI businesses represent a relatively small proportion of the sector in number of firms, they contribute a much larger proportion of sector revenue and activity. In the digital sector 99.8% of businesses had less than 250 employees¹⁷⁹ and in the sub-sector 'computer programming, consultancy and related activities', this increased to 99.9%. This shows that if only large businesses were included in the regulation only 0.1% to 0.2% of businesses would be in-scope. This scope is not large enough to create the regulatory changes necessary to substantially increase trust in AI systems.
229. As shown in table 11a, medium businesses face 12% of the direct costs for AI businesses. Medium sized AI businesses receive a higher proportion of AI sector revenues, therefore the analysis concludes that they do not face a disproportionate impact from the policy. Given these businesses are crucial in achieving the policy objectives, this analysis supports inclusion of these businesses in scope of the regulatory framework.

Section 12 - Wider impacts

12a - Competition impacts

230. Although AI systems are used in many industries, the most appropriate market for competition analysis is the AI sector. AI is core to these firms' business models and therefore regulatory changes are likely to have the biggest impact in this market. Given the AI sector is made up of digital products and services, the geographic market in scope is assumed to be global. Recent DCMS analysis highlights 51% of UK AI businesses (representing 40% of AI sector revenues) are exporters which validates this assumption. This analysis also shows a relatively high number of businesses entering the market, with competition mainly focussed on product differentiation and quality.
231. As competition incentivises businesses to improve product quality, lower prices, and innovate, the potential impacts of regulation on competition must be considered.¹⁸⁰ In line with the CMA's guidance for competition analysis, an assessment is made of whether the preferred option (option 2):
- a. Directly or indirectly limit the number or range of suppliers
 - b. Limit the ability of suppliers to compete
 - c. Limit suppliers' incentives to compete vigorously
 - d. Limit the choices and information available to consumers.
232. *Directly or indirectly limit the number or range of suppliers* - The preferred option introduces no new prohibitions on the use of AI systems. However, the analysis estimates a small proportion of AI systems will be prohibited by existing regulators given the context in which the AI system is being used. As the prohibitions will apply to all firms in the market, they are not expected to impact or distort competition. There are no planned limits or licences for the use of AI systems in the UK, therefore it is assessed that it does not directly limit the number or range of suppliers of AI systems.

¹⁷⁸Large Language Models like ChatGPT say The Darnedest Things. The Road to AI We Can Trust (2022) - [link](#)

¹⁷⁹DCMS Sectors Economic Estimates 2019: Business Demographics. ONS (2022) - [Link](#)

¹⁸⁰ Competition Impact Assessment - Guidelines, CMA (2015) - [Link](#)

233. With regards to indirect impacts, the analysis estimates small additional regulatory burdens for businesses (familiarisation and compliance costs) which would not differ materially between existing or new suppliers. All businesses, whether established or new entrants, are assumed to review the proposal and face similar direct costs. The estimated costs are relatively more expensive for smaller firms. However, as these costs are small in absolute terms (estimated at £990 for a small business) this suggests a non-material increase in costs in option 2.
234. Additionally, international regulatory fragmentation may create barriers to trade. If these barriers persist, they are expected to limit the ability for international AI businesses to compete in the UK, therefore weakening competition in the UK AI sector. However, it is not assumed these barriers will persist given the beneficial outcomes of mutual recognition agreements and the fact the OECD principles, on which the UK approach is based, are a consistent basis for a large proportion of international regimes.¹⁸¹ Trade impacts are discussed in more detail in the International Trade section below.
235. This analysis concludes it is unlikely the proposal directly or indirectly impacts the number of suppliers of AI systems. The proposal may, in fact, increase competition in the supply of AI systems, by increasing regulatory clarity around AI systems. This would reduce the regulatory barrier to entry and encourage businesses to enter the AI market. As highlighted in section 4b, uncertainty and a lack of regulatory clarity is a frequently cited barrier to increased AI development and adoption.
236. *Limit the ability of suppliers to compete* - The regulatory proposal does not substantially change the ability of suppliers to compete on price, quality, or characteristics of the products supplied. The context based approach means that individual regulators will be best placed to introduce any new regulatory requirements on AI systems that are appropriate to the scenario it is being used e.g. MHRA's work on AI as a medical device.¹⁸² There are also no new restrictions on advertising, sales channels of AI systems or organisational form.
237. *Limit suppliers' incentives to compete vigorously* - The regulatory proposal does not limit incentives to compete vigorously between suppliers of AI systems. Stakeholders flagged that firms' implementing the 'transparency' principle may make pricing algorithms more transparent to competitors and facilitate collusion. The principle mentions 'appropriate transparency' and does not mandate or recommend that algorithmic transparency is the best remedy in all contexts. The context based approach is designed specifically to address such challenges. The proposal expects sector specific regulators to provide detailed guidance on implementing the principles in their regulatory context, which would include pricing algorithms.
238. Therefore, the analysis suggests there are no new measures that help suppliers to coordinate their behaviour, exempt businesses from competition law, or amend any intellectual property. The analysis identifies that suppliers may begin to compete on alternative non-price factors that are part of the regulatory proposal, such as transparency and explainability. There is evidence that firms like Meta¹⁸³ and HireVue¹⁸⁴ are already starting to compete with information provision and this activity is likely to increase due to the greater regulatory focus on these areas via the proposed principles.
239. *Limit the choices and information available to consumers* - Consumers support competition when making well informed decisions and rewarding those firms that meet their preferences. The proposal does not limit the ability of consumers to decide where to purchase AI systems from, other than potentially limiting the choice from non-UK suppliers (discussed above).
240. The proposal outlines key regulatory principles that AI systems should adhere to. It is expected that these principles will increase the ability of consumers to make informed decisions, however

¹⁸¹ OECD AI Principles overview, OECD - [Link](#)

¹⁸² Software and AI as a Medical Device Change Programme - Roadmap, MHRA (2022) - [Link](#)

¹⁸³ Instagram Feed Ranking System Card, Meta (2022) - [Link](#)

¹⁸⁴ HireVue AI Explainability Statement, HireVue - [Link](#)

behavioural biases from consumers may limit the effectiveness of this information to improve competition. It is not expected that information provision arising in the proposal would reduce incentives of consumers to freely choose. Additionally, the proposal does not impact the switching costs of consumers. The analysis suggests a limited impact on consumer choice and no detrimental impacts to competition.

241. The preferred option is assessed to have neutral or marginal beneficial impacts on competition. This is because new regulatory burdens are minimal, with only familiarisation costs expected for the majority of businesses and therefore competition distorting effects are limited. However, the introduction of clearer guidance and forthcoming central AI regulatory functions are expected to improve clarity and certainty for businesses and consumers, which in turn reduces regulatory costs and increases the likelihood of well informed decision making by consumers. Competition impacts mentioned during the stakeholder call for evidence suggested proposals with bigger regulatory burdens were likely to have the largest impacts on competition. This validates the analysis undertaken.

12b - Innovation impacts

242. Neither economic theory¹⁸⁵ nor empirical evidence¹⁸⁶ are definitive on whether increasing regulation stimulates or stifles innovation. In the context of AI regulation, there are multiple channels by which innovation can be impacted. The first of these channels stimulates innovation, as evidence suggests businesses may have stronger incentives for innovative activities following regulation. For example, product safety legislation has increased innovation towards safer products and services.¹⁸⁷
243. Other channels are likely to reduce innovation. Regulatory compliance means scarce resources may be displaced from productive processes that generate output (e.g. R&D, production, management activities) to regulatory compliance activities, which themselves are not productive. There is an opportunity cost to these resources. Finally, some AI innovation that would have previously been allowed may not be under a new regulatory proposal. While prohibiting some AI systems could help to achieve the policy objectives, it could also inadvertently prohibit some beneficial innovation.
244. Option 1 is not expected to materially impact innovation, given there are only limited voluntary amendments to the regulatory framework. However, as described in the rationale for intervention, the lack of regulatory clarity is potentially weakening innovation incentives. In option 2, central AI regulatory functions are expected to provide additional regulatory clarity which will support innovation. The duty to regard the regulatory principles is expected to increase regulatory scrutiny, but do this in a proportionate manner. This will ensure innovation in high risk applications is effectively regulated, whilst allowing innovation in low risk applications to continue without burdens. Criticism of the EU AI Act, represented in option 3, suggests it will hinder innovation, with research finding 51% of startups surveyed are concerned that the AI Act will slow down AI innovation.¹⁸⁸ An additional 15% of startups surveyed are considering stopping AI development or moving outside the EU. These concerns are driven by the centrally prohibited list of AI systems and the large expected increase in compliance costs for businesses.
245. Analysis suggests the net impact of the proposed regulatory options on innovation is unclear. Much of the evidence highlights that when done well, regulation can support innovation and business by providing clear guidelines which they can operate within. As further evidence

¹⁸⁵ Taxonomy Of Regulatory Types And Their Impacts On Innovation, BEIS (2020) - [Link](#)

¹⁸⁶ The impact of regulation on innovation, P. Aghion et al. (2021) - [Link](#)

¹⁸⁷ The Impact of Regulation on Innovation, Nesta (2012) - [Link](#)

¹⁸⁸ AI Act Impact Survey: Exploring the impact of the AI Act on Startups in Europe, Initiative for Applied Artificial Intelligence (2022) - [Link](#)

becomes available, through the consultation and additional research, the analysis will identify any significant impacts on innovation from the proposed regulatory frameworks.

12c - Environmental impacts

246. This analysis estimates the preferred option to have no direct impact on energy use, CO2 emissions or other environmental issues. However, there are likely to be indirect impacts in these areas. The regulatory proposal is expected to impact the number and size of AI systems that are being developed or used in the UK, causing indirect environmental implications.
247. AI systems can use large amounts of computing power to process vast amounts of data during the training period and beyond. As AI models get bigger, the amount of computing resources required for training increases. The size of prominent AI models, based on the number of parameters, has increased substantially over time. There has been a speed-up in the growth of models, with large models increasing by 5 orders of magnitude between 2018 and 2022.¹⁸⁹ The majority of these very large models (more than 70 billion parameters) are language models, which are of growing importance in the field of AI due to recent breakthroughs and their wide-ranging implications.¹⁹⁰ Based on this, is it reasonable to expect their prominence and use to continue growing.
248. Estimates for the impact of AI systems on the environment vary, with no standardised methodology for calculating their impact. Research in 2019 estimated training one large language model is roughly equal to around 300,000 kg of CO2 emissions,¹⁹¹ although these findings have been challenged (by Google researchers)¹⁹² to suggest emissions are overstated by a magnitude of at least 100 times. 2022 research estimates training a 6 billion parameter model emits roughly 10,000 kg of CO2 emissions.¹⁹³ Regardless of the specific emissions, evidence shows that the training and use of AI models has a material contribution to CO2 emissions, and given the expected increase in AI research and adoption this is likely to grow in the future.
249. AI can also positively contribute towards solving environmental issues by improving allocation of resources, enhancing efficiency of processes, and developing new production processes. In 2016, Deepmind announced it saved 40% of the energy related to cooling its data centres by applying machine learning methods.¹⁹⁴ Applications such as load balancing in the National Grid will also help to reduce peak loads and reduce electricity emissions.
250. The preferred option outlined will clarify the regulatory framework for designing, developing and using AI in the UK. This will support AI businesses to innovate and provide clarity for all UK businesses to adopt AI technology. This clarity is expected to accelerate and increase the rate of adoption of AI systems in the UK, however quantitative estimates for this impact are not possible.
251. The above analysis shows an increase in the number and size of AI systems in the UK may have detrimental environmental impacts, such as increased emissions of CO2. Due to the uncertainty regarding current measures of AI system CO2 emissions, and a lack of detailed data on the size and number of AI systems in the UK, this analysis is not able to quantify this impact.
252. The proposal is likely to have an indirect impact on the environment, although the magnitude, direction and timing of this impact are difficult to estimate. This is due to uncertainty on the impact of regulation on AI development and the limited evidence of AI systems' environmental impacts. The analysis suggests increased CO2 emissions are likely to be the biggest indirect

¹⁸⁹ Machine Learning Model Sizes and the Parameter Gap. P. Villalobos et al (2022) - [Link](#)

¹⁹⁰ How Large Language Models Will Transform Science, Society, and AI. Stanford University Human-Centred Artificial Intelligence (2021) - [Link](#)

¹⁹¹ Energy and Policy Considerations for Deep Learning in NLP. E. Strubell, A. Ganesh and A. McCallum (2019) - [Link](#)

¹⁹² The Carbon Footprint of Machine Learning Training Will Plateau, Then Shrink. David Patterson et.al. (2022) - [Link](#)

¹⁹³ Measuring the Carbon Intensity of AI in Cloud Instances. J. Dodge et. al. (2022) - [Link](#)

¹⁹⁴ DeepMind AI Reduces Google Data Centre Cooling Bill by 40%. Deepmind (2016) - [Link](#)

environmental impact from an increase in the use of AI systems in the UK. Industry and academia are increasing transparency in the CO2 emissions from AI models.¹⁹⁵ This move is welcomed and encouraged to determine accurate estimates for the environmental impact of AI in the future.

12d - Public Sector Equality Duty impacts

253. DCMS as a public authority has a legal obligation to consider the effects of policies on those with protected characteristics under the Public Sector Equality Duty (PSED) set out in section 149 of the Equality Act 2010 (“the Act”). The PSED requires a public authority, in the exercise of its functions to:
- a. consider the need to eliminate unlawful (direct or indirect) discrimination, harassment and victimisation and other conduct prohibited by the Equality Act 2010;
 - b. advance equality of opportunity between people who share a protected characteristic and those who do not share it; and
 - c. foster good relations between people with a protected characteristic and those who do not share it.
254. The Equality Duty is not an obligation to achieve a particular result, but rather a mechanism to eliminate unlawful discrimination, or to promote equality of opportunity and good relations between persons of different protected groups. It is a duty to have due regard to the need to achieve these goals.
255. The characteristics that are protected by the Act are: age, disability, gender reassignment, marriage or civil partnership (in employment only), pregnancy and maternity, race, religion or belief, sex and sexual orientation.¹⁹⁶
256. A separate PSED assessment has been undertaken. In summary, the analysis finds that the preferred option would not directly impact those with protected characteristics. However, given AI goods and services are used more by certain groups, it could be argued that these groups will be impacted disproportionately. BEIS Public Attitudes tracker found that 58% of 16-24 year olds “Know a lot or a fair amount” compared to only 27% for those 65+.¹⁹⁷ The same research finds greater support for AI from those that were frequent internet users measured against those that were infrequent or non-internet users. If greater support leads to greater usage, this could mean that groups which do not engage with the internet may benefit proportionately less from the regulatory proposal.
257. The Centre for Data, Ethics and Innovation (CDEI) analysis found individuals from lower socioeconomic class and females are less likely to say they were able to explain AI¹⁹⁸. Furthermore, analysis of the AI labour market identifies females, ethnic minorities, and those with disabilities as all being underrepresented in the AI labour market¹⁹⁹. Consequently, if the proposal were to have beneficial long-term impacts for the AI sector and those businesses developing or using AI systems, any beneficial impact will be felt proportionately less by the underrepresented groups.
258. The matters in this Impact Assessment that are relevant to the public sector equality duty under section 149(1) Equality Act 2010 have been considered by relevant parties. The policy proposed does not discriminate or unjustly favour any person or group of people based on their protected characteristics. The PSED assessment undertaken is available upon request.

¹⁹⁵ NeurIPS 2021 Paper Checklist Guidelines. Conference on Neural Information Processing Systems (2022) - [Link](#)

¹⁹⁶ Discrimination: Your rights, HM Government - [Link](#)

¹⁹⁷ Public Attitudes Tracker Wave 34, BEIS (2020) - [Link](#)

¹⁹⁸ Public Attitudes to Data and AI Tracker Survey: Wave 1, Centre for Data Ethics and Innovation (2021) - [Link](#)

¹⁹⁹ Understanding the UK AI Labour market 2020, DCMS (2021) - [Link](#)

12e - Trade and Investment

International trade and foreign direct investment

259. The regulatory proposal does not include differing requirements for AI systems produced by foreign or domestic businesses. It is expected that the proposals outlined will apply to all AI systems being used or sold into the UK market, regardless of where they are designed, developed, or deployed.
260. There may be implications for trade in AI systems, with the main mechanism being the potential for international regulatory fragmentation to increase barriers to trade for businesses. Regulation is a non-tariff trade measure that can have both beneficial or detrimental impacts on trade. The detrimental impacts can be direct, from increased business compliance costs, or indirect, from reduced opportunity for economies of scale because products and processes have to be modified across jurisdictions.
261. Introducing new requirements for UK AI systems, that differ from large trading partners, may make it more costly for UK businesses to export their goods and more expensive to import foreign AI goods and services. If these costs are material they may affect firm's decisions on whether to trade internationally.
262. There are three broad categories with which regulatory fragmentation increases trade costs:²⁰⁰
- a. Familiarisation costs to gather information on regulatory requirements in different jurisdictions.
 - a. Costs associated with changing processes or AI systems to maintain compliance with multiple jurisdictions. This includes potential loss of economies of scale or product differentiation.
 - b. Direct compliance costs which may relate to any new regulatory requirements such as reporting or conformity assessments to demonstrate compliance.
263. Data limitations prevent accurate estimates of trade in AI products and services in official statistics. Using a mix of official statistics and ad-hoc analysis, ranges for the size of UK AI imports and exports that may be impacted have been estimated. Two estimation approaches have been undertaken: a top-down estimate based on the digital sector and a bottom-up estimate from the AI sector.
264. *Top-down approach:* UK digital sector goods exports were £17.4bn for 2019, 58% (£10.0bn) of which were exports to the EU²⁰¹. In comparison, UK digital sector goods imports were £43.2bn for 2019, 42% of which were imported from the EU. This shows that digital goods imports were roughly 2.5 times the size of exports, highlighting potentially greater absolute impact of regulatory asymmetry on digital goods imports than exports. With regards to services, the digital sector imported £33.5bn whilst it exported £51.9bn in 2019.²⁰² This demonstrates exports in services as 1.5 times the size of imports and likely a greater absolute impact from regulatory asymmetry on service exports than imports. Digital sector revenues for 2019 totalled £347.7 billion.²⁰³
265. This analysis shows that exports account for roughly 19.9% of digital sector revenues and imports are equivalent to 22.1% of digital sector revenues. By applying these same proportions to estimated AI sector revenues (£10,651 million), the total value of potentially impacted trade is

²⁰⁰ International Regulatory Co-operation and Trade: Understanding the Trade Costs of Regulatory Divergence and the Remedies, OECD (2017) - [Link](#)

²⁰¹ DCMS Sectors Economic Estimates 2019: Trade, DCMS (2022) - [Link](#)

²⁰² DCMS Sectors Economic Estimates 2019: Trade in services, DCMS (2021) - [Link](#)

²⁰³ DCMS Sectors Economic Estimates 2019: Business Demographics, ONS (2022) - [Link](#)

estimated to be £2,100 million for exports and £2,350 million for imports. Some broad assumptions have been made to generate these estimates:

- a. Exports as a proportion of revenues is the same for the AI sector as the digital sector.
- b. All AI related imports and exports involve the AI sector. This assumption is expected to be reasonably strong for exports, given these firms are those focussed on developing AI products and services. However, this is expected to be a significant underestimate for AI imports. This is because many UK businesses not in the AI sector are using AI systems and may be importing these.

266. *Bottom-up approach:* Recent analysis from DCMS estimates that AI Sector revenues are £10,651 million. As part of this analysis, a business survey of 250 firms within the AI sector were asked the proportion of their revenues that were from exports. Analysis found that 40% of revenues were estimated to be from exports, which corresponds to £4,250 million in exports for the AI sector.

267. Using both methods of estimation, the estimated size of export trade in AI goods and services is between £2,100 and £4,250 million annually. This represents the total AI export trade that could be impacted, rather than an estimate for the size of the impact from the preferred option.

268. To quantify the proportion of trade that could be impacted by changes in regulation, the OECD's Services Trade Restrictiveness Index (STRI) Simulator for computer services has been used²⁰⁴. Whilst this isn't able to simulate the exact specifications of AI regulation, and primarily relates to increased barriers being implemented for foreign exporters into the UK, it provides a rough estimate for the potential impacts of regulation on trade. Including 'Other restrictions in regulatory transparency' within the UK's trade in computer service increases the UK's computer services STRI by 0.016 from a baseline value of 0.142, an impact of 11.3%. Assuming a linear, 1-to-1 impact of the STRI on the value of international trade (Including both goods and services), and applying this percentage impact to International trade in the AI sector, this estimates an upper bound of the impact regulation could have on international trade exports of £480 million annually. This upper bound represents approximately ~4.5% of AI Sector annual revenues. Whilst this is a material change, it is also a relatively small proportion of total AI sector revenues. This analysis suggests that the impacts of AI-specific proposals will be within this upper bound that represents a broader set of regulatory changes. This estimate doesn't attempt to predict the impact of AI regulation, but gives an indication of the magnitude that regulatory changes can have.

269. The implications for trade from the proposal may be mitigated by wider factors. These include:

- a. *De-facto standards*²⁰⁵ - As outlined in section 4c, some regulatory frameworks become de-facto international standards. This usually occurs where the regulation is perceived to be clear and effective, where it affects a particularly large market, or where it signals product quality. If the UK becomes a de-facto international standard, the costs of regulatory asymmetry for UK firms will be reduced. The close alignment of the UK's approach with the OECD principles may support it in becoming a de-facto international standard.
- b. *Mutual recognition of regulation* - To reduce the costs of regulatory asymmetry, agreements on mutual recognition of regulation can provide alignment of regulation across multiple jurisdictions e.g. In the UK and EU for GDPR. These are more likely, and more appropriate, where regulatory requirements are relatively similar across jurisdictions. There is an encouraging degree of commonality between the UK's approach and those being developed internationally. Based on the OECD AI Principles, the cross-cutting principles at the heart of the framework are closely comparable to those adopted

²⁰⁴ Services Trade Restrictiveness Index Simulator, OECD - [Link](#)

²⁰⁵ The Emergence of De-facto Standards, S. Den Uijl (2015) - [Link](#)

internationally. This will be of significant importance given the multiple regulatory approaches to AI that have been proposed internationally.

- c. *Dynamic regulatory asymmetry* - It is important to note that regulatory fragmentation is a dynamic concept. Whilst many jurisdictions have proposed AI regulatory regimes, many of these are not yet finalised and are going through multiple refinements and iterations. It is important that the proposed approach has a function to assess regulatory alignment on a continuous basis rather than as a point-in-time assessment.
- d. *International engagement* - Working closely with international partners on AI governance is critical to establishing an effective approach. The UK will continue to work with global partners to shape international norms and standards relating to AI, including those developed by multilateral and multistakeholder bodies at global and regional levels.

270. Wider implications on trade may come from the ability of AI systems to reduce costs to trade (e.g. through better analytics), or by improving efficiency of infrastructure that facilitates trade (e.g. logistics, finance, customs). There may be impacts on trade if any of these AI products or services are no longer offered following the proposed regulatory intervention, either due to lack of regulatory compliance or indirectly through profitability implications. These impacts have not been quantified in this analysis but further work will be undertaken to understand the contribution of AI to UK trade.
271. Related to international trade, Foreign Direct Investment (FDI) may be impacted by the regulatory proposal. UK AI businesses raised investment of ~£2.8 billion in 2021. Of this investment, £774 million (28%) was from UK based investors and £683 million (24%) from the USA. The remainder from the rest of the world with the next highest investments from Sweden, Hong Kong and Netherlands.²⁰⁶ The proportion of UK based funding for UK AI companies has decreased from roughly 50% in 2015 to 28% in 2021, showing the growing importance of FDI in providing funding for UK AI businesses.
272. The regulatory proposal does not stipulate any requirements or changes that are expected to directly impact FDI. Expected impacts are indirect, and are likely to occur from investors seeing the regulatory proposal as a signal of intent, with varying impacts on FDI. Investors may see the preferred option as an introduction of regulation and therefore an additional cost to businesses that increases restrictiveness. If this is the case then investment incentives may be reduced and FDI may decrease.²⁰⁷ Evidence from the OECD finds that increases in trade restrictiveness lead to significant impacts to FDI across all sectors.²⁰⁸
273. On the other hand, a less onerous approach to regulating AI than in other jurisdictions could be expected to increase the incentives for investment into UK AI businesses. Relatively lower regulatory burdens can mean lower costs, and therefore a greater return on investment. Furthermore, increased clarity and clearer protections from an updated regulatory framework may lead to greater demand for AI systems, enhancing incentives to invest in UK AI businesses. Most major economies including the EU, US, China, Israel, Canada, Australia, Japan and others are also introducing new regulatory frameworks for AI. Based on this, the analysis assumes the impact as minimal with greater impacts expected if the UK is left behind by not keeping up with international developments in AI governance.
274. The net of these two effects will determine whether FDI is expected to increase or decrease following the regulatory change. There are many other drivers of investment in UK AI businesses that remain unchanged as a consequence of this proposal, such as AI skills, AI research excellence, reputable institutions, trusted associated regulatory frameworks and a strong

²⁰⁶ Beauhurst data, DCMS analysis

²⁰⁷ Investment and Regulation, Alberto Alesina, Silvia Ardagna, Giuseppe Nicoletti, and Fabio Schiantarelli (2002) - [Link](#)

²⁰⁸ The determinants of Foreign Direct Investment: Do statutory restrictions matter?, OECD (2019) - [Link](#)

customer base. Based on this multitude of factors, and relatively more burdensome regulatory developments in alternative investment jurisdictions, the analysis does not forecast a large impact on FDI for UK AI businesses. Further analysis should be undertaken if individual regulators change or amend regulatory requirements for AI systems.

Domestic investment

275. External investment (e.g. Venture Capital etc.) into the AI sector is largely driven by expected return on investment and uncertainty. Two mechanisms are identified by which external investment may reduce due to regulatory changes: Increased market uncertainty, or removal of unsustainable business models.

- a. **Uncertainty** - A significant change to the regulatory framework for AI systems is expected to have an impact on short-term uncertainty, with larger changes assumed to lead to a more substantial negative shock to investment in the short-run. Evidence suggests this occurred when GDPR came into force in the UK²⁰⁹. This same paper also highlights that this impact of market uncertainty appears more profound for young technology companies, the same business demographic expected to be impacted by the proposals.

To determine the impact of regulatory-driven uncertainty on investment, the Economic Policy Uncertainty (EPU) Index can be used.²¹⁰ The EPU can identify the impact of large regulatory changes or events, such as GDPR, on market uncertainty. DCMS analysis identified the impact of GDPR to be a 0.19 change in the EPU. Research has been conducted to estimate the impact of EPU changes on SME investment, with an expected coefficient of -0.046 or the impact of EPU on investment rates for SMEs²¹¹. Combining these findings estimates a potential for GDPR to negatively impact investment rates by -0.9% in the short-term. The analysis has not quantified the impact on each of the policy options but will use the consultation to ascertain an appropriate impact of uncertainty in each of the regulatory options relative to the implementation of GDPR. This could support greater quantification of these impacts at the final stage Impact Assessment.

In the longer term, it is expected that the regulatory clarity and certainty provided by the proposed regulatory framework for AI will be beneficial to businesses. This is discussed in greater detail in the indirect benefits to businesses section.

- b. **Removal of unsustainable business models** - New regulation can reduce market investment by limiting unsustainable business models currently operating in the AI market. Some businesses currently operating may not be viable under the new regulatory regime. Any external investment associated with such firms may consequently be reduced. Whilst this is categorised as a cost, it is important to think of the type of investment that may no longer occur and where that investment may be redirected to. Investment into businesses that are no longer compliant with the regulatory regime (simplified as 'bad AI investments') may reduce and be redirected into businesses that are compliant ('good AI investments'). This may have an overall net positive impact, but this has not been quantified.

276. **Reduced internal investment** - Internal business investment may be impacted if the regulation is perceived to reduce the return on investment into AI systems. Increasing regulation of AI systems can make investments in alternative technologies now look comparatively more attractive. Businesses may also decide to reduce investments in AI as compliance costs increase as a result of implementing changes due to the regulatory options proposed. Whilst this may

²⁰⁹ The short-run effects of GDPR on technology venture investment, Centre for Economic Policy Research (2019) - [Link](#)

²¹⁰ The Economic Policy Uncertainty Index measures the policy-related uncertainty in a given country based on news articles referring to policy changes and uncertainty in a given month - [Link](#)

²¹¹ Economic policy uncertainty and investment in Spain, Dejuan-Bitria (2021) - [Link](#)

reduce business costs in the short-term it is likely to have long term implications for AI innovation, research and development.

277. The impact of the policy options on reduced internal investments is unclear. Businesses will internalise a proportion of their compliance costs and pass on a proportion of the costs to consumers, through price increases or degradation in quality. (assumptions details discussed in next paragraph). From the regulatory costs that are internalised, AI businesses may reduce a proportion from internal AI investments. Reducing internal investments in AI is expected to have negative consequences for the AI sector revenues.

12f - Productivity impacts

278. AI innovation is positively correlated with highly productive firms and emerging evidence suggests AI innovation has a causal impact on firm productivity^{212 213}. Further to this, businesses adopting digital tools such as AI are also more productive²¹⁴. If investment in, and adoption of, AI systems reduces as a result of new regulation this could have a knock-on impact on productivity, both in the AI sector and for businesses in the wider economy. However, if the regulatory proposals outlined increase long-term certainty and trust in the AI sector it could increase the use of productivity enhancing AI systems.
279. The resulting impact on productivity will be determined by the extent to which new regulation limits or encourages the development and use of productivity enhancing AI systems in the economy. Where regulatory options have a larger negative impact on investment and prohibit a wider number of AI systems, the resulting impact on productivity is expected to be larger. A mitigating argument is where investments in prohibited AI systems are redirected to permitted AI systems, which have greater beneficial productivity impacts. In this case the impact on productivity from the regulation would be marginal or positive. This impact has not been quantified due to estimation difficulties and a lack of available evidence.

Section 13 - Monitoring and evaluation

280. Under the preferred option, existing regulators will be required to report on business compliance with their regulatory remits. Central AI regulatory functions will have responsibility to report on the overall effectiveness of the governance regime with respect to achievement of the policy objectives. Due to the ‘test and learn’ feedback loops that are key to the preferred option, close monitoring and evaluation is essential. The AI regulatory functions will have dedicated resources to undertake this work, identifying where the framework is working well and whether it requires updating to better achieve the policy objectives. This will take into account a wide range of data sources including individual regulator reporting, direct feedback from businesses, consumer surveys, rights groups and government analysis.
281. The initial metrics identified to monitor achievement of objectives are below in table 13a. Where this data has already been obtained, the 2022 estimate is provided. Where the metrics are not yet available, a status is provided including how the estimates are being developed. More granular indicators on the outputs of the regime will be identified and agreed following implementation of the preferred option.

Table 13a: Metrics monitoring

Objectives	Metrics	Estimate/ Status	Source and method comments
------------	---------	------------------	----------------------------

²¹² Quantifying the Impact of AI on Productivity and Labor Demand: Evidence from U.S. Census Microdata, D. Alderucci et al. (2019) - [Link](#)

²¹³ How Artificial Intelligence Technology Affects Productivity and Employment: Firm-level Evidence from Taiwan, Yang (2022) - [Link](#)

²¹⁴ Are digital-using UK firms more productive? D. Coyle (2022) - [Link](#)

Driving growth and prosperity.	<ul style="list-style-type: none"> Increase investment in UK AI SMEs, relative to investment into international AI SMEs (excl. USA and China). 	2.4%, UK investment as a proportion of total international investment in AI businesses	<ul style="list-style-type: none"> Pitchbook data used Does not filter for SMEs, all companies included.
	<ul style="list-style-type: none"> Increase participation in innovative regulatory tools for AI, for UK-based SMEs e.g. regulatory sandboxes. 	NA	<ul style="list-style-type: none"> No current source Work underway with regulators to develop this indicator.
	<ul style="list-style-type: none"> Increase in the proportion of UK businesses adopting AI technologies and the average number of AI technologies used by UK companies. 	15% of UK businesses adopting at least 1 AI technology	<ul style="list-style-type: none"> https://www.gov.uk/government/publications/ai-activity-in-uk-businesses Potential for ONS Digital Economy survey to be used in future. Survey results not yet published.
Increasing public trust.	<ul style="list-style-type: none"> Increase the proportion of the UK public positive about AI. 	49%	<ul style="list-style-type: none"> https://www.gov.uk/government/publications/public-attitudes-to-data-and-ai-tracker-survey Estimate found in table 136, cell C35. Represents all scores from 6-10 on 10 point scale.
	<ul style="list-style-type: none"> Reduce the proportion of UK citizens that have experienced harms associated with AI, and the perceived severity of those harms. 	NA	<ul style="list-style-type: none"> No current source Work ongoing to include in recurring survey publication.
	<ul style="list-style-type: none"> Increase the usage of AI-enabled products and services by individuals e.g. in the home, at work etc. 	NA	<ul style="list-style-type: none"> No current source Work ongoing to include in recurring survey publication.
Strengthening the UK's position as a global leader in AI.	<ul style="list-style-type: none"> Maintain or improve the UK's position in the Stanford Global AI Index. 	Rank of 4th	<ul style="list-style-type: none"> https://aiindex.stanford.edu/vibrancy/ All weights set to midpoint
	<ul style="list-style-type: none"> Improve the regulatory 'Readiness Self-Assessment Tool' score to an average of 4 ("Fairly confident" - ATI Regulatory Capacity report). 	Confidence level = ~3	<ul style="list-style-type: none"> https://zenodo.org/record/6838946#.YxmvNXbMKUk Further discussion with ATI required to determine regulators for inclusion and how to implement more substantially.
	<ul style="list-style-type: none"> Negotiate a Council of Europe position that enables the UK to implement its own regulatory position for AI, not bound to other international approaches. 	NA	<ul style="list-style-type: none"> Council of Europe discussions not yet finalised. To update once agreed.

282. DCMS has commissioned research to baseline a set of economic variables such as employment, revenues, investment, and GVA for the AI sector. This is a commitment from the National AI Strategy and is due to be published in spring 2023. The research will support future monitoring of impact to the AI sector as a whole, and will provide greater confidence in the analysis for final stage impact assessment.

283. With regards to evaluating the impacts of the proposed measures, the government will conduct a post-implementation review within approximately two to three years of implementation. A

post-implementation review will provide an opportunity to examine the emerging effects of the governance proposal and any unintended consequences arising from its actions, as well as to review its positioning in the international regulatory landscape for AI.

284. This review will include a full impact evaluation of the activities generated by this regulation, alongside appraising the performance of the framework using critical success factors. Monitoring activity, conducted centrally by the AI regulatory functions, will be used to develop counterfactual evidence in order to undertake a robust impact evaluation. Evaluation activities will also include quantitative and qualitative research into business and household impacts arising from the regulatory proposal, including continued stakeholder engagement.
285. Following the review, should there be significant divergence between the objectives and the outcomes observed, the government retains the option to amend the approach. More detailed proposals for monitoring and evaluation will be included in the final-stage impact assessment.