Department for Environment Food & Rural Affairs

Generative AI Opinion paper on relevance and opportunity for Defra

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Executive summary

- **Purpose**: This paper aims to inform, inspire and encourage awareness of the potential of the latest technologies for future business strategy. It represents the current state of trends, maturity and opportunities, to the best of our understanding. It discusses Defra-focused scenarios, feasibility analysis and recommendations. The nature of evolving technologies means some assertions may be uncertain or may change over time, and it should be read within this context.

- **Feasibility summary**

Business feasibility	Easy	Medium	**Difficult**
Value potential to Defra	**High**	Medium	Low
Strategic relevance	**High**	Medium	Low
Technology maturity	High	Medium	**Low**
Technology maturity velocity	Slow	Average	**Fast**
Investment required	**High**	Medium	Low

- **Recommendation**: Progress
- **Suggested actions**:
    - Continue to explore proofs of concept identified as relevant for Defra group, consistent with CDDO guidance. [1]
    - Establish an organisational capability to deliver GenAI solutions and services as defined in the Management Actions agreed in the GIAA.[2]
    - Continue to horizon scan and keep up with the trends and capabilities GenAI and LLM's due to speed of development. [1]
    - Generating guidance for Defra staff in the use of Gen-AI, in-line with emerging CDDO guidance - in particular, stressing the data privacy issues.
    - Explore how training and support for Defra group users for AI technologies will go ahead, consulting with CDDO.

Background and context

Artificial Intelligence (AI) continues to emerge as one of the most transformative technologies of our time, revolutionising industries and reshaping the way we live and work.

Generative AI (GenAI) is a broad label used to describe any type of AI that can be used to create new text, images, video, audio, or code. Large Language Models (LLMs) are part of this category of AI and produce text outputs. [1]

The recent public release of tools like ChatGPT has created huge interest from the mainstream media which has led to massive global interest in the associated opportunities and threats

presented by it. This has resulted in huge market and state investment which is rapidly accelerating opportunities.

Defra group has been using AI technologies for some time and is now already experimenting with GenAI technologies. AI technologies are another technology tool, just like Microsoft Excel, and as such require human guidance.

As new AI technologies emerge, it will be necessary to update and write more opinion papers on the subject.

Strengths and opportunities

Generic opportunities provided by GenAI include staff being able to use it to draft and edit text, images and other media. It can summarise, simplify and classify content. If this is used wisely, this could significantly improve the quality and quantity of outputs of our organisation.

The key opportunity areas include:

Assisting Research and Generating Content: GenAI can assist with research, draft, and edit reports, presentations, data analysis and create synthetic data. It can summarise, simplify, and classify content. At this stage, GenAI is highly proficient at creating any artefacts that users can describe or imagine, and can produce the content in a requested style, and can also carry out sentiment analysis.

Coding and computer language translation: GenAI can generate software code, translate it from one language to another, verify its accuracy and fix bugs.

Improved Data Science: GenAI has the potential to democratise data science, making it accessible to non-technical staff. AI-powered tools can abstract complex data analysis tasks, enabling individuals without a technical background to extract meaningful insights from data. For instance, natural language processing (NLP) can translate data queries into SQL, while GenAI-powered data visualisation tools can automatically generate informative and interactive charts. Automated machine learning (AutoML) platforms can build predictive models with minimal user input. These advancements empower non-technical staff to participate in data-driven decision making, fostering a more inclusive, innovative, and data-savvy organizational culture

Creating Automated Assistants: GenAI can create chatbots and digital assistants that can intelligently converse with users through natural language, e.g., Microsoft CoPilot

Intelligent search capability: GenAI can be used to search and ask questions of an organisation's corpus of knowledge.

Risks / Impacts

There are generic risks associated with Gen AI that include data privacy (all data included in a prompt is then added to the LLM), bias (there currently no way to insure against bias in the data.) over-dependency on the technology (overreliance may increase complacency and reduced human scrutiny) and job displacement (certain roles becoming obsolete).

Furthermore, issues with AI Hallucinations (where the tool creates very credible but incorrect responses, sometimes actually making up the answer) whilst diminishing, persist.

Outside of Defra, the potential for GenAI to be used by external stakeholders / unknown parties to disrupt our operations (e.g., mass submission of correspondence/ misinformation on Defra that is circulated via the technology) could severely impact our business-as-usual capability and reputation.

The establishment of Defra policy and guidelines, the effective communication of these and targeted 'Prompt engineering' training will help to mitigate these risks. As the technology matures some of these risks will reduce.

There is a risk that business users use Gen-AI in ways which bring business risk because they are not formally supported or trained within the enterprise solutions, and there may be significant duplication across the organisation.

Decisions made by AI will be subject to different, and potentially rapidly changing legislations and there is already concern that the decisions will not be clearly auditable nor explainable.

Dependencies

There is a requirement for enterprise class solutions, which provide the level of security, privacy, management, and scalability needed for large organisations, this includes all aspects of its use, e.g., from general usage to code prompting. We are already seeing these products become available in the market.

Competencies such as technical skills and awareness of limitations will need to be put into place to deliver and support Gen-AI services and solutions.

Guidance and training for staff will be required to provide the skills required to effectively use Gen-AI services and solutions.

There will be a need for suitable governance and legal frameworks, covering open source / commercial usage; environmental impact of using such high-powered compute; transparency/references on which the decisions of the LLM were making them; data/privacy issues; monitoring of bias and recommended task usage (or not task to be used for).

Architecture principles, reference models, guidelines, patterns, and standards will need to be created.

Vendors

The market is moving quickly, and regular scans will be required to ensure our knowledge is up to date. There are numerous large vendors in the market as well as open-source suppliers. Defra is currently experimenting with ChatGPT Plus from OpenAI and considering the use of Azure OpenAI Service from Microsoft (reflecting this is our strategic platform provider). The UK government has signalled that it is considering building its own government wide Gen-AI platform (BritGPT). Any vendors chosen now will have to reflect the potential market turbulence, there will be merging of vendors, vendors dropping out of the market or being acquired.

Business Scenarios

All the general opportunity areas identified are relevant to Defra group i.e.

- **Assisting Research and Generating Content**
- **Coding and computer language translation**
- **Improved Data Science**
- **Creating Automated Assistants**
- **Intelligent search capability**

Business Feasibility (**Difficult**)

Business feasibility consists of the technology being available and the business being able to explore and deploy it. Broadly the Gen-AI technologies are available, but some are very embryonic and evolving quickly. Enterprise class solutions are available, e.g., Microsoft OpenAI Azure Service. Data sovereignty is a key question as many of the large vendors do not have a UK based service. Open source will allow AI improvements to come more rapidly, but licences may require us to provide back some of our training data. Currently, Defra DDTS capability to deliver and support Gen-AI services and solutions is very embryonic. At present, business users' capability to make use of Gen-AI services and solutions is very embryonic. It will require a lot of investment to develop the required delivery and business competencies.

Value potential to Defra (**High**)

All the general use cases identified are relevant to Defra group. The use cases are widely applicable in multiple places across Defra group. There is significant value for service improvement, efficiencies and cost savings associated with the deployment of Gen-AI. For example, increased automation, improving information management, application coding, etc.

Strategic relevance (**High**)

Generative AI provides Defra the opportunity to vastly increase the average worker’s productivity and their wellbeing through providing automation and augmenting their work. Gen-AI has the potential to significantly increase or improve Defra group efficiency and can be used to transform its digital services and the value it gets from its data. The external threats from malicious use of GenAI for cyber-attacks and misinformation are a strategic threat.

Technological maturity (**Low**)

Gen-AI is currently relatively embryonic, with significant development improvements on a rapid basis.

Technology maturity velocity (**Fast**)

Significant new capabilities are being developed rapidly. The growth of open-source models will speed up the maturity significantly over the next few years. Generative AI has gone from generating basic yet passable responses to comprehensive answers. New branches and uses of AI are appearing every few months which generate further developments. Further evolution is to be expected as Quantum Computing resources become mainstream. Government interest across the world will ensure a regular injection of research resources. However, we predict that regulation will grow and potentially impede AI research.

Investment required (High)

Given the scale of the opportunity, there is a need for significant investment to explore and deploy GenAI. Government has already made significant funding available and will be expanding this funding. It is anticipated that Gen-AI investment will be a key component of the next spending review.

Conclusions

AI is being seen as the fourth industrial revolution. It is of strategic importance to Defra both in terms of the business opportunity and risks associated with Gen-AI. It can be widely applied across the Defra group, but significant investment is required to put in place both the technical and the business skills needed. Technology will continue to change rapidly but is good enough already to practically explore and exploit.

Suggested actions

- Continue to explore proofs of concept identified as relevant for Defra group, consistent with CDDO guidance. [3]
- Establish an organisational capability to deliver GenAI solutions and services as defined in the Management Actions agreed in the GIAA.[4]
- Continue to horizon scan and keep up with the trends and capabilities GenAI and LLM's due to speed of development.

References and Further Reading

1. Draft Guidance to Civil Servants on Generative AI (Published by CDDO, 26/06/2023).
2. GIAA Audit Artificial Intelligence (AI) Government Maturity Review Audit.

Document information

Document Owner Name	Role	Email	
Tony Riggs	Head of Technology Innovation	tony.riggs@defra.gov.uk	
Version	**Date**	**Changes**	**Author**
0.A	01/05/2023	Initial Outline / Content	David Lau
0.B	30/05/2023	More content / refining	Jan Murdoch
0.C	08/06/2023	More content / refining	David Lau / Jon Griffiths
0.D	09/06/2023	Production of final team draft	Tony Riggs, Jon Griffiths, David Lau
0.E	22/06/2023	Refining based on feedback from CTO	Jan Murdoch, David Lau
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