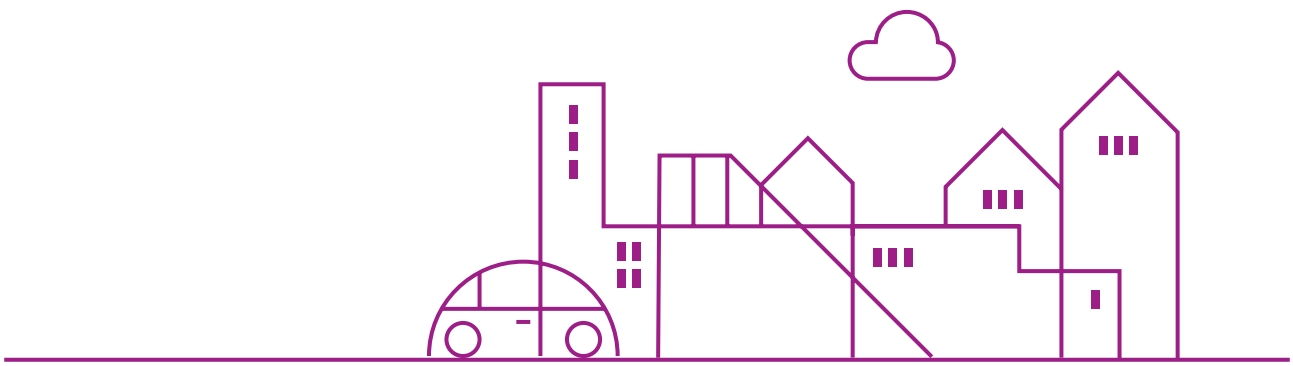
IEMA Transforming the world to sustainability

Digital Impact Assessment

A Primer for Embracing Innovation and Digital Working



Executive Summary

What is a Digital Impact Assessment?

- The use of software and hardware in an Impact Assessment (IA) that uses digital data as the storage medium.
- Digital innovation is currently occurring predominantly in Environmental Impact Assessments (EIA) but has wider application to other forms of IA, including Strategic Environmental Assessments (SEA), Sustainability Appraisals (SA), Health Impact Assessments (HIA), Habitats Regulations Assessments (HRA) as well as non-statutory assessments.
- Not just digital reporting – digital practices underpin digital reporting and present greater opportunities throughout the IA process.

Current Situation

- Data management practice and use of standards is variable, not always efficient and does not always support the maximisation of data value.
- The availability and accessibility of data has expanded over time.
- While digital tools, technology and skills are already utilised in IA practice, they are predominantly confined to the private sector. Digital practices within the private sector are sometimes the preserve of a few specialised experts, although digital skills and the application of these practices are still variable between and within organisations.
- Communicating the findings of the IA in a proportionate and clear way that supports modern methods of interaction is a challenge. Environmental Statements (ES), EIA Reports and other Environmental Reports are often of considerable length and this can inhibit the ability of those involved to interact and interpret the information contained therein.
- Digital practices are considered applicable to a wide range of IA beyond EIA.

Key Challenges and Opportunities

Regulatory

- Ensuring there are no legal barriers to adopting digital approaches.
- Digital reporting may, at first, supplement rather than replace paper copies. However, this duplication should be avoided if possible as it can potentially lead to inconsistencies and removes many of the benefits that digital reporting provides.
- Digital approaches are already being used successfully to support planning applications.
- Digital IA has the potential to offer improvements to the examination of information and to aid better-informed decision-making. Improvements arising from Digital IA, therefore, present an opportunity to provide beneficial outcomes for the environment.
- There are further opportunities for Digital IA innovations in the post-consent phase of IA to support the management of mitigation, conditions, monitoring and post-project reporting.
- Potential barriers to Digital IA are expected to further recede over time.

Data

- Data underpins Digital IA, and effective management of data is required if Digital IA is to be fully adopted and to evolve.
- There is a need to engage data specialists early to set digital strategies and efficiently manage data.
- Under normal IA practice, data ownership and assurance is already necessary to ensure data is fit for purpose and auditable. However, under existing practice, much of the data is not accessible to stakeholders. For Digital IA, it is important to ensure ownership and assurance of all data is transparent and accessible.
- Practice needs to make better use of the ever-increasing open sources of data.
- Data availability continues to increase, driven by a wide range of factors including government initiatives, non-government actors, technology and market trends.
- Guidance and standards are needed to drive consistency and efficiencies of data use.

Technology and Tools

- Digital technology and tools can assist throughout the EIA and other forms of IA, both for internal working practices and outward-facing deliverables.
- There will be opportunities to promote collaboration, improve efficiency and drive down costs over time.
- There is a need to ensure that the technology and tools used are future-proofed and can retain function for the required duration of the IA reporting.
- Development of generic tools (and standards) may be beneficial to improve efficiency for all involved in the IA process. However, without industry consensus and standards, there is a risk of a proliferation of competing standards and formats being adopted without a 'common language' for users to adopt.

Communication

- Using digital tools (including infographics, maps, illustrations and digital media) for reporting can help to promote proportionate and concise reports which aid understanding of complex issues on a spatial level.
- Digital IA reporting may support more-effective engagement but also needs to ensure that those with less-developed digital skills (or with specific needs) are still able to interact with the process effectively.

Culture and Approach

- Training staff in digital working (and updating as required) and defining digital roles in the early stages of a project are key to adopting a Digital IA approach.
- There is a need to develop cultures and behaviours that encourage digital working across all levels of the organisation undertaking Digital IA.
- It is equally important that a culture of digital engagement and reporting are promoted across the stakeholders involved in Digital IA and planning, such as statutory and non-statutory consultees, local and national authorities, legal and planning professionals, IA surveyors, subcontractors and supply chain, and the wider public.

Time and Costs

- There will be initial up-front costs to adapt processes and skills to Digital IA. However, Digital IA has the potential to result in substantial time and cost savings in the longer term.

Acknowledgements

IEMA's IA Network consists of IEMA members who have a professional interest in IA. The IA Network plays an important role in developing and sharing good practice case studies, webinars and guidance across the IA community of practice.

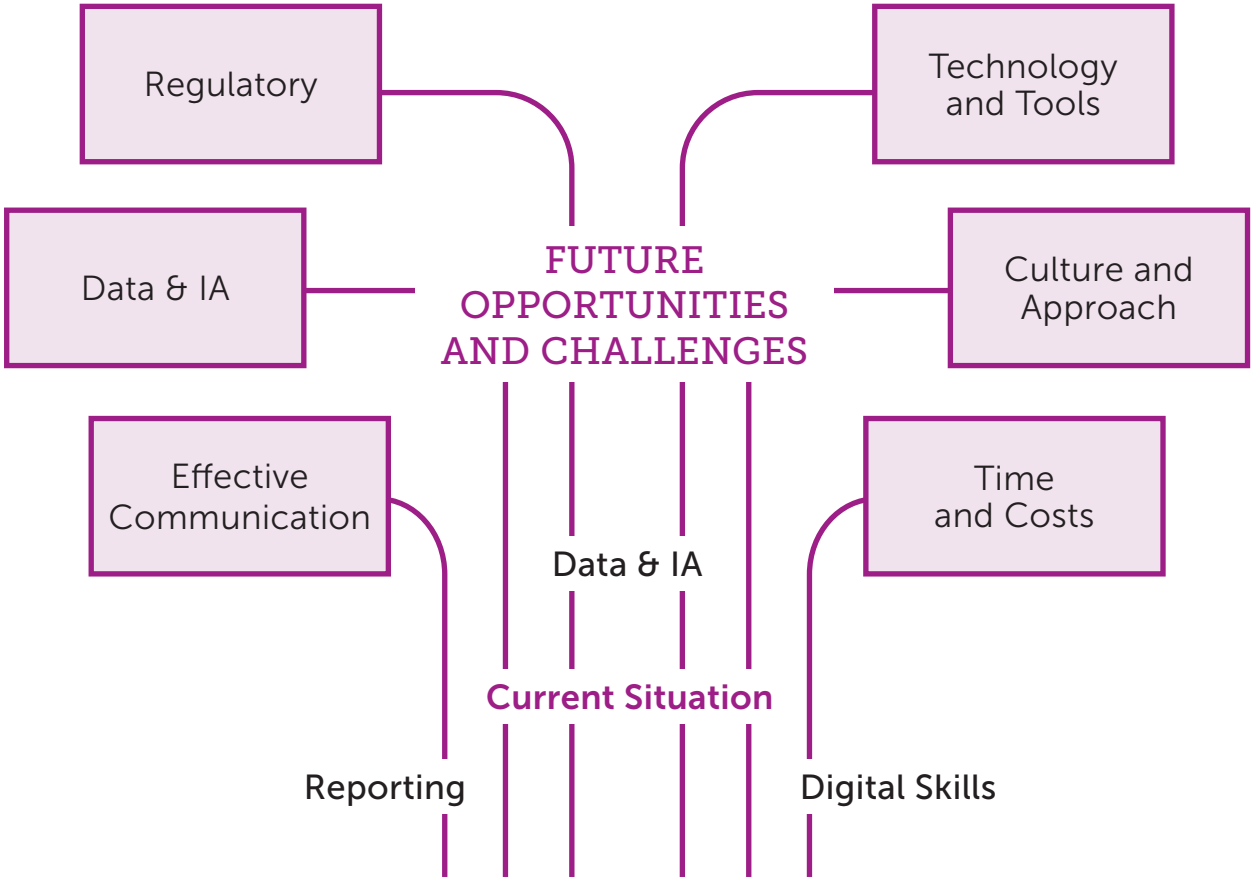
This Digital Impact Assessment Primer has been developed by the Digital Impact Assessment Working Group, a cross-industry working group of environmental assessment and GIS/data professionals working together in collaboration.

Tom Gold (Working Group Lead) – WSP
Alistair Walker – Quod
Anthony Corcoran – Sweco
Damien Keneghan – Jacobs
Elizabeth Baigent – Royal HaskoningDHV
Gemma Stubbs – Stantec
Georgina Cutler – Royal HaskoningDHV
Hanne Larsson – Capita
Janet Langsford – Stantec
Jess Wood – WSP
Lara Knapman – Waterman Group
Laura Archer – Barton Willmore
Lisa Hall – Barton Willmore
Naushad Tahsildar – ERM
Phoebe Cox – Arcadis
Richard Shortridge – Atkins
Ross Stewart – Aecom
Sarah Pyatt – Mott Macdonald

In addition to the working group authors, we offer a special thanks to the following peer reviewers and editors:

Andy Mitchell – Arup
Benjamin Fisher – Glasgow Caledonian University
David Price – The Planning Inspectorate
Richard Britton – Scottish Power Renewables
Rufus Howard – IEMA
Spencer Clubb – IEMA

Contents


Regulatory
Technology and Tools
Data & IA
FUTURE OPPORTUNITIES AND CHALLENGES
Culture and Approach
Effective Communication
Time and Costs
Data & IA
Current Situation
Reporting
Digital Skills

Key Terminology

A description of the meaning of key terms as applied in this document is provided below.

The term **digital** means the use of software and hardware that uses digital data as the storage medium, and the application of the knowledge created from this data for practical ends. It should be noted that digital does not necessarily mean 'real-time' or 'live', and can refer to products or reports that have been archived in a static digital form.

Innovation means any new method, idea or service not currently in common use that creates value for the IA process.

Impact Assessment (IA) in its broadest definition means any technique or process that assesses the impact of a planned activity on the environment and society. In the majority of uses it usually refers to any process for considering the implications, for people and their environment, of proposed actions while there is still the opportunity to influence (or even, if appropriate, cancel) the proposals. It can be applied to all levels of decision-making, from policies to specific projects[1].

Environmental Impact Assessment (EIA) means the statutory process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of proposed development proposals prior to major decisions being taken and commitments being made[2]. For the purposes of this Primer, this is taken to mean statutory EIA as required by UK legislation transposed from the EIA Directive[3] and its amendments. An **Environmental Statement (ES)**[4] is the document that presents the applicant's assessment of likely significant effects from a proposed development and is used to inform the decision-makers' EIA process.

Technology is used to mean any scientific process, invention, method, service or the like.

Tool means any specific form of technology that has a practical application.

Data means information, facts or statistics collected for reference or analysis.

Geographic Information Systems (GIS) means the computer systems and software used to manage, analyse and present spatial data.

Building Information Modelling (BIM) means a process for creating and managing information on a construction project across the project lifecycle.

The term **wireframe** refers to the creation of a visual mock-up of the website or development proposal.

1. International Association for Impact Assessment (IAIA) Impact Assessment [online]. Available at: https://www.iaia.org/wiki-details.php?ID=4
2. IAIA (2009) What is impact assessment? Fargo, ND: IAIA
3. Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment
4. EIA Report in Scotland. The remainder of the Primer uses the collective term ES, which can be read as Environmental Statement in England, Wales and Northern Ireland and EIA Report in Scotland.

Introduction

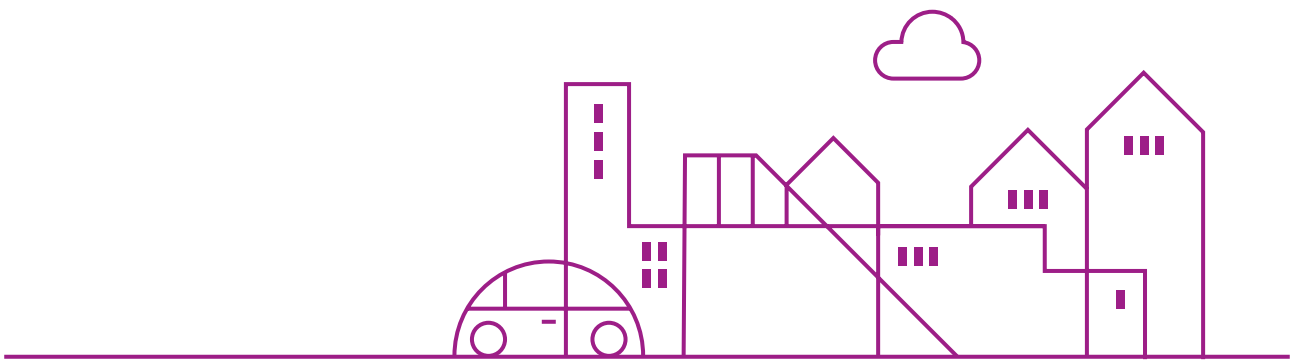
AIMS AND AUDIENCE

Digital technology and its tools have long been used in IA, but its potential is not always fully realised, and practice does not always keep pace with innovation. IEMA's 'Delivering Proportionate EIA' strategy emphasises the need to modernise EIA to deliver effective and efficient assessment. The strategy also highlights the importance of reporting, which adds value to projects and their interaction with the environment[5], and 'Embracing innovation and digital' is one of the four strategic themes for action.

The majority of discussion to date on Digital IA has focused on EIA. However, Digital IA methods have a much wider application and can be applied to SEAs, Cumulative Effects Assessments (CEA), HRAs and a wide range of international and national assessments required by legislation and policy. Digital IA can also be used on a voluntary basis and on a range of activities that fall outside statutory requirements, including research projects, feasibility studies, route and site selection analysis, and a host of monitoring and reporting purposes. For simplicity, references in this Primer to IA should be aligned with a wide definition and application. Where the recommendations are specific to EIA, this is made clear.

This Primer is intended to raise awareness of current Digital IA practices, their potential for contributing to better outcomes in IA and the issues and challenges faced in doing so. This Primer has been developed to generate comment and discussion, upon which future guidance and institutional and regulatory change can be built.

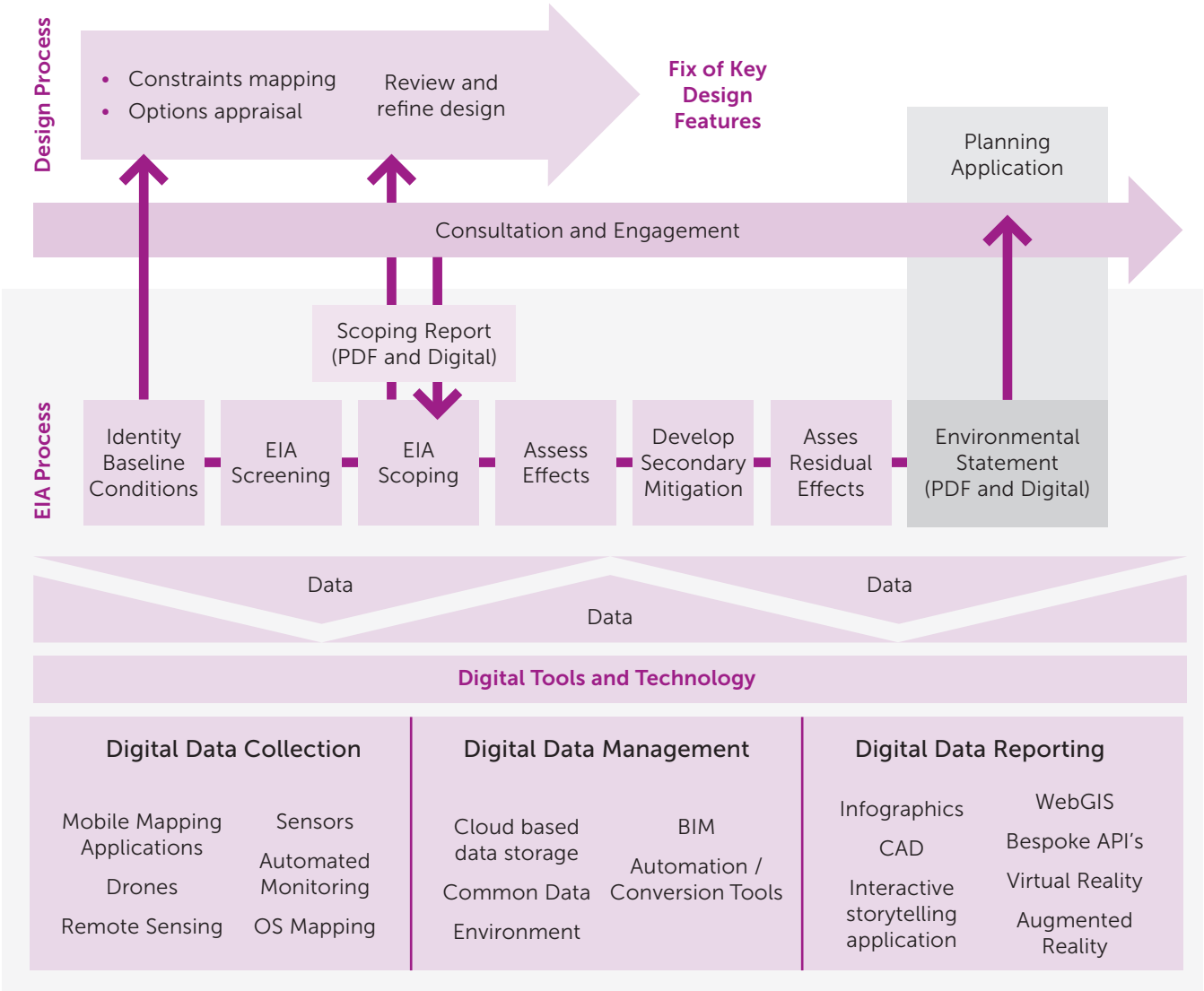
The intended audience of this Primer is anyone involved in IA and with an interest in improving working practice. It is assumed that the reader has a basic knowledge of IA practice in the UK.



5. IEMA (2017) Delivering Proportionate EIA – A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice [Online]. Available at: https://www.iema.net/policy/ia/proportionate-eia-guidance-2017.pdf

WHAT IS A DIGITAL IMPACT ASSESSMENT?

It is important to acknowledge the difference between digital reporting and Digital IA. Recent discussions have commonly focused on digital reporting in the EIA process (i.e. Digital EIA Scoping Reports and Digital ES). However, digital practices widely underpin any effective digital reporting and present greater opportunities than the format of presentation. For example, in addition to the presentation of final reports in a digital format, making use of multimedia and digital methods can also be used for data collection, surveys, modelling, visualisation, remote-sensing, databases and calculations, to inform the IA. Furthermore, Digital IA can be utilised throughout the project lifecycle and continue through discharge of conditions, construction, operation and decommissioning of projects. Therefore, it is important to separate out the meaning of digital reporting from the wider adoption of Digital IA practices and techniques.



This Primer, therefore, focuses on digital practices throughout the IA process, referred to as 'Digital IA'. A summary of the digital tools available for use in IA is presented in Table 1 below.

TABLE 1 - DIGITAL TOOLS AND TECHNOLOGY OF USE IN IA

	TOOL	DESCRIPTION
Data Collection/Mobile GIS	Mobile mapping applications	Mobile mapping applications allow for the digital collection of qualitative and quantitative information using mobile devices such as mobile phones and tablets. Applications can be customised to capture different types of data and in different formats, and allow for both offline and online working, making them easy to use and adopt for IA surveying and monitoring.
	Unmanned Aerial Vehicles/ Drones	Drones are more formally known as Unmanned Aerial Vehicles (UAVs). A drone is an aircraft that can be remotely controlled or can fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS.
	Remote-sensing	Remote-sensing is the capture of data from platforms mounted on satellites or aeroplanes. The sensors capture data in the form of images using the whole electromagnetic spectrum. Remote-sensing is broken down into active and passive sensing (active sensors have their own light source and passive sensors measure reflected sunlight). Examples of remote-sensing data are light detection and ranging (LiDAR) sensors and Landsat imagery.
	Sensors/ automated monitoring	Sensors and automated monitoring systems allow for real-time and long-term data acquisition. They simply automate the process of data collection and, in some cases, the processing of this data for users. Sensors can measure a wide range of environmental parameters that relate to the IA process such as noise levels, air quality or vibration levels from construction sites.

	TOOL	DESCRIPTION
Data Management, Processes and Monitoring	Automation tools	Automation tools improve the process or repetitiveness of tasks such as post-survey processing of data or reformatting of raw data into another compatible software format. Automation tools can be custom-made or purchased software.
	Conversion tools	Conversion tools allow for the transformation of data from one format to another. These tools can be built into readily available software or available online converter tools.
	Building Information Modelling	Building Information Modelling (BIM) is a set of consistent standards and processes used within the production of co-ordinated planning, design and construction information (both graphical, i.e. drawings, and non-graphical, i.e. reports). It is a digital representation of the design of a project combining the multiple discipline nature of modern infrastructure projects into a federated model.
	Common Data Environment	The Common Data Environment (CDE) is a storage location that provides a single source of information to allow the collection, management and dissemination of project data to the whole project team used within the BIM process. This information can be both graphical and non-graphical, and brings information from all parties together into one easily searchable virtual space. Access and security permissions can be applied at role level ensuring that the right people have access to the information they need.
	Data Register	Organisations can control and process hundreds of different datasets when compiling an IA. A data register will give an organisation oversight of things like: • information held and processes • where it is stored • how it moves • who it is shared with • what the data is • classification • level of protection reflecting its classification • indicator of integrity • availability and confidentiality. When dealing with personal data, such as land ownership, the requirements of the General Data Protection Regulations (GDPR) will need to be followed. Most projects will use some form of spreadsheet for the data register; however, there are other options, such as dedicated software, that could be used.
	Databases	Databases can be used to organise a collection of data so that it can be easily accessed, managed and updated. They are used by organisations to store and retrieve information with a database management system. Similar to other tools, databases can be customised.

	TOOL	DESCRIPTION
Data Visualisation and Reporting	Desktop GIS	Desktop GIS software is available either through open source (e.g. QGIS or Google Earth) or commercial software providers (e.g. ArcGIS). Desktop GIS is the principal software utilised by many companies for IA with GIS professionals. The software is used for data visualisations, data analysis, query and editing within a local desktop environment. There is also functionality to perform and view data within 3D environments and perform specialist spatial analysis of data. Outputs can be in the form of interactive PDFs, images or published to an online environment to create WebGIS viewing.
	Computer-aided design	Computer-aided design (CAD) software is most commonly used within engineering and architecture to produce highly accurate designs and drawings either in 2D or 3D form.
	WebGIS	Similar to Desktop GIS, WebGIS is available via open source or commercial providers for data visualisation and also to perform analysis. Unlike Desktop GIS, WebGIS is accessible over the internet, giving the advantage of being able to interact with data wherever you are, and also sharing the information with a wider audience. Data is visualised and analysed through customisable map applications, which can be linked directly to and embedded into websites for reporting. WebGIS is used by both GIS and non-GIS professionals offering multi-user accessibility.
	Interactive Storytelling Application	An online application that gives a unique and highly customisable way of visualising spatial information. This information can be combined easily with images, videos and other multimedia alongside a narrative text to allow for both data visualisation and IA reporting side-by-side. With easily navigable options and layouts, they can be used by anyone, which is why Interactive Storytelling has become a popular application for digital reports.
	Bespoke web systems	Customised systems can be created based on specific user requirements. Bespoke functionality can be created using a variety of web tools and programming languages to assist with key project tasks and deliverables. An example may be online websites for crowdsourcing data or providing data and information to stakeholders. High-end visual interfaces provide simple access to the right information at the right time.

	TOOL	DESCRIPTION
Data Visualisation and Reporting	Dashboards	Commonly used to give an overview of results or reports, this information management tool is created by combining a collection of widgets to give a simplified view of key performance indicators. Dashboards are customisable and, with certain applications, can be incorporated with a web map to give a spatial, locational representation of the data contained in the dashboard as well as contain dynamic charts and graphs. They can be used as a project management tool to monitor document status and completion, or to display the results of a recent or ongoing survey. Dashboards have multiple uses within the EA process.
	3D fly-throughs	3D fly-throughs can be created using a multitude of 3D geospatial and/or graphical software and image processing software. Advances in technology have enabled large datasets to be processed and displayed in the 3D environment, allowing design data to be placed within its virtual surroundings. This powerful combination allows stakeholders and clients to visualise a project while navigating or flying through the 3D world, either as an interactive display or a pre-constructed video.
	Virtual reality	Virtual reality (VR) is a simulated, computer-generated environment that is most commonly used with head-mounted displays. VR places the user completely within the simulated environment, providing them with the ability to interact with their surroundings. Most popularly used for gaming, VR has now grown into the architecture, engineering and construction (AEC) industry, as clients and project managers realise the benefits of using immersive technology for conveying project development.
	Augmented reality	Augmented reality (AR) focuses on superimposing computer-generated objects into the real-world environment. AR enables the user to place digitally created objects into a live view by using devices such as a camera on a smartphone/tablet or a headset. The AR device can either detect a pattern or code or utilise a co-ordinate reference system in order to display the objects in the correct real-world location.
	Infographics	Infographics are information or data presented in a graphic format, either static or interactive, infographics give an overview of a topic. They could be a chart, image or icons alongside a small text to give an easy-to-understand snapshot of information.

THE NEED FOR A DIGITAL IMPACT ASSESSMENT

Current IA practice, notably in EIA, predominantly utilises hardcopy recording, storing and presentation of data and assessments. Due to the need to produce a robust assessment and reduce the scope for legal challenge (e.g. adopting the precautionary principle and risk-aversion of the applicant to challenge), the IA process can often struggle to be proportionate and easily navigable, with key messages often poorly defined. The large volume of material produced can also be a barrier to communication, and the development sector is further behind than some other sectors and practices for communicating information in an easily accessible manner. Furthermore, the development sector, along with many traditional professional services and wider industries, is failing to maximise the use and value of the underpinning data.

While consultancies and developers are starting to harness the potential of digital tools, technology and skills in IA, the practice and application is currently limited to technical experts and GIS specialists, and the application and integration of this expertise varies significantly between and within organisations. This is leading to a proliferation of standards and formats being adopted with no 'common language' available for users to adopt.

BENEFITS OF A DIGITAL IMPACT ASSESSMENT

Digital practices have long-improved the efficiency and effectiveness of numerous industries, with Netflix (film distribution) and Amazon (online shopping) being high-profile examples. IA can be counted amongst this. IA has developed to use tools including GIS, ground-penetrating radar for geophysical survey, satellite imagery, LiDAR, CAD and photomontages. This Primer advocates further digital progress and innovations in IA with a view to realising new and greater benefits to improve outcomes for all stakeholders, the environment and society.

Digital IA offers potential benefits for all those engaged in the IA process: practitioners, consenting authorities, stakeholders and the public. At a high-level, these benefits may include better communication of IA outcomes, resulting in better stakeholder engagement and an increased accessibility of information. This improvement in communication has the potential to save both time and costs in the IA process, and provide consenting authorities with better information for better decision-making. While cost and time savings are not necessarily a key concern of all stakeholders involved in IA, for applicants, the cost and time associated with current practices can be considerable. There are also substantial lost opportunity costs in terms of the time required by all stakeholders to engage with the process, during which they cannot progress other activities. An overall benefit of Digital IA, therefore, is the opportunity to substantially improve the interaction of projects with the environment.

Beyond these high-level advantages lie a variety of beneficial opportunities more specific to the circumstances of the digital practices being used. This Primer explores these in more detail.

STRUCTURE OF THE PRIMER

The remainder of this Primer is structured as follows:

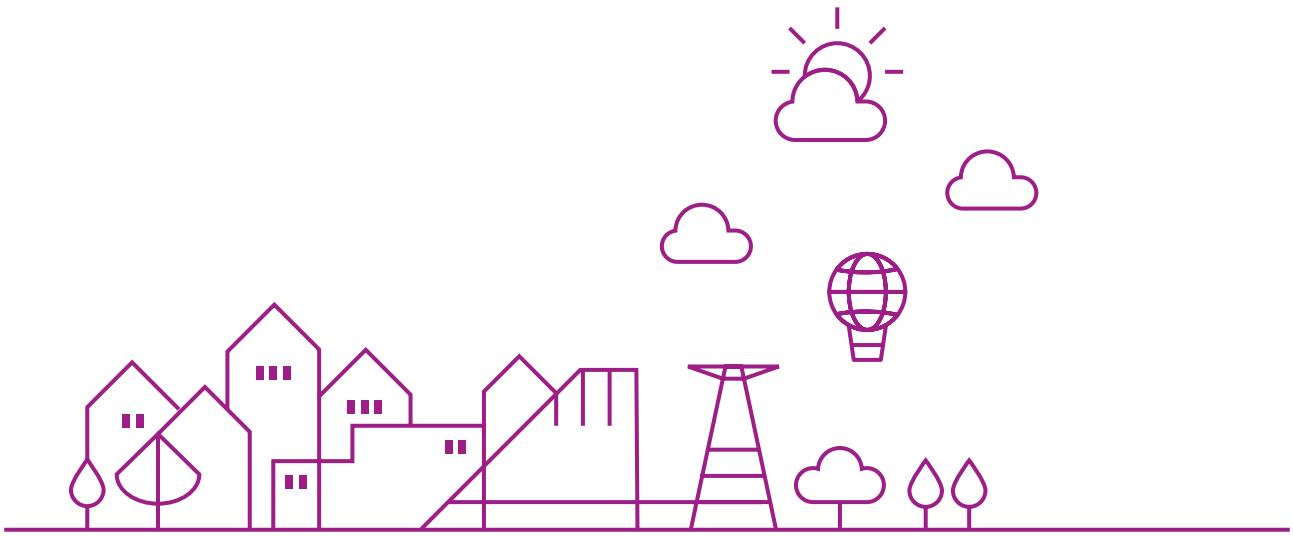
Current situation – an overview of the current context within which the challenges to, and opportunities for, digital working are found, covering:

- data;
- digital skills; and
- effective communication.

Opportunities and challenges – exploring the future key opportunities presented by Digital IA and challenges to implementing it within the following key topics:

- regulatory;
- data;
- standards and consistency;
- technology and tools;
- effective communication;
- culture and approach; and
- time and costs.

Key messages – key messages for adopting innovation and digital working.



Current Situation

The challenges and difficulties[6] within the EIA process are well documented, particularly relating to effective scoping, reporting and monitoring. More recently, the focus has moved to proportionality and efficiency[7] of EIA practice and addressing the trend towards ever larger documentation and costs. These trends provide the context within which Digital IA offers future opportunities to drive efficiencies and improve the effectiveness of EIA.

This section presents an overview of the current situation of Digital IA practice, and some of the key challenges providing the context for Digital IA opportunities.

DATA AND IMPACT ASSESSMENT

Data and evidence are the foundation of effective IA and the basis upon which robust decisions can be made. However, dealing with the volume, range and variety of data is a particular challenge for the current IA process. Data must be gathered and/or generated, recorded, processed, managed and presented. Its origins, ownership, quality and limitations must also be understood if stakeholders and users are to be confident in the assessment and the conclusions upon which it is based.

The availability of data for use in IA is expanding at a fast pace. Since the Freedom of Information Act (FoI)[8] was implemented, public access to information has rightly increased, driving much of the now readily available government open source information. Open data initiatives have continued to expand on the availability of different datasets. This applies to both non-spatial and spatial information, as well as to digital and non-digital data. The recent establishment of the Geospatial Commission[9] shows a clear commitment from the Government that it acknowledges the potential economic benefit that open data can provide, with this data availability only set to rise. Spatial data has seen the greatest growth in data availability, especially with technological advances, meaning that access to digital data and mapping is now part of everyday life.

Standards of data management are, however, variable, and data are not always used efficiently or in a way that maximises their value to the IA process. This may be partly attributed to the number and variety of different specialists involved in IA, the range of skills they bring and the structures they operate within. Different skill levels, technologies, clients and market sectors also contribute to variable standards of data management. As a consequence, the quality of IA outputs is variable and the time, and cost of using the data fluctuates.

Data standards (including format, attribution and geometry standards) are often specified by the client, especially for EIA on large infrastructure projects such as Crossrail, HS2 and Thames Tideway, where numerous contracts are in place. For metadata, industry standards such as INSPIRE[10], UK GEMINI[11] and MEDIN[12] are mainly used. Standards for processes and procedures are usually based on BIM standards but adapted for IA GIS data purposes, including data management, delivery and collection. These can vary between clients and projects, and become less standardised, making it difficult to track compliance. Such standards are then sometimes adopted by consultancies on smaller-scale projects.

6. IEMA (2011) Special Report – The State of Environmental Impact Assessment Practice in the UK [Online]. Available at: https://www.iema.net/assets/uploads/Special%20Reports/iema20special20report20web.pdf
7. IEMA (2017) Delivering Proportionate EIA: A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice. https://www.iema.net/policy/ia/proportionate-eia-guidance-2017.pdf
8. Freedom of Information Act 2000. Available at: http://www.legislation.gov.uk/ukpga/2000/36/contents
9. The Geospatial Commission is an expert committee that will set the UK's geospatial strategy and promote the best use of geospatial data. See: https://www.gov.uk/government/organisations/geospatial-commission
10. Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). Available at: https://inspire.ec.europa.eu/
11. The Association for Geographic Information (AGI) Geo-spatial Metadata Interoperability Initiative (UK GEMINI). Available at: https://www.agi.org.uk/agi-groups/standards-committee/uk-gemini
12. Marine Environmental Data and Information Network (MEDIN). Available at: https://www.medin.org.uk/medin-discovery-metadata-standard

While data availability and standards are increasing at the national scale, there is still much variation across local- and regional-level data providers such as local authorities or local biodiversity groups. This might be attributed to the levels of funding, support and familiarity of standards amongst these data providers.

One key area of concern, and presently a missed opportunity, is the amount of data lost each year through poor data management and lack of data standards, dissemination and storage. Most data collected for IA activities are currently infrequently reused. Where the data is reused or referred to, it is often through a secondary reference to outputs of the data reporting, rather than the source data. This systematic loss of data across the UK is likely to be costing the industry in excess of several million pounds each year[13]. Furthermore, any funds spent on IA that are unnecessary or avoidable are funds that are not then available for other potentially important activities, such as mitigation planning, design enhancement or further research.

DIGITAL SKILLS

Digital technology and tools, and the skills to use them, are already a part of IA practice. The nature and prevalence of digital practice has evolved with time. GIS use, for example, has grown since the 1980s, associated with increasing access to online data, development of commercial providers, new data standards, the digitisation of Ordnance Survey (OS) data and improving technology. Higher education facilities have increasingly offered GIS education.

The value of digital skills for IA is evident in the increasing presence of digital skills within the industry. However, the location of these skills is not evenly distributed across the industry, nor within organisations. Across the organisations that play a part in IA, most existing digital skills are located within the consultancies that undertake major IA projects, such as EIA.

Many statutory consultees, local authorities, other organisations and members of the public do not yet have sufficient digital skills to properly engage with Digital IA. Care needs to be taken in the development of any Digital IA in respect of the requirement for either practitioners or stakeholders to obtain licences or subscriptions for specific software or systems. Many of the preferred software packages utilised by early adopters require annual subscriptions and/or ongoing technical support to operate. This could be prohibitively expensive for smaller developers or consultants.

It should be noted, however, that even within consultancies, digital skills are not evenly distributed. Dedicated digital specialists (i.e. GIS consultants, BIM managers, graphics teams) and environmental technical specialists often have a range of digital knowledge and skills (e.g. GIS, remote-sensing/ image processing and CAD, etc.), especially within their topic of expertise. General EIA practitioners and many technical specialists, such as ornithologists or contaminated land experts, may not have the same level of digital skills.

13. Based on the assumption that survey data is a significant cost item for each EIA and the data that is generated is not accessible to future users in a data standard format.

Digital skills and the application of digital best practice may, therefore, be regarded as the preserve of those few highly specialised experts. Data, GIS and the technology skills of those entering typically non-digital specialisms are variable and often dependent on step-by-step lessons, should this type of training be available at university or post-academia. This trend is likely to reduce over time as GIS and Digital IA are starting to be introduced into higher education EIA degrees. However, it remains to be seen if the digital skills agenda will also enter the higher education syllabus of core technical degrees like zoology, hydrogeology and others.

In summary, different organisational structures and cultures are found in different organisations and professions that practice IA. The variability within these groups means that some organisations and professions are better placed to facilitate the application of available digital skills than others. The natural separation of technical disciplines can lead to a silo mentality that may hinder development of digital working. Unless organisational structures or processes dictate or facilitate cross-discipline (multi-disciplinary) working and the awareness and utilisation of digital skills, collaboration may be dependent on the network or project team available to the IA co-ordination team. As a result, the degree to which digital skills are applied to IA is variable and best practice in Digital IA is not consistently applied.

EFFECTIVE COMMUNICATION

Reporting provides the medium by which the process of IA communicates its outcomes. However, it is well acknowledged that IA, notably EIA, too commonly does not communicate its messages in a proportionate and clear way. Complex information is often left with little or no explanation and/or simple illustration. There is a clear gap in the industry as skills to develop such illustrative communication materials are often in short supply. There are examples of ES that span 50,000 pages, with stakeholders concerned about the feasibility of properly engaging with such large volumes of information within time-constrained consultation periods. These challenges to current practice are a key factor driving a call for a more-proportionate approach to EIA[14].

In practice, IA is commonly resource-limited as well as budget- and deadline-driven. For this reason, practice often draws upon previous experience and established ways of working with limited scope for innovation. Commonly, figures and visuals form only a small percentage of an IA output. To make IA more effective in communicating with the intended audience, this approach needs to be revisited. Failure to do this will lead to the IA process falling further behind on available digital methods and continuing to report using bulky paper copies, PDFs and static maps and figures.

These traditional methods are likely to become less and less effective means of communicating, as society continues to evolve ways of sharing and digesting information. Modern IA audiences are increasingly familiar with digesting large amounts of accessible and personalised digital information, through mediums such as news apps, Wikipedia, social media and YouTube. As a result, the demand for relevant information quickly is heightened, and we are more likely to skim read and skip between sources of information. This applies to the public and decision-makers alike, and in this context, traditional forms of IA reports risk failing to offer a medium that successfully conveys their message.

Examples of digital practice in IA vary and this is an emerging area, developing quickly with the help of digital tools. Digital reporting, however, still tends to be uncommon and largely at the level of Non-Technical Summaries (NTS) or as an additional resource, with detailed information still shared via PDF.

14. IEMA (2017) Delivering Proportionate EIA [Online]. Available at: https://www.iema.net/policy/ia/proportionate-eia-guidance-2017.pdf

Opportunities and Challenges

This section explores the opportunities presented by, and challenges to, adopting Digital IA.

REGULATORY

Impact Assessment operates within a regulatory framework, and so it is appropriate to consider whether this framework can allow the digitalisation of IA practice. If it can, to what degree does regulation present a challenge? Or can it present an opportunity?

It is important to note that regulations differ across the nations and devolved administrations across the UK. In England, the Statutory IA processes are shaped by primary legislation, such as the Planning Act 2008[15] as amended, and secondary legislation such as The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[16] (henceforth known as the EIA Regulations).

While differences occur across the different administrative areas within the UK, for example in terminology and EIA screening thresholds, all of the regulations were introduced to implement the EIA Directive, and therefore the fundamental requirements of EIA are consistent throughout.

When considering submitting an application in digital form, it is important to understand whether there are any barriers or hurdles within the specific legislation, regulations or guidance. There are also different requirements for major infrastructure projects and different EIA Regulations for certain types of project.

Some common examples of barriers might include:

- **A requirement for paper copies:** for example, the Welsh EIA Regulations[17] state that an applicant who submits an ES to the relevant planning authority must submit both electronic and paper formats unless otherwise agreed in writing. Paper copies may also be requested throughout the planning process.

- **Ensuring accessibility:** the planning process normally requires that planning applications are available to the public. Because not all members of the public have access to a computer, fast download speeds or the skills to use digital technology, more work is needed to develop ways of meeting this requirement that are acceptable to all.

- **Permanence:** planning applications are required to be 'sufficiently permanent'. With the speed of change in software and hardware sometimes leading to redundant formats, careful consideration is needed as to how accessible a digital application may be in, say, 20 years' time.

- **Interpretation of requirements:** legislative language is often based on the custom and practice of using paper, and has for decades. For example, requirements for 'copies' of statements, or the need to 'give' or 'send' an application. Agreement with the regulator that these requirements can be met with electronic applications may be needed.

- **Specific circumstances:** sometimes the Regulations will be clear about the absolute need for paper copies. For example, the Scottish EIA Regulations[18] set out exceptions to electronic communications being acceptable, such as for trans-boundary applications or where a recipient has opted out of electronic communications.

17. The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. Available at: https://www.legislation.gov.uk/wsi/2017/567/contents/made
18. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: http://www.legislation.gov.uk/ssi/2017/102/contents/made

Until they develop further, these requirements are likely to lead to a degree of caution in submitting and receiving digital applications, particularly where these are at the cutting edge of innovation such as a web-based interactive ES.

There is always going to be a time-lag between slower regulatory changes and faster-paced changes in practice. Nevertheless, custom and practice is moving inexorably towards digital being not just acceptable but desirable, and many of these potential barriers will recede over time.

There are already examples of digital approaches being used successfully in planning applications. In April 2019, the first electronic-only Development Consent Order (DCO) submission was made to the Planning Inspectorate as part of a trial of electronic-only applications. This is a clear step forward and, in November 2019, the Planning Inspectorate's Advice Note Six, addressing the preparation and submission of application documents, was updated and no longer requires applicants to submit their application documents in printed copy at the point of submission. The successful trial period has enabled this updated approach, and there may come a time when electronic-only applications become a requirement. Electronic submission is already mandated in some other countries, Oman being one example.

'The Planning Inspectorate is committed to the UK Government's "digital by default" approach set out in the Civil Service Reform Plan. Following a successful trial approach, the Planning Inspectorate now accepts NSIP applications in electronic-only format at the point of submission.'

Planning Inspectorate, 2019

More generally, governments have set a clear direction toward a digital future. For example, the Scottish Government established a Planning Digital Taskforce with the aim of creating a strategy for a world-leading digital planning service in Scotland. One output from this taskforce is expected to be a set of recommendations for amending secondary legislation and associated guidance.

DATA AND IMPACT ASSESSMENT

This section identifies the main challenges and opportunities that a digital approach to IA would have with reference to data, sub-dividing into five key areas to help facilitate further discussion.

Data Types

Data in IA can be split into three broad categories: input, created/processed and output. These broad categories each comprise spatial and non-spatial datasets and can be further subdivided into discipline and/or topic and, at the most detailed level, a specific file format. The volume and complexity of data types generally increases exponentially with the scale of the IA, with Nationally Significant Infrastructure Projects (NSIPs) and National Developments tending to have the most complex data requirements.

Types of data will continue to present challenges in a digital environment, especially as IA requires so much cross-discipline collaboration and knowledge sharing. However, adopting a digital strategy at the outset of an IA will increase the interoperability of data in all its forms, across the IA team and beyond, resulting in significant improvements to the efficiency and delivery of an IA.. The success of adopting a digital strategy is heavily reliant upon being able to engage the right skillsets within the IA team and wider project team early enough in the process.

There are recent examples of large-scale Digital IAs that have developed data and digital strategies from the outset. Such strategies were developed by engaging data specialists and specific technological experts that have had access to each discipline involved, enabling a collaborative approach. This is possible mainly due to the complexities, opportunities and budgets available for these large-scale schemes. These specialists can spend time understanding the requirements of each specialism, the various interconnectivities and then set-up systems and processes to cope with the data exchange. Budget and time constraints on smaller IA projects often restrict this initial strategic planning, resulting in significant time spent by each discipline converting data into useable formats. This could be avoided or reduced by initial collaboration with data specialists. Given that smaller-scale assessments, with smaller budgets, are more common across the industry, it is these assessments that would benefit most from working to clear data strategies and adopting a digital approach. The adoption of data strategies and common standards are particularly difficult to implement when a large number of small and specialist subcontractors are being utilised. Therefore, supply chain upskilling will be necessary across the industry and affiliated businesses and organisations.

As a start point, connecting with data or GIS specialists wherever they are within an IA team can be the first step towards a Digital IA process, but alongside this, as an industry, it is important to learn from these large-scale schemes and implement key digital solutions on smaller schemes where possible. This could be as simple as starting with introducing digital field collection tools. An example of this is the Crossrail Learning Legacy[19] which is 'the collation and dissemination of good practice, lessons learned and innovation from the Crossrail construction programme aimed at raising the bar in industry' and includes a section on Information Management and Technology.

Data Availability

The recently established Geospatial Commission[20] shows a clear commitment by the Government to encourage innovation through an increase in geospatial data availability, as a way to promote UK economic growth. The Geospatial Commission is engaging with multiple agencies such as the British Geological Survey, Coal Authority, HM Land Registry, OS, UK Hydrographic Office, and Valuation Office Agency. This initiative has the potential to heavily influence the digital revolution in all industries, not just in IA practice.

In comparison to many countries, there is a large amount of environmental open data in the UK. This open data provides key information inputs to the IA process and, as access to this data is generally hosted on digital platforms, it is providing a catalyst to encourage the IA process to migrate to a more-digital solution. The availability of open data in digital formats will continue to increase and evolve, and this presents both challenges and opportunities for the IA industry.

In this changing data environment, it is important that IA practice becomes more adaptable in line with the constantly evolving availability of data. By taking advantage of the ever-increasing open data sources, the move towards a digital and collaborative approach could be the key in achieving this for any scale of IA. Some of the challenges that may arise from increasing availability of data are discussed in other sections here, including how to manage, analyse and communicate information in a useful way.

19. https://learninglegacy.crossrail.co.uk/
20. Details on the aims of the Geospatial Commission are contained in their annual plan found here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/799197/6.5522-CO-GeospatialCommissionAnnualPlan.pdf

Ownership and Assurance

Data ownership and assurance are key issues in IA and both relate partly to trust.

On the one hand, do data owners and providers entrust their data to be used by third parties? Concerns may arise around confidentiality, sensitivity, data protection, commercial issues, liabilities and risks.

On the other hand, can users place reliance upon the data they are accessing? There may be concerns around the provenance, reliability and quality of data. Digital IA methods can be designed to ensure ownership and assurance of data is maintained and shared with all relevant parties, rather than something that is maintained by individual disciplines and/or individual data owners and creators, and is rarely shared or updated.

ISO 19115 (Geographic Information: Metadata) advises the use of metadata within geospatial information, ensuring fundamental information about each dataset is captured, stored and is available with the spatial data. Metadata accompanying data (from any of the three broad categories) should include information on who owns the data, who is responsible for it (usually the same as the owner) and any other relevant information pertaining to its use. This ensures that the data can be correctly referenced and accredited, and used within any conditions of use specified by the data owner. The conditions of use of these datasets may also include who the data can and cannot be shared with, and in what format (e.g. reproduced in maps or online web services).

Metadata principles can be extended to other datasets when a digital strategy is adopted, regardless of whether it has a spatial element or not. By storing metadata with each data layer, an IA team can easily determine whether it is suitable for its intended use in the IA process, or whether further information needs to be collected. This also helps ensure that the IA process for a particular scheme is robust, and fully auditable. It is important that IA practitioners are aware of the metadata information for data they use and become more familiar with it.

Data assurance is the responsibility of the data owner, and information around the quality of a dataset should be contained within the metadata for individual datasets. Most data used in the IA process is owned by governmental organisations, and therefore its assurance lies with those relevant bodies. The INSPIRE data directive has been responsible for setting standards around metadata and the publishing of governmental datasets. However, this should not be taken for granted in a Digital IA. Co-ordinators of Digital IA need to take responsibility for the quality and assurance of the data created across all disciplines during the IA process. Through adopting the same standards set in the INSPIRE data directive, as the governmental bodies, they can help ensure a digital approach is still fully quality checked and assured, providing confidence in an IA's validity.

Data Management and Security

Digital IA provides professionals with an opportunity to develop appropriate data management strategies. This allows data management, security and version control to be considered across disciplines, supporting deployment of the most appropriate methods. As indicated previously, larger infrastructure projects have been able to beneficially implement such strategies, and smaller-scale developments could learn from and apply some of the principles of data management adopted.

The need for effective, comprehensive data management will only increase in importance with the adoption of Digital IA. The benefits of Digital IA cannot be fully realised without this. IA professionals must engage with the right specialists to help develop these strategies, such as dedicated data management teams or geospatial/GIS specialists, particularly in understanding how this data is managed and analysed. This is already common in many environmental consultancies, particularly those that have been involved in large-scale IA, but may be less so for those working on smaller schemes. The development of a common strategy across the industry could build upon the work and legacy learnings of major projects to develop and disseminate good practice across the wider IA community. However, it is important that any standards do not place a disproportionate burden on smaller projects and maintain flexibility for multiple types of project and scale.

Awareness of the Guide to the General Data Protection Regulations (GDPR) is also required, in particular, consent for processing any data which might be considered 'personal data'. This data does not need to be 'private' information, but can relate to any information whereby someone could be identified.

Standards/Consistency

As the industry evolves towards digital, the learning curve presents an opportunity to develop standards to drive consistency. IEMA has previous experience of working with BSI and ISO, as well as other organisations, on the development of and consultation on robust standards.

The industry needs to consider how best to advise on standards for Digital IA without specifying named hardware or software requirements, avoiding commercial sensitivities, and allowing each company, consultant, client and stakeholder to retain independence and autonomy. This is still a huge challenge, but IEMA and the Impact Assessment Network provide a key platform to facilitate knowledge sharing in this area, which all sizes of organisation can benefit from.

INSPIRE also recognises the importance of standards in environmental data and has developed those across 34 spatial data themes. This has enabled key data to be shared in a format that was interchangeable and standardised. This could potentially input into any standards being established in Digital IA.

TECHNOLOGY AND TOOLS

Technology and tools have contributed to IA for many years following the introduction of GIS software in the 1980s. Over the last decade, there has been exponential growth in the digital sector, particularly geospatially, which can assist the IA process.

FIGURE 2 - POTENTIAL APPLICATION OF TECHNOLOGY ACROSS THE KEY STAGES OF IA

Technology	Screening	Scoping	Business Data Collection	Impact Prediction / Assessment	Mitigation	Reporting	Consultation	Monitoring	Inspections	Auditing and Enforcement
Mobile GIS / Data Capture	✓	✓	✓					✓	✓	
Data Management	✓	✓	✓	✓		✓		✓	✓	✓
Data Visualisation	✓	✓	✓	✓	✓	✓	✓	✓		
Digital Reporting		✓		✓	✓	✓	✓	✓	✓	✓
Industry Standards	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Technology is considered to be the collection of techniques, methods and processes used throughout the IA stages. The tools are the components, technical software or hardware, for example, that facilitate these methods and processes. Throughout the key stages of IA, the various technology areas and associated digital tools that have been adopted are summarised in Figure 2 above. A list of tools and their descriptions was provided earlier in the Primer, in Table 1.

Digital tools offer various opportunities for the IA process, some of which are still relatively new to the industry, such as 3D visualisations, when compared to desktop drawing packages which are currently more widespread. A few of the opportunities and challenges of these tools are outlined below.

Data Collection/Mobile GIS – Opportunities and Challenges

Various software applications (apps) allow users to generate bespoke data collection methods. Apps make the data collection more efficient when compared to paper-based data collection methods that are more prevalent across the industry. The apps cut out several stages of the workflow process, saving time, allowing data to be instantly uploaded to a database or online viewing platform, to be verified faster and then shared and disseminated.

Mobile data collection apps, development and advancements of UAV technology alongside use of automated monitoring sensors and systems have all opened up opportunities for cheaper data collection methods and faster collection of information when compared to traditional methods.

It is important, however, that data collection strategies are controlled by a trained professional (usually within the remit of a GIS professional) to maintain consistency and standards. Accuracy of data may also be a concern. For example, drones lack capability when the need for sub-centimetre accuracy is required. Acquiring the necessary permissions to undertake such surveys, such as from the Civil Aviation Authority, may be a further challenge depending on project location.

Data Management, Processes and Monitoring – Opportunities and Challenges

Organisations are developing a greater understanding and adoption of data management standards such as BIM, and the opportunity for the industry to standardise its approach to how data is collected, stored and shared is a positive one. Despite BIM being an ISO standard (ISO 19650), the way in which these standards are interpreted and implemented internally varies between organisations and collaboration between organisations can, therefore, be difficult. With future development in software tools, there will be the potential for greater interaction between different software and data formats currently used by different IA specialists, allowing for a more-collaborative approach to design, assessment and reporting. The Common Data Environment will be a key driver in this.

The use of automation and conversion tools to aid data management and data processing help to remove the repetitive elements of some tasks and add efficiencies to the IA process. For example, automating a routine operation such as data validity checking will lead to:

- improved quality and consistency;
- time saving;
- reduced costs; and
- improved operational efficiency.

Combined with improved data collection methods, the use of automation tools, particularly for data analysis processes, enables analysis of historical trends in data.

A further example would be the use of conversion tools to convert data to a single format. A smaller number of working data types within a multi-disciplinary project will improve the efficiency of sharing and disseminating data.

Data Visualisation and Reporting – Opportunities and Challenges

Data visualisation has come a long way from simply extracting images from desktop applications to insert into a report. Although still useful in some situations, newer tools with online applications such as WebGIS and interactive story telling applications offer more and different opportunities. One example is the ability to present the same information in a more user-friendly way, which can be helpful for communication with a non-technical audience. With added search and filter functionality, users can find and display information that is specifically relevant or of interest to them. However, a challenge remains not to overcomplicate WebGIS, and there is a need to always be mindful of accommodating users with little or no GIS experience. Applications need to be as intuitive as possible, while still presenting the necessary information for regulators and stakeholders.

Online applications allow for greater collaboration across organisations with the ability to share information between clients, the lead IA co-ordinators, regulators, stakeholders and the public. However, there are challenges to this that need to be managed. The different stages within the IA process means that there will be times when clients will want to share information with the public and regulators, and times when information remains private during the various design stages of a project. In a digital environment, this creates the challenge of requiring different tools and applications for different stages, ensuring there is the capability to vary user access and rights as well as manage user accounts effectively. There is also the challenge of ensuring online platforms and applications are secure, and that data transfers are adequately encrypted.

The ability to present information in a VR or AR model can give greater context and understanding of the project than 2D drawings, particularly where technical design details and visual representations can be confusing to the public. Using technology for immersive experiences and visual platforms will allow people to understand projects better and help them to make decisions faster.

However, with so many options available to visualise data, it is necessary to establish which is best suited to the project in the context of its scale and budget. The costs of new software and applications alongside the hosting and online storage costs may be too great for smaller companies and smaller projects to meet.

Developing New Tools – Challenges

Developing and adopting digital tools and techniques will be the key to streamlining future work processes. However, there is a risk that eagerness to progress leads to key steps being missed. As a guide, the following steps might be helpful when carrying out software development:

1. Identify what goal the tool is intended to help meet.
2. Determine core requirements through consultation with likely users.
3. Review tools readily available on the market to determine if they meet the needs of the project.
4. Build a wireframe tool to test the basis and assumptions.
5. Build the tool as a minimum viable product (including the most essential features) and carry out the appropriate review.
6. Release the minimum viable product, testing its use in an environment where the issue of tool failure will cause minimal cost or impact.
7. Collect minimum viable product comments and integrate these into further tool versions.

EFFECTIVE COMMUNICATION

The need for more-effective communication in IA raises a key question – could we make better use of illustrations, infographics and maps (creative infographic (CiGs)), or visualisations to make reports more concise and more easily understood by technical and non-technical readers alike? This should be an aim for all those involved in any IA process.

With the rise in digital technologies and a highly visual online culture, we need to revisit our approach to the IA reporting style and to effective communication more broadly. Professionals with expertise in creative visualisations and infographic software will need to work closely with IA technical teams to support the development of clear, well-communicated IA outputs.

CiGs are an important tool (one of many) because they help communicate complex ideas in a clear and meaningful way. However, infographics are not just illustrations or a representation of words as pictures. They need to be well thought through to meet an intended purpose, and therefore require careful creative planning from the early stages of the project.

Other tools and examples of effective communication include:

- **Digital ES** – the application of a digital reporting platform to deliver a digital ES combines the spatial data, visualisations and reports of a traditional report into a single web-based platform, offering stakeholders an improved, more-intuitive, more-interactive alternative to the traditional reporting format (for example, using receptor-based reporting).

- **Digital reporting and scoping** – by using a digital platform instead of a traditional text-based report, it allows the environmental information to be accessible to the reader in a logical, modular manner, allowing anyone to access, understand and respond to relevant information quickly. This is much quicker and is likely to increase user understanding of the information being presented.

- **Interactive NTS** – creating a Digital NTS to support consultation and the consent process.

- **Using GIS-based visualisations and interactive mapping** – various tools are available to enhance digital reporting, interactive baseline mapping and monitoring results, cloud-based database solutions including asset management, and reporting.

The main purpose of visualisations is to make information presentable and digestible to a general audience using a variety of tools. To cite an example, where a project is being undertaken in a geography/location where literacy levels are lower, simple CiGs may be more effective in conveying information about the project and its effects. Where literacy is less of a barrier, other interactive tools may be more useful. Visualisations use a universal language without the need for translation (or with simple translation), which is likely to be more effective than a text-based report in many situations.

In modern society, there is a competition for people's attention, and information is more-readily available than at any other time in history. Compelling imagery in the form of infographics is one form of data exchange that communicates information quickly and helps the content to stand out. Creative thought and a simplified approach should be applied to ES for them to be more effective in communicating with the intended audience. There is no reason why greater use of visualisations should conflict with meeting statutory requirements or guidelines for IA – in fact, through better communication, CiGs or any form of creative visuals/maps/GIS outputs should enhance compliance. It might be that IA reports that use high-end visualisations to their full effect could even help to speed up decision-making in relation to consenting projects.

CULTURE AND APPROACH

The availability and effective application of digital skills for IA are influenced by organisational culture and approaches. Without a clearer understanding within management structures and processes within organisations, existing digital skills will not be used to their full effect, and opportunities for developing new digital skills will not be fully embraced. There is an opportunity to change organisational cultures and approaches to GIS, data and technology so that they better facilitate team working and encourage innovation and digital working. However, such changes present notable challenges.

Developing Organisational Culture and Behaviours to Encourage Digital Working

Figure 3 below outlines behaviours that should be encouraged to develop a culture that encourages digital working:

FIGURE 3 - BEHAVIOURS FOR DIGITAL WORKING

- **Communication** – embrace digital without allowing it to cloud the fundamentals of good IA.
- **Understanding** – within individual disciplines and a wider view on other areas.
- **Flexibility** – have a digitised approach which allows the workforce to work in innovative and different ways.
- **Transparency** – share digital methodologies, applications under current development, industry improvements within and outside the company where possible.
- **Interactive** – make IA information available through interactive means.
- **Collaboration** – well-designed digital platforms can nurture more collaboration.
- **Preparedness** – to embrace new ways of working.
- **Efficiency** – seek opportunities for digitalisation and automation to reduce the time and cost of regular tasks.
- **Open-minded** – willing to consider new information or ways of working.
- **Inclusion** – practices which are clear and accessible to everyone.
- **Clarity** – know the data being collected and why.

Existing organisational structures or cultures can present a challenge to any effective move towards a culture and approach that embraces digital working. Focused effort will be needed to engage senior management within organisations to communicate the importance and benefits of embracing digital transformation of working practices. In many organisations, digital practice can often be ad hoc and contingent on the network of individuals involved. Project teams change and there is inevitably a turnover of staff, which can make it challenging to maintain consistent practice.

In an ideal world, IA technical disciplines would have access to data managers and data specialists without specific project deadlines looming, to work together to develop digital strategies and processes around their data management. However, finding the time or budget for staff to improve practice and undertake training presents a challenge, and often requires individuals to take the initiative. For non-management level staff to do this requires an enabling culture and organisational support. Failure to capture the imagination and secure the buy-in of senior managers and decision-makers can present a challenge to overcome. Technical complexity (real or perceived) has also been acknowledged as a major barrier[21]. But this complexity also offers opportunities for staff to develop new skills.

21. Vonk, G., Geertman, S. and Schot, P. (2005) 'Bottlenecks blocking widespread usage of planning support systems', Environment and Planning A, 37, pp. 909-924.

Train Staff in Digital Working

Training is an opportunity to upskill staff and raise the awareness needed to support and implement Digital IA. This may take a variety of forms, from webinars highlighting digital opportunities to formal technical training courses. Such training can support the application of digital skills more widely and consistently throughout an organisation, can encourage uptake of new and enhanced skills, and help raise awareness of these skills.

If digital working is to become more prevalent in IA, digital skills need to be a part of the wider team beyond those dedicated digital specialists. Applying these skills in practice presents a challenge in the absence of suitable opportunities and mentorship. It is, therefore, also a challenge to distribute the necessary awareness of digital working and opportunities required to use the skills of digital specialists, or for non-specialists to embrace digital working in a manner that is effective and complements those with more-advanced skills.

Define Digital Roles on a Project

Defining digital roles for specialists presents an opportunity to ensure GIS, data and other technology is applied consistently and effectively on a project. Involving a GIS/digital lead on a project from the outset (e.g. the bid stage) is key to ensuring digital thinking is embedded and opportunities for innovation are identified. A defined GIS/digital lead can provide leadership in applying digital working, review digital outputs, obtain and manage the right data, and communicate this across disciplines.

However, individual teams or companies that support the IA process have very different internal structures, which often means access to those with the skills for a digital lead role is limited, not easy to identify and potentially constrained by budget and/or availability. Some companies may have a dedicated data or GIS team, or have data or GIS specialists within disciplines. However, in most cases, the GIS or remote-sensing capability comes from within the disciplines themselves, resulting in these specialists being found across teams. Therefore, what would work for one team or company may not be transferable to another.

Define GIS Standards at the Organisation and Project Level

Defining GIS standards presents an opportunity to raise the quality and consistency of GIS outputs and facilitate effective digital working practices that can underpin other digital opportunities such as digital reporting. Standards documents and templates at the organisation level should be created and applied, while more-specific standards and templates may apply for clients, consenting regimes or individual projects. Investment in defining and communicating standards outside of a project is critical to gaining efficiency and reducing the risk of inconsistency and programme delay. Enforced standards for practices such as metadata, file naming conventions, map scales and version control will raise the standard of practice and support the implementation of BIM and digital reporting.

TIME AND COSTS

Digital IA can result in significant time and cost savings. Digitised field and desk-based collection is an easier and more-streamlined process for collating baseline data and can be linked to create a direct pathway to a Common Data Environment. If all project data is centralised in one single project location, there is the potential for rapid integration of data from new field surveys and assessments into the evolving scheme to allow time-saving in the design stages and create a more-efficient, iterative process. Data accuracy and speed of validation is also improved, contributing to more-appropriate design with the associated time and cost savings. Data searches and queries can be rapid (rather than searching through text-based documents), with a Common Data Environment accessible and reusable throughout the project lifecycle providing further time and cost savings, noting data ownership restrictions.

Collation and use of data in appropriate formats throughout the project lifecycle would incur cost savings throughout the whole project, not just the IA workstream. While existing models are well-established for disciplines such as air quality, noise and water modelling, few practitioners currently carry out benchmarking predictions with actual observations of post-project monitoring. In many cases, the cost of undertaking post-project monitoring and evaluation against predictions is the main barrier and the reliability of conventional predictive tools and techniques is largely untested. However, recent changes to the EIA Regulations introduced a more-formal requirement to consider monitoring. Digital data collection, linked to an active platform and a positive monitoring loop, provides an opportunity to improve time and cost efficiencies and extend existing benchmarking practices to technical disciplines where numerical modelling is less-directly applicable, such as ecological, visual or social IAs.

Implementing Digital IA also has up-front time and cost implications before savings can be realised. The purchase of software and hardware for digital data collection, storage, management and presentation of IA will require short- to medium-term up-front costs as well as ongoing management costs. As an emerging field with little standardisation or regulation, different projects, proponents and/or consultants may have differing software and hardware requirements, and satisfying these may incur multiple costs. Without standardisation of formats across the platforms, the translation of data could also have additional time implications.

There would be a learning curve for staff associated with a transition from hardcopy-based software to new software packages, data environments and ways of working. Staff training would have initial time and cost implications as well as ongoing training costs.

Draft Principles for Digital IA

The purpose of this Primer has been to inform and aid the IA community and stimulate further discussion and debate.

The executive summary provides a short overview of the findings, although the Primer provides a large amount of information on a complex and emerging area of practice. To aid practitioners and stakeholders further, the following seven draft principles have been developed as a summary of key issues that a Digital IA project or organisation should strive to adopt:

1. **Technology offers opportunities throughout the IA process.** From surveys, input to design and optioneering, consultation, data analysis, reporting and monitoring, the opportunities presented by digital tools and technology should be considered across all stages of the IA lifecycle.

2. **Digital working can create a culture that promotes collaboration**. Digital expertise should be a core part of a project team from the outset to help design and facilitate digital working practices. Key benefits of a digital working culture include the pro-active identification of opportunities and constraints that come from working in a common data environment and from multi-disciplinary working in shared digital workspaces. Raising digital awareness and providing guidance and training in digital working to IA professionals will lead to more effective digital cultures.

3. **Information management underpins effective Digital IA.** The volume and pace of data generated within the IA sector is growing significantly and requires a structured framework to draw out the greatest value. Data handled without effective structures, ownership and assurance can lead to project risk and inefficiency. Governance around data management, quality and standards is essential for Digital IA to provide outputs such as digital reporting efficiently and deliver the best outcomes.

4. **Effective communication increasingly necessitates digital technology.** Digital technologies can make IA outputs more digestible and engaging in a manner that modern audiences are increasingly accustomed to. Furthermore, consultation, stakeholder engagement, access to environmental information and transparency in decision making can all be enhanced through better use of digital communications.

5. **Provide accessibility for all needs.** Data and digital tools need to be easily accessible, inclusive and understood by a wide variety of audiences while still maintaining security and confidentiality.

6. **Regulation should be carefully considered when defining digital solutions, yet also provides an opportunity to facilitate innovation and digital working.** Regulatory requirements can present challenges to digital IA. However, industry regulators and stakeholders also play a key role in facilitating the adoption of Digital IA in order to unify current IA practices with digital processes.

7. **Innovation and collaboration across the IA sector can improve outcomes for all**. Good practice across the IA industry and between IA sectors should be shared to inform wider practice. Best practice examples and lessons learned from prototypes should be shared widely to raise standards and promote innovation across the IA community. New data, trends and analysis techniques should be reviewed as Digital IA evolves to continually develop and improve IA practice.

Future Ambitions

Digital IA is advancing at a pace. This Primer highlights the opportunities presented now and in the near future. The possibilities of Digital IA are much greater and extend beyond those currently in sight. Ambitions for Digital IA and proposed next steps are presented below.

CATEGORY	FUTURE AMBITION	NEXT STEPS
Regulatory	Regulation changes that facilitate and encourage Digital IA	• Work with key stakeholders to remove references to, and requirements for, paper copies. • Roundtable with environmental and planning lawyers (such as UKELA) and IEMA's legal professionals and members to identify and resolve any legislative barriers to Digital IA. • IEMA Policy Lead for Impact Assessment to work with UK Government and Devolved Administrations on Digital IA policy development.
Data	Set and implement new industry-wide data standards	• IEMA to host expert roundtable with Geospatial Commission, Royal Geographical Society, Association of Geographical Information and other key organisations in GIS and data.
	Explore ways to open up and process the vast amounts of data collected for IA	• IEMA to engage with data scientists and digital experts, for example by working with the Open Data Institute.
Technology and Tools	Collaborate with specialists in other fields to bring innovation to practice	• IEMA to consult with specialists (e.g. academics, planners, architects) and learn from other industries and organisations, for example the Connected Places Catapult.
Effective Communication	Communication – engage with creative industries	• IEMA to host expert roundtable with creative industry, marketing and communication professionals to explore new ways of working and presenting information.
Culture and Approach	Practical guidance on applying digital working throughout the EIA process	• IEMA to consult on Primer and draft Principles. • IEMA to consider expanding upon the Primer to develop a guide/handbook, including more-detailed guidance on topics such as digital reporting, data collection and monitoring.

IEMA Transforming the world to sustainability

About IEMA

IEMA is the professional body for everyone working in environment and sustainability. We're committed to supporting, encouraging and improving the confidence and performance, profile and recognition of all these professionals. We do this by providing resources and tools, research and knowledge-sharing along with high-quality formal training and qualifications, to meet the real-world needs of members from their first steps on the career ladder, right to the very top. We believe that, together, we can change perceptions and attitudes about the relevance and vital importance of sustainability as a progressive force for good. Together, we're transforming the world to sustainability.

About the IEMA EIA Quality Mark

IEMA's EIA Quality Mark is a scheme operated by the Institute allowing organisations (both developers and consultancies) that lead the co-ordination of statutory EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed. The EIA Quality Mark is a voluntary scheme, with organisations free to choose whether they are ready to operate to its seven EIA Commitments: EIA Management; EIA Team Capabilities; EIA Regulatory Compliance; EIA Context & Influence; EIA Content; EIA Presentation; and Improving EIA practice.

iema.net

IEMA
+44 (0)1522 540069 | info@iema.net | iema.net
IEMA, City Office Park, Tritton Road, Lincoln, LN6 7AS. UK