

Building capacity through innovation

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Executive summary

In 2019 CIfA, in collaboration with the Association of Local Government Archaeologists (ALGAO), initiated a project funded by Historic England to address feedback from the 2017 *21st century challenges for archaeology* workshop series. The project, entitled *Building capacity through innovation*, focused specifically on the feedback that suggested there was a lack of innovation in developer-led archaeology. The aim was to explore this observation, identify the potential barriers and issues inhibiting the wider implementation of innovative approaches and present recommendations for improvement. Survey data were collected, and online discussions were undertaken to provide information related to practitioners' perceptions and experience of innovation in developer-led archaeology. This led to the identification of cost, time, and a lack of awareness about innovative applications as the primary barriers to implementing innovation, largely mirroring the 2017 *21st century challenges* workshop feedback. Notwithstanding these and other identified issues, project feedback highlighted that the historic environment sector does see itself as innovative, regularly adopting/adapting new science, technologies and methods for archaeological practice across developer-led archaeology. Several examples of innovative practice included in this report provide a valuable snapshot of the wide variety of work taking place in across the sector. However, the feedback emphasises that more work is needed to help promote and encourage the wider utilisation and implementation of innovation, especially in developer-led archaeology. Proposed recommendations for improvement focus on the themes of facilitating knowledge exchange and the dissemination of information across the historic environment sector.

1. Introduction

Whether it is defined as *the introduction of new things, ideas, or ways of doing something*, or as a *new idea, method or device* (see [Cambridge Dictionary](#) & [Oxford Learners Dictionary](#)), innovation embraces the notion of possibility and progress that is achieved through a combination of human ingenuity and scientific/technological advancements. It is described in various ways and can often mean different things to different people, but the fundamental concept remains the same – 'Innovation is a process that transforms ideas into outputs' (O'Sullivan & Dooley 2009, 4). Archaeological research and innovation go hand in hand with the desire and drive that comes from wanting to discover and learn more about the past. Innovation in archaeological practice has contributed over the years to the introduction of new methods, approaches, technologies, scientific techniques, and safer working practices, allowing archaeologists to delve deeper and extract more information to help support the delivery of public benefit to wider society. Individuals, organisations, and institutions from across the historic environment sector and beyond contribute to this process by engaging in innovative development and practice, both individually and collectively via research collaborations and partnerships. This success, and the impact of publicly funded and research funded projects/initiatives has been recognised and celebrated on the wider 'world stage' as evidenced in a UNESCO [review](#) undertaken in 2017. This review of the innovative capacity of the cultural heritage sector within the UK stated: 'the work being undertaken by UK universities and heritage institutions is broad-ranging, diverse and impressive, illustrating the UK's eminence in heritage science and research and its people-centred approach.' (UK National Commission for UNESCO 2019, 6). Although very positive, this view

is not consistently shared across all parts of the heritage sector and was highlighted as an area of concern for the historic environment sector particularly (and especially developer-led archaeology) in a 2017 project entitled [The world after PPG16: 21st century challenges for archaeology](#). The wider heritage sector is without a doubt 'innovative', but the *21st century challenges for archaeology* project stressed the need for a review of how well innovation is embedded in developer-led archaeological practice, in England, which can be a challenging and competitive environment to work in. Developer-funded projects often involve multidisciplinary teams and multiple stakeholders, are controlled by conditions of planning, monitored by local authority advisors, undertaken by commercial organisations and are subject to strict time and budgetary pressures (Pitts and Thomas, 2015). Therefore, consistency in relation to the ability to implement innovation is a legitimate area of concern.

21st century challenges for archaeology

The *21st century challenges for archaeology* project (funded by Historic England), was inspired by the 25th anniversary of the introduction of Planning Policy Guidance 16 Archaeology and Planning (PPG16). PPG16 dramatically changed the role and perception of archaeology in England from rescue and salvage to investigation, research, and mitigation/offsetting. It was instrumental in initiating widespread change across the historic environment sector, advocating for the protection and management of the archaeological resource, and is now integrated into the present-day National Planning Policy Framework (NPPF). The project organised a series of discussion workshops to reflect upon this turning point in the profession, covering different aspects of professional archaeological practice including archaeological archives, standards and guidance, designation and management of the archaeological resource, new models for advisory services, synthesis of information and challenges for archaeological publication in a digital age. Innovation was a theme running throughout the discussions, with the conclusion being that it was *limited* and *lacking* in some areas – a conclusion that contrasts with the success of the UK's wider innovative outputs as highlighted in the UNESCO [review](#). The lack of innovation in developer-led archaeology was attributed to a combination of factors including resource and time pressures, the related impact of reduced input from archaeological advisors and the need to better communicate public benefit (see ClfA/Wills 2018). The workshops outlined a series of proposed actions to address these findings, including identifying opportunities to promote change and innovation within the sector, strengthening links with regional research frameworks, identifying innovation case studies for further promotion/publication and further consideration of how barriers to greater collaboration and sharing of innovative approaches can be overcome.

The *Building capacity through innovation* project was commissioned in 2019 to explore these findings further, to understand better the role of innovation in current archaeological practice and to consider the mechanisms required to support greater consistency in its implementation. Funded by Historic England, ClfA worked in collaboration with the Association of Local Government Archaeologists (ALGAO) who provided advice during the early data-gathering stages. This report presents and discusses the data gathered and outlines a series of proposed recommendations for consideration that promote the need for greater knowledge exchange and communication across all disciplines and specialist areas, both within developer-led archaeology and further afield.

2. Project aim and objectives

The primary aims of this project were to

- investigate perceptions related to innovation in archaeology and explore how it is implemented across the historic environment sector, especially in developer-led archaeology
- explore further the potential barriers to implementation to gain a better understanding of their context and how they can be overcome to promote greater consistency in approach

To achieve this, data and feedback related to innovation, especially in developer-led archaeology, were collected from practitioners across the historic environment sector in England.

3. Methods and results

To achieve a better understanding of the role of innovation and its implementation in developer-led archaeology and to further explore potential barriers, the following methods to collect data and information were identified:

- practitioner survey
- online discussion
- literature review
- call for examples of innovative approaches

Practitioner survey

The survey was aimed at archaeologists undertaking a variety of roles across the historic environment sector, with some specifically tailored questions aimed at local authority advisors. The aim was to gather some initial baseline data to help establish how those working in different roles across the historic environment sector, and especially in developer-led archaeology, engage with innovation. The questions focused on how innovation is planned for, considered, and incorporated into projects, in addition to the barriers preventing more widespread implementation. The survey (using Survey Monkey as the platform) was circulated in August 2019 to ClfA, ALGAO and FAME (Federation of Archaeological Managers and Employers) members, ClfA Registered Organisations and several ClfA Special Interest groups. There were 62 responses; these can be viewed in Appendix 1.1 along with a written summary of the results in Appendix 1.2.

The questions included the following:

- does the identification and implementation of innovative techniques/methods feature in your organisation's business model/plan/strategy?
- does your organisation have a budget to facilitate research into innovation/development/research collaborations?
- how do you tend to find out about new approaches/techniques/technologies?
- have you been able to apply innovative approaches to your area of archaeological practice?
- how do you approach incorporating the use of innovative techniques on certain projects?
- do you think Regional Research Framework objectives encourage the use of innovative approaches on projects?
- local authority advisors only: How do you encourage the use of innovative approaches on certain projects?

- local authority advisors only: What type of information would you need before recommending/approving the use of a new innovative approach/technique/method on a project?
- would a published review of new techniques/methods/case studies be useful?
- what are the barriers to accessing and using innovative approaches/technologies on projects?
- how do you think these barriers could be overcome to achieve better awareness and application?

Online discussion

To engage a wider audience and to capture additional feedback, two online events were organised. The first comprised an hour-long Twitter chat which took place as part of the regular monthly Heritage 2020 #heritagechat programme that provides a discussion forum for the historic environment sector. An initial call for questions was circulated via social media with 11 questions selected to help structure the discussion. The chat resulted in 28 tweets from a variety of respondents (see Appendix 2). The questions selected for the chat included:

- on a scale of 1–10 where would you rank our sector in terms of innovation?
- is innovation always a good thing?
- how do practitioners currently discover innovations?
- how do we feel about/respond to other practitioners' innovations?
- how best can we as a sector assess which innovations will be genuinely useful?
- would a published review of new techniques/methods/case studies be useful?
- what are the primary barriers to adopting innovation in archaeology?
- how can we as a sector better promote and facilitate knowledge exchange when it comes to innovation opportunities?
- why are we not using better innovative forms of dissemination and publication (i.e., digital, open access) for greater public benefit? How can we do this?
- do you have any examples or case studies you can share where you have implemented innovative practice on a project?

The second event comprised an informal discussion about innovation as part of the regular ClfA 'tea chat' events that have been a feature since the beginning of the Covid-19 lockdown in 2020. The event took place in July 2020 and involved discussion with several practitioners from across the UK and further afield (USA). The feedback from this event and the #heritagechat was collated and fed into the wider project summary discussion.

Literature review

A review of relevant literature and practice journals focused on innovation in archaeology was planned to supplement the survey and discussion feedback. However, this was not completed due to difficulty in locating and collating examples that would form a representative sample of innovative practice from across the historic environment sector within the project timeframe. The reasons behind this exclusion are discussed more widely as part of the summary discussion, as they also relate to some of the identified barriers to implementation.

A call for examples of innovative practice

To supplement the methods already employed and to achieve a better understanding of how innovation is being implemented across the historic environment sector, and in developer-led

archaeological specifically, a general call was circulated for examples of innovative approaches/practices from individuals and organisations. Table 1 outlines eight examples (Appendix 3) that highlight a wide range of innovative approaches ranging from desk-based solutions to data management, the use of different survey techniques, geochemical sampling, specialist analysis, adaptation of technologies from other industries and sectors, interactive publishing methods and different approaches to engaging audiences for public benefit.

Table 1 Examples of innovative approaches			
Appendix 3	Author(s)	Organisation	Topic
Appendix 3.1	Dr Chrys Harris	Magnitude Surveys	Making Ground Penetrating Radar more efficient
Appendix 3.2	Dr Clive Waddington Dr David Passmore	Archaeological Research Services University of Toronto	Geoarchaeological approach to evaluating large land parcels
Appendix 3.3	Dr Emma Tetlow Dr Emma Hopla	Costain Skanska Joint Venture HS2	ERT and EM surveys
Appendix 3.4	Jay Carver Roger Doonan Dr Clive Waddington	Fusion Joint Venture University of Sheffield Archaeological Research Services	Geochemical sampling as a method for archaeological evaluation and prospection
Appendix 3.5	Adam Brossler	HS2	New approach to understanding Historic Landscape using National HLC datasets
Appendix 3.6	Dr Rachael Townend	Crow Archaeology	QGIS stylesheets
Appendix 3.7	Dr Evelyne Godfrey	Uffington Heritage Watch	Provenancing Roman Iron
Appendix 3.8 (a&b)	Milica Rajic	Wessex Archaeology	Innovative open access publishing & Innovative approach to outreach

4. Summary discussion

The survey and online discussions formed the primary sources of input gathered for this project, and although they represent the views of a small percentage of practitioners, the information still provides valuable baseline data and insights regarding engagement with innovation. The feedback is expanded on below in relation to the following themes, exploring the barriers to innovation, innovation in developer-led archaeology, examples of innovative practice, the transition from innovation to standard practice and how more consistent implementation of innovative practice can be encouraged.

Exploring the barriers to innovation

As part of the survey, respondents were asked to identify potential barriers to accessing and implementing innovative approaches/technologies on projects with a list of options provided. The most frequent barrier identified was cost (76%), followed by time pressures (69%) and a lack of awareness of new approaches (66%). The remaining options included lack of in-house expertise, training, commercial availability at short notice, little evidence of previous use, lead in/delivery times, equipment/software, client/advisor approval, adherence to Standards and guidance and not knowing where to look for information (Table 2). The answers provided as free text further supported these themes by highlighting constraints associated with the planning system, specifically the ability to justify the use of a new technique or approach for planning-led projects, a lack of resourcing for

professionals to effectively identify and contemplate the use of new approaches and the availability of some specialist services for commercial projects that require a quick turnaround. These barriers are highlighted in various parts of the wider discussion below but unfortunately the project was not able to fully unpack the context surrounding them. For example, when looking at cost as a barrier, there could be several reasons for this, including a perception that innovation is too expensive, difficulties in convincing clients and project commissioners to fund certain research/investigative approaches, the discovery of specific approaches too late in a project to factor into budgets or more likely a combination of all these factors. The specific circumstances surrounding a barrier will undoubtedly differ project by project but investigating them in greater detail would provide a clearer understanding of how they can be overcome, offset, or avoided from the outset.

Table 2 Identified barriers to implementing innovation	
Barrier	% respondents
Cost	76
Time pressures	69
Lack of awareness of new approaches	66
Lack of in-house expertise	47
Training	47
Commercial availability at short notice	42
Little evidence of previous use	37
Lead in/delivery times	35
Equipment/software	34
Client/advisor approval	29
Adherence to Standards and guidance	26
Not sure where to look for information	24
Other	16

Innovation in developer-led archaeology

Survey respondents and those taking part in the online discussions generally viewed the historic environment sector as innovative with evidence that new science, methods, and technologies were regularly being adopted/adapted to archaeological projects. Innovation was not just interpreted as reflecting ‘new’ developments, but also adapted, revisited, and revised approaches that apply to all aspects of work from initial project planning, data gathering and archaeological excavation right through to analysis, archiving and publication. The latter is well evidenced in the range of innovation examples submitted (Table 1) but also more widely in the way the sector has had to adapt its working practices in response to the worldwide Covid-19 pandemic. However, the determination of how well innovation is embedded in developer-led archaeological practice is less clear. Looking at organisational approaches, over half of the survey respondents (62%) indicated that the identification and implementation of innovative techniques/methods featured in their organisation’s business model/plan/strategy but 56% also indicated that their organisation did not have a specific budget to facilitate research into innovation/development/research collaborations. These results illustrate that while for some a commitment to facilitating innovation may form a key business target and be contained within a plan or strategy, this is certainly not the case for all, and in those instances where it is, there may not be a defined budget to help support it. This links to feedback from the survey regarding a lack of resourcing for professionals creating a barrier to effectively identifying and contemplating the use of new approaches. As a result, having a defined approach and resources to

support innovation in the workplace appears to be a key component for archaeological organisations and individuals operating in developer-led archaeology.

Examples of innovative practice in developer-led archaeology

The innovation examples outlined in Table 1 and described in more detail in Appendix 3 provide some insight into the types of innovative approaches being explored and implemented by individuals and organisations operating within developer-led archaeology in England. The examples highlight approaches and applications that range from:

- desk-based solutions
- data management
- survey techniques
- sampling methods
- specialist analyses
- the adaptation of technologies from other industries/sectors
- the use of interactive/digital publishing and other methods to engage wider audiences

Most are directly associated with developer-led projects or have potential applications to them and include contributions from sole traders, researchers, medium–large organisations and joint ventures operating on one of England’s largest current infrastructure projects (HS2). There are also published examples of innovative practice available elsewhere that demonstrate the value of collaboration and knowledge exchange, especially across different sectors. For example, a piece written by Caroline Raynor on innovation highlights how the construction industry and archaeologists can work together to ‘unify construction and archaeological processes in order to maximise learning, innovation and environmental impact management’ ([Raynor 2019a](#)). A second piece by the same author presents a HS2 case study that focuses on the work of Costain-Skanska Joint Venture alongside a team of archaeologists on a large archaeological site in Euston, London. This case study showcases how the application of approaches and techniques routinely implemented in engineering and construction (for example, lean and ergonomic processes) helped to increase performance, reduce risk, and introduce technological innovations on a sensitive excavation (Raynor 2019b). However, despite the varied examples of innovative practice showcased in this report and elsewhere, the project feedback still points towards inconsistency in implementation across the historic environment sector. The barriers and issues highlighted in the survey and online discussion feedback show that despite the positive work being undertaken by some, improvements are still needed to facilitate further opportunities to encourage, develop and expand upon the innovative practice already taking place. For this to be successful there needs to be a better understanding of the process of discovery related to innovation and how this translates into standard archaeological practice, as well as the wider encouragement to utilise and implement innovation on developer-led projects.

The transition from innovation to standard practice

To appreciate the role and impact of innovation in developer-led archaeology, the overarching processes by which innovative techniques and approaches are communicated, disseminated, tested, recommended, and adopted as standard practice need to be formalised. This is especially important if they are to adequately support those organisations undertaking archaeological works and help guide archaeological advisors recommending specific approaches. At present it is difficult to pinpoint how the cascading of information works in practice; for example, understanding how innovations developed in other industries, as part of university research, or as applied on larger infrastructure projects become shared, communicated, and eventually regarded as standard practice. When asked

as part of the survey how new innovations are discovered, most respondents (88%) indicated that word of mouth/networking amongst colleagues and across professional networks formed a key source of knowledge exchange, closely followed by publications/new items and conferences/events. This illustrates the importance of these networks and forums for sharing information but also points towards the fact that there appears to be no formal structure or defined process in place that governs how innovation is introduced, recommended and implemented across the historic environment sector. As a result, it is not clear how a new application or technique evolves into a trusted approach that can be recommended by local authority/specialist advisors (Historic England Science Advisors, for example) or where practitioners can consistently access useful information. This is not a criticism but an observation captured in the survey feedback that highlights the potential impacts of the ad hoc approach taken. For example, over half (66%) of respondents identified barriers that included *a lack of awareness of new approaches* along with *little evidence of previous use* (37%) and *not sure where to look for information* (24%).

The fact that developer-led archaeology represents a fiercely competitive market is undoubtedly a contributing factor that cannot be ignored, especially in relation to the development and sharing of information, but beyond that the wider historic environment sector also comprises numerous sub-disciplines, specialist areas and sources of information, which compounds the issue. Although relatively small by comparison to other sectors, the number of specialisms and potential crossovers and collaborations with other specialists and industries (science, biology, ecology, IT, engineering, construction etc) is wide ranging and ultimately means that publicised case studies and reports pertaining to innovative practice may appear in a range of specialist journals, books and grey literature. The tendency for archaeological publications to focus heavily on the outcomes and results of projects also creates a vacuum in knowledge about methodological approaches that would be useful for those operating in developer-led archaeology. Archaeological results can be published in a wide variety of period or specialist journals, but there is often little in the way of practical information supporting the approaches taken to obtain those results. It would be useful to have more information like this appearing in general publications aimed at those working across the historic environment sector, for example, *The Historic Environment: Policy and Practice Journal*. Consequently, relevant information is often dispersed, difficult to find for non-specialists, not always easy to access (without a subscription) and not written in relation to commercial applications – issues that formed the primary catalyst for the exclusion of the planned literature review as part of this project. Therefore, the fact that innovation was seen to be lacking in certain areas in the 2017 *21st century challenges for archaeology* workshops is understandable and is a perception further supported by the current project feedback. As it stands, the sector, and especially developer-led archaeology, is faced with the dichotomy of being able to demonstrate some excellent and thought-provoking examples of innovative practice (see Table 1 and Appendix 3) showing positive progress for some, alongside the continued and persistent identification of barriers preventing similar progress for others. Overcoming this inconsistency in a competitive market environment is perhaps going to form the greatest challenge but promoting wider sharing and greater accessibility of information could be a crucial first step.

Encouraging the use of innovation in developer-led archaeology

The top two barriers highlighted in the survey and in the online discussions were cost (76%) and time pressures (69%). These two primary barriers also undoubtedly link to others highlighted, including being unaware of innovative approaches, not being able to adequately justify their use, or not having enough time to use them. In total 85% of survey respondents were in favour of having access to guidance outlining innovative approaches, pros/cons, associated costs and applicability to site conditions to aid knowledge exchange and decision making. If information like this was more readily available in the public domain (as highlighted above), this would provide a more robust structure for

the dissemination of information and would potentially encourage earlier consideration of different approaches. This may not eliminate the barrier of cost, of access to funding or of time pressures depending on other project-specific factors, but having the information available would allow these barriers to be potentially offset at an earlier stage. This information would be useful to those working in a variety of roles, especially consultants, clients, developers, and anyone else commissioning archaeological works and/or projects. For example, in the online discussions it was commented that if a requirement for innovation was a regular feature in tender documentation this would encourage the wider use of innovative approaches, allowing them to be factored into budgets earlier on in the process. The need for accessible information and guidance was highlighted in the practitioner survey by 85% of respondents and when asked about the types of information required before a specific innovative approach could be recommended for use, those working as archaeological advisors highlighted that access to previous results (72%), evidence of previous use (69%) and practitioner feedback (64%) were key requirements, followed by access to publications/written reports (49%). In total 70% of advisors indicated that they encouraged the use of innovative approaches via general communication and through the project brief/specification documentation; therefore, having this information to hand would clearly be beneficial.

The network of Regional Research Frameworks (RRFs) that span each region of England represents a possible platform to encourage innovation by providing information and research objectives to aid the decision-making process in relation to archaeological research. When asked as part of the survey whether the RRF objectives encourage the use of innovative approaches on projects there was a clear division in opinion, but also some uncertainty. A total of 24% of respondents agreed that the objectives encouraged innovation, but 26% of respondents did not, with the larger proportion (35%) answering that they were not sure. Some of the responses were elaborated on to provide wider context, including that the RRFs were quite variable and in their current 'static' format were subject to being out-of-date relatively quickly. However, the current development of a wiki-based format for RRFs would remedy the latter, enabling updates to practice as they happen, which would help to disseminate and encourage the application of innovative techniques/approaches as they become available. In this format, the RRFs could potentially be used as a useful driver to disseminate information about innovative practice and tried and tested techniques across the sector in a more consistent fashion, providing support and useful information for advisors and for practitioners when liaising with clients.

5. Recommendations

The feedback and examples of innovation gathered as part of this project have provided valuable insight into the role that innovation currently plays in developer-led archaeology, following on from the 2017 *21st century challenges for archaeology* workshop observations. A series of proposed recommendations are outlined below to initiate further discussions and to help maximise the potential that consistent innovative practice has to offer across the sector.

When the question was asked as part of the practitioner survey how the identified barriers to innovation could be overcome to achieve better awareness and application on archaeological projects, the answers focused on greater communication and collaboration between historic environment professionals. It was suggested that this could be achieved via the regular circulation of thematic papers/case studies by organisations like ClfA, ALGAO and FAME focused on different methods and techniques, the organisation of more training/seminars/webinar opportunities to better promote innovation and to highlight lessons learned, the provision of advice on how to be cost effective in the application of innovative techniques, the production of guidance outlining different approaches, their pros/cons, and associated costs and applicability, in addition to the use of current networks, for example, the Historic England Science Advisors, as a regular channel/conduit for

circulating information to those within their areas. These suggestions have been touched upon in the discussion above and are also included in several recommendations presented for consideration below. These concentrate on knowledge exchange and the dissemination of information and are predominantly focused on actions that CifA in its role as the leading professional body for archaeologists, could undertake. However, the recommendations have also been deliberately worded to be general to stimulate discussion and for organisations to review and identify what they could take forwards. A collective approach to the issues raised would be beneficial and the most proactive route forward; therefore, it is hoped that this report will encourage productive discussions and the potential identification of a delivery framework for the recommended actions.

Knowledge exchange

Knowledge exchange from research projects, larger infrastructure projects, and other industries down to those individuals and organisations operating in developer-led archaeology is essential to ensure that practitioners have access to up-to-date information and potential applications. The project feedback identified that a largely ad hoc approach is taken to implementing innovation across the historic environment sector at present and organisations do not routinely include innovation as business targets or have resources dedicated to its implementation. As a result, there is no consistent process for the routine cascade of information or consistent support for research or delivery. Establishing a singular process to fit a sector that comprises so many subdisciplines is perhaps unfeasible but gathering information and bringing people together to share experiences is one way of combatting this. The provision of regular forums/events aimed at drawing together people from within the sector and those operating in other sectors/industries should be considered – for example, a standing session at an annual conference, an annual event, or a series of seminars across the year. These would also provide valuable CPD and training opportunities.

Collaboration is clearly fundamental to this process. Looking at academic research as an example, a recent scoping study (*Mapping collaborative interactions between Higher Education Institutions in the UK and the Heritage Sector*) provides an interesting overview of the collaboration between developer-led archaeology and academia. The research was undertaken on behalf of the Heritage 2020 *Discovery, Identification and Understanding* working group by the University of Newcastle and showcased the high levels of collaboration being undertaken between UK higher education institutions and the UK heritage sector. However, it also noted that these collaborations could be developed and improved upon further with plenty of ‘untapped potential’ to explore. The research being undertaken by historic environment postgraduates across the UK and further afield forms an excellent resource of innovative ideas, approaches, and data for developer-led archaeology and one which is probably not being maximised at present. Therefore, supporting and encouraging knowledge exchange across these (and other) channels is essential. The potential public benefit associated with fostering wider collaborations is also well demonstrated by the Massive Open Online Courses (MOOC) developed by Durham University. These courses engage learners and demonstrate how the results from developer-led archaeology projects can be taken forward into full-scale research projects. The results of research projects can be analysed and translated into a variety of formats (exhibitions, plays, music, fiction, etc), which not only highlights the potential for archaeology to reach wider audiences but also provides a valuable legacy for the work undertaken – see <https://www.futurelearn.com/courses/battle-of-dunbar-1650>. Other examples of collaboration and knowledge exchange include the [Early Medieval Archaeology Project \(EMAP\)](#), which was a collaborative archaeological research project funded by INSTAR and the Irish Heritage Council. This project brought together university students and commercial organisations with a focus on the archaeology and history of early medieval Ireland.

The opportunity that these types of knowledge exchange examples afford is more widely emphasised in the UK Research and Innovation [publication](#), *The UK's research and innovation infrastructure*:

opportunities to grow our capability, which states ‘Heritage science infrastructures can act as bridges between the humanities and sciences by using scientific analysis and technological innovation to understand, manage and communicate the human story, expressed through landscape, buildings and artefacts’ (UK Research and Innovation, 65). Therefore, facilitating knowledge exchange both for practitioners and the wider community should be a priority.

Recommendation summary

- for heritage sector organisations across the historic environment sector to review their own approaches to innovation, identify where improvements could be made and encourage the wider sharing of information. For those organisations with membership networks to also encourage others to do the same
- for ClfA to promote to Registered Organisations the benefits of identifying innovation as a business target with dedicated funds and resources allocated to support its delivery
- for ClfA (and others) to develop additional tailored training/CPD events and opportunities, with specialist input (for example, the Historic England Science Advisors/ClfA Special Interest Groups/ALGAO, etc)
- ClfA to organise an event focused on promoting innovative practice, facilitating knowledge exchange, and encouraging network opportunities. To consider how this could be repeated in the future to engage a wide-ranging audience
- promoting links to existing collaborations and projects that are facilitating knowledge exchange; for example, the MOOC courses
- for ClfA to work with sector partners to investigate the context of the identified barriers to innovation; for example, cost. This could potentially involve a follow-up survey as a future piece of work

The dissemination of information

With time constraints and resource issues highlighted as barriers to implementation in developer-led archaeology, ensuring that relevant information is available and accessible is essential. This is not just relevant to those working within developer-led archaeology and the historic environment sector, but also for those in the wider heritage sector, academia, community groups and the public. There are several options that could be explored to help facilitate the dissemination of information, including the use of already established networks, the creation of a centralised resource, utilising frequently used platforms/information sources, and encouraging the use of open access publishing alongside the regular use of other publications as avenues for facilitating dissemination. Employing already established networks, like the Historic England Science Advisors, or Special Interest groups/associations as regular channels/conduits for relevant information is one avenue for disseminating information about innovative practice to relevant audiences. The inclusion of information in resources regularly referred to already, like the RRFs (especially when in their new wiki-based format) is also worth consideration. This would ensure the delivery of information to practitioners working across the historic environment sector, from the provision of advice to undertaking archaeological works. Another option is the creation of a dedicated webpage/online resource containing case studies and useful information; the development of a framework for knowledge exchange like the Historic England funded [HistBEKE](#) (Historic Built Environment Knowledge Exchange) is a good exemplar. A web resource for innovation like this could be linked to other sources of information – for example, the newly developed wiki based RRFs – as well as to larger scale synthesis research projects, sector-wide Standards and guidance and other resources, for example the funded projects database hosted by the UK Research and Innovation website (<https://gtr.ukri.org/>).

Encouraging the regular use of publications for the dissemination of information for those working across the historic environment sector and beyond would also help to establish a regular forum for content related to innovative practice or approaches. For example, the scope of [The Historic Environment: Policy & Practice](#) journal includes ‘New techniques in the investigation of ancient and recent archaeological sites, landscapes and buildings’ so could be a good candidate. For wider audience engagement, open access content should be explored more frequently, an example being web-based journal [Internet Archaeology](#). This platform allows the incorporation of interactive content into online publications, including links to video, audio, enhanced imagery, and animation. The benefits of open access in terms of engagement and inclusivity are clear (see Appendix 4 for case study) but as with publications that come with a subscription, there are also associated costs with open access publications and for developer-led projects; these costs would need to be factored in at the design stage.

The importance of sharing and disseminating information via publications and by other means is essential to delivering public benefit and social value. A recommendation published as part of the UK National Commission for UNESCO (UKNC) publication on Cultural Heritage innovation stated, ‘All funding bodies should require that outputs from projects are made public and promoted in the UK and ODA eligible countries in order to share knowledge and maximise impact’ (UK National Commission for UNESCO 2019, 8). The communication of results in developer-led archaeology is built into the planning process and secured by archaeological conditions but this recommendation emphasises the importance of disseminating and communicating information, whether it is within or outside of the planning process. Putting this at the forefront of projects in developer-led archaeology, writing it into WSIs and costing for it early in the project planning stages will help to deliver public benefit and engage audiences, helping to promote a longer-term impact and project legacy for communities and wider society.

Recommendation summary

- for ClfA to encourage greater interaction with the journal *The Historic Environment: Policy & Practice* via its member network, where subscription packages are offered as part of ClfA membership. This journal exists specifically for those working across the historic environment and provides a good forum for discussion of innovative approaches and methodology
- for ClfA (and others) to identify and publicise more widely (especially to clients) case studies and projects that highlight the benefits and public value associated with innovative practice
- for ClfA to encourage members and organisations to engage early with clients and the commissioners of projects to ensure that innovation is considered early on in the process and that relevant costs/resources can be assigned to support delivery
- for organisations to utilise already existing specialist networks, Historic England Science Advisors/Special Interest Groups, etc, as a way of sharing information about innovative practice
- for ClfA to seek funding towards the development of a dedicated webpage/framework for knowledge exchange to host information and resources, including case studies, focused on innovation
- for ClfA to discuss with Historic England colleagues the feasibility of adding information to the newly developed wiki-based RRFs when they are complete, pertaining to specific innovative approaches, suitability, pros and cons, cost, etc

6. Conclusion

The *Building capacity through innovation* project was commissioned to address feedback in the 2017 *21st century challenges for archaeology workshop* series that identified a lack of innovation in developer-led archaeology. To further explore this conclusion the project gathered feedback from across the historic environment sector to gain a better understanding of the implementation of innovation in archaeology, to identify the potential barriers and issues experienced by practitioners and to present proposed recommendations for improvement. There is no doubt that developer-led archaeology is innovative, with several wide-ranging examples included in this project attesting to this fact. However, the approach taken to sharing information about innovation across the wider sector is ad hoc at best leading to inconsistency in the delivery of information and the ability of practitioners to consistently consider and implement it. As a result, innovation is still lacking in some areas with feedback largely mirroring that of the *21st century challenges for archaeology* project. Overcoming the barriers to innovation identified across the historic environment sector and especially in developer-led archaeology hinge on the ability to improve *knowledge exchange* and *information dissemination*. If these processes can be improved, a large proportion of the barriers identified will be resolved. This would lead to an increase in capacity for innovative practice granting those working in developer-led archaeology greater access to information and advice. It would support those who commission, specify, and monitor archaeological works to consider and promote innovative approaches more proactively and it would provide the public with added value when data is shared more widely. A report published by Nesta in February 2020 (*Is the UK getting Innovation right? A survey of perceptions of the impact of innovation and technology*) provided a recent insight into the British public's perception of innovation highlighting it is '*...seen as a vital tool to help address socio-economic issues*'. Archaeology adds value to society and by addressing the barriers to innovation identified in this project, and maximising the value gained from innovative practice, archaeology has the potential to contribute on an even greater scale with longer lasting impacts.

7. Links and references

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Appendices

Appendix 1.1	Summarised survey data
Appendix 1.2	Survey summary
Appendix 2	#heritagechat
Appendix 3.1	Innovation example (Making Ground Penetrating Radar more efficient)
Appendix 3.2	Innovation example (Geoarchaeological approach to evaluating large land parcels)
Appendix 3.3	Innovation example (ERT and EM surveys)
Appendix 3.4	Innovation example (Geochemical sampling as a method for archaeological evaluation and prospecting)
Appendix 3.5	Innovation example (New approach to understanding Historic Landscape using National HLC datasets)
Appendix 3.6	Innovation example (QGIS stylesheets)
Appendix 3.7	Innovation example (Provenancing Roman iron)
Appendix 3.8	Innovation example (Innovative open access publishing)
a&b	Innovation example (Innovative approach to outreach)
Appendix 4	<i>Internet Archaeology</i> open access publishing