Green Impact Excellence Project Report

To be completed before 5 May 2023 (approved extension until 12 May 2023)

This update is an opportunity for you to celebrate your hard work and achievements in Excellence. We hope that a lot of your projects will continue after the submission deadline, but you should aim to summarise your work so far, as well as any work due to be completed. Please ensure your project update doesn't exceed 2,500 words.

Name of Team: Green Impact Group (GIG)
Excellence Submission Title: Turning studies paperless

A summary of your project's achievements

This should reflect the projects aims and objectives as outlined in the project plan.

Table 1 below presents a summary of the project achievements and reflect the projects aims and objectives as outlined in the project plan.

Table 1 – Project achievements

Original aim / objective	Evidence	Relevant Appendix
Reduce paper usage in research studies involving collection of participants' data and/or samples.	Fenland Study used to provide an estimate of the amount of paper saved by moving to digital platforms.	A
Reduce energy consumption (through the reduction in scanning, storage and disposal of paper documents).	Assessed environmental benefit of reducing travel costs (to storage offsite storage in Haverhill).	See Table 2 and Appendix B
To digitalise all research systems and processes involved in one of our flagship studies (3rd phase of the Fenland Study), including: • Participant consent forms • Case report forms (CRF) • Storage of source data (from anthropometrical devices, ECGs etc.)	The process of digitalizing our systems and processes (for Fenland 3 and other studies) is progressing well but with a few delays we now have a proposed start date of Fenland 3 for August 2023 (as of 14th May 2023).	A and B

• All participant documentation including questionnaires and results feedback.		
• To reduce the amount of paper documents stored and destroyed, and subsequent energy consumption associated with these actions (i.e. fuel used associated with the transportation of documents to storage sites and energy use involved with scanning, shredding and disposal).	Using data from Fenland 2 we have predicted the vehicle travel costs of Doxbond, the offsite storage company used by our Unit.	See Table 2 and Appendices A and B.

KPI Delivery Update

Please refer back to the KPIs you stated in your project plan and report the progress made. If you didn't quite meet your targets, you can make reference to any challenges in a later section. The most important thing here is to check you've been able to accurately measure your KPIs. Please also mention your target KPIs alongside your actual figures. The table below may be helpful.

Table 2 – KPI delivery update

KPIs (as in project plan)	Revised KPIs (If applicable)	Actual outcomes
Demonstrate reduced paper usage by: • Comparing the approximate number of pages used per volunteer in previous Fenland study phases. • Calculating approximate carbon savings (CO2 equivalents) by comparing Fenland 3 paper usage with previous study phases.	N/A	• 92% reduction in paper use (see Appendix A).
Demonstrate reduced energy consumption by: • Calculate carbon cost of digitalising documents and processes for Fenland 3 (i.e. environmental cost of using servers) and compare to carbon costs of previous paper versions of study (i.e. paper production, scanning, storage and disposal).	A significant challenge is estimating an accurate assessment of the environmental impact of storing data electronically compared to the production of paper copies. Web based evidence is mixed[1-3] and it was thus more pragmatic to assess the environmental benefit of reducing travel costs (to storage sites such as Doxbond),	• Savings of £527.67 and 792kg CO2 compared to Fenland 2 (see Appendix B).

• Calculate carbon cost of digitalising documents for other future studies undertaken by the department by applying tools developed for Fenland 3.	something we have successfully calculated in a previous Excellence Award[4].	• 92% reduction in carbon cost (see Appendix A)

Sources

1 https://www.saxoprint.co.uk/blog/print-vs-digital-greenest

2 https://www.theguardian.com/sustainable-business/digital-really-greener-paper-marketing

3 https://www.custommade.com/blog/e-readers-vs-print-books/

4 MRC Epidemiology Unit Excellence Report 2021-22: Ultra Low Temperature (ULT) freezer centralisation programme

Evaluating the impact of your project

How can you evidence the success of your project, other than through the KPIs above? Qualitative data is as useful as quantitative data so you can add anecdotal evidence here on the overall result of your project. You may wish to refer back to the 'action plan template' that you submitted in your project plan in December. Are there any things that resulted from the project that you can't easily measure? What were your team members', colleagues' and senior management's views on the project?

Alongside the purported environmental and financial savings (see appendices A and B) electronic data collection is a much more streamlined process than the equivalent paper based trial. Despite the environmental concerns over electronic data storage during the undertaking of clinical studies[1] there are a number of energy consuming steps that can be removed. Figure 1 below presents an illustration of how data storage can be streamlined, using ECG generation and review as an example.

Previously an ECG was printed at an external site, scanned and emailed/faxed to a clinician (if they were not present on site), printed at the site of the clinician, reviewed, signed by hand and then rescanned, emailed/faxed back to the external site where it was printed for the hard file! For Fenland 3 it will simply be generated electronically by the ECG onto our network where it can be viewed online and signed electronically where it can be seen directly by the external site.

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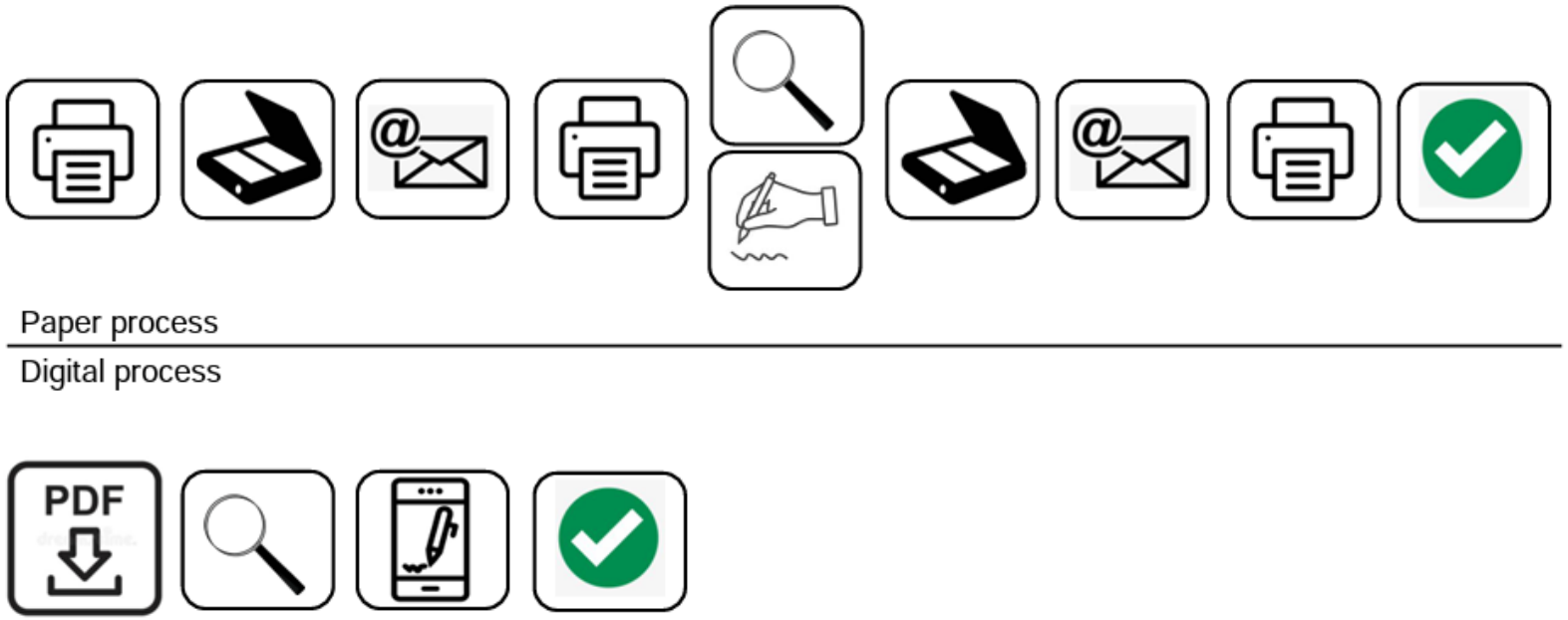

Figure 1 – Streamlined process of electronic data collection, using ECG generation and review as an example

Source
1 https://shcoalition.org/clinical-trials/

In addition to the energy saving processes highlighted in Figure 1 a number of study benefits have been realised, which are invaluable to Unit staff as well as study volunteers (see Figure 2 below):

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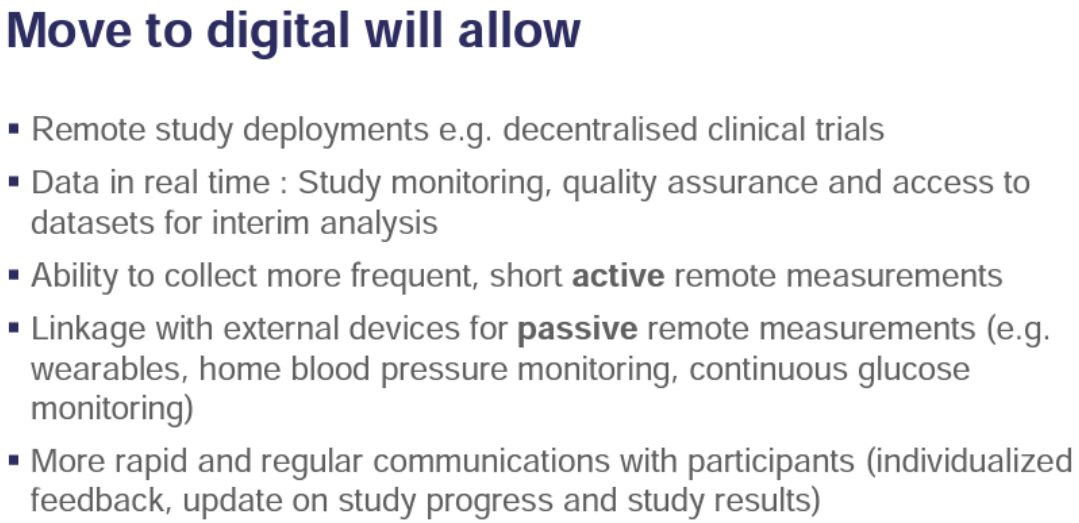

Figure 2 – The move to digital processes offers a number of benefits for both the study teams and volunteers

Project Difficulties and Opportunities

What were the barriers (if any) to your project's success and how did you overcome these? Has the project raised any opportunities? If so, how does your team plan to take advantage of them? This is an ideal place to make reference to any unexpected issues or barriers that may have come up during your excellence project. If your project plan didn't progress as planned, please explain why and what you did instead.

We have successfully achieved three of the four SMART actions set at the beginning of the project, and partially competed a fourth. The fourth SMART action was to "calculate (the) carbon cost of digitalising documents and processes for Fenland 3 (i.e. environmental cost of using servers) and compare to carbon costs of previous paper versions of study (i.e. paper production, scanning, storage and disposal)".

We sought the opinion of our IT department on whether the calculation of the environmental impact of storing documents and data electronically was feasible, and if so, whether an accurate estimation of environmental costs could be ascertained. Since our servers are hosted in Cambridge at the Biomedical Campus and in the Sainsbury Lab Server Room at the Botanical Gardens, the difficulty arises from accurately assessing our usage since our servers host shared services that run processes, services and applications for the entire Unit. We therefore decided to focus on more tangible energy costs that we are able to measure with more confidence, such as the reduction in travel costs (both environmentally and financially) as a result of storing data electronically (see Appendix B), since we will not be required to utilise the transport services of off-site storage sites (e.g. Doxbond) for Fenland 3.

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Value added benefits

Please outline what the value added benefits of completing an Excellence project were. These are anything that arose from the project that wasn't planned, or any additional benefits outside of your original KPIs and objectives. Examples could be building community bridges, strategic community partnerships, engaging hard to reach students, helping to widen participation in sustainability issues, building a stronger Green Impact community etc.

There have been a number of further benefits to the 'Turning studies paperless' venture. These include:

- Electronic studies will now become more commonplace and feature heavily in our grant applications, potentially providing our Unit with an advantage over other research groups who have not yet made the progression to electronic data collection.
- No more annoying boxes that take up a lot of physical space (at least for future studies) – see photograph section below.
- No more paper Adverse Event forms, with electronic versions saving both time and improving speed of communication / reporting.

Legacy

Please outline where you hope to take the project next and what the legacy effects of your Excellence submission are. For instance, will the project continue? Will the project result in any lasting change? Do you plan to share the results with others or is there scope for others to adopt a similar project? What would your recommendation be to others wishing to carry out a similar project?

The intention for the Unit is that from this point forward all studies will move to an electronic format, or at least feature some level of electronic data capture. The final development of the processes required to enable Fenland 3 to start is yet to be completed (data collection now predicted for August 2023) and will require close communication between the principal investigators, study support, data management, IT and data collection teams and the application software developers InkSpot and Flipside Health. Despite the clear environmental and financial benefits of reducing paper usage during clinical studies, there are significant concerns for the carbon footprint of storing data electronically[1]. The challenge for us, and the medical research groups globally, is to strive to reduce the carbon emissions as much as possible[2-4].

Source

1 https://shcoalition.org/clinical-trials/

2 https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01384-2/fulltext

3 https://thepublicationplan.com/2022/09/29/how-to-lower-the-carbon-footprint-of-clinical-and-biomedical-research/

4 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839193/

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Photograph

Please include a photograph (or photographs) relating to your project – you can provide captions for these in this section.

Fenland 3

Fenland 2

Photographs – Space and travel saving comparison between Fenland 3 (digital process) and Fenland 2 (paper process)

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Appendix A – Paper usage and associated carbon cost during the Fenland Study

Fenland 2
The first two phases of the study (completed between 2005 and 2020) have been heavily dependent on paper usage. 12,435 volunteers were seen at phase 1, with 7,805 returning for Phase 2. Paper documents were used for both phases which resulted in a huge amount of paper being used (~ 0.5 million sheets of paper for Phase 2)!

Phase 2 Paper: 63 sheets of A4 (per volunteer) x 7,805 (volunteers) = 491,715 sheets of A4!

Based on a calculation made for some Green Impact workbook evidence in 2021[1] that amount of paper equates to 1286kg of CO_2[2]. 113 boxes were used to store the paper at an offsite storage company for Fenland 2 which approximately equates to 11.4kg of CO_2 per box. 284 boxes were used for Fenland 1 which roughly equates to 3,232kg of CO_2. The combined CO_2 cost of Fenland 1 and 2 is therefore 4,518kg (or 4.5 metric tons) of CO_2, which is the equivalent of the annual production of a typical passenger vehicle![3]

Fenland 3 (Predicted)
In 2022 an estimated 82% of 55-64 year olds had a smartphone (current range of ages in Fenland Study is 48 to 73 years of age). The East of England is comparable to the the UK average for high digital capability (64% versus 63% respectively)[4]. Since approximately 10% of the population cannot use an IT application and 1% of the UK had not used the internet in last 3 months[4], it is therefore reasonable to assume that approximately 10% of the Fenland 3 participants will require paper forms to complete the study visit.

Phase 3 Paper: 63 sheets of A4 (per volunteer) x 10% of 6,000 (participants) = 37,800 sheets of A4 (a 92% decrease in paper usage compared to Phase 2), equivalent to 102kg of CO_2.

Sources

1 https://www.environment.admin.cam.ac.uk/news/saving-trees-resources-and-money-mrc-epidemiology-unit-over-lockdown
2 491,715 sheets of paper is just over 983 reams, based on 500 pages per ream, which equates (very approximately*) to a saving of 59 mature trees or 1286kg of CO2**. Our calculation of the number of mature trees saved is based on information from the Urban Forestry Network and Conservatree.**
3 https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle#typical-passenger
4 https://pubmed.ncbi.nlm.nih.gov/36194866/

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Appendix B – Financial and environmental costs of a small van travelling from Doxbond (Haverhill) to Cambridge Biomedical Campus

Table 5 - Calculated financial and environmental costs as a result of small van return travel

Journey	**Roundtrip distance (miles)**	**Cost of journey (£)**			**CO2 production (kg)**		
		Per Journey*	Annually†	Over duration of study‡	Per Journey*	Annually†	Over duration of study‡
Doxbond, Haverhill to CBC	34.8	5.33	95.94	527.67	8	144	792

CBC – Cambridge Biomedical Campus
* Based on an assumption of 50 mpg and 168.4 pence/L diesel costs (using a Citroën Berlingo and diesel prices as of May 2023).
† Based on 2 x return trips per month taking place on 9 months out of 12.
‡ Based on 2 x return trips per month taking place on 9 months out of 12, for a period of 5.5 years.
Calculations made using the following calculators:

https://www.car-emissions.com/cars/model/CITROEN/Berlingo+Multispace
https://www.fleetnews.co.uk/costs/fuel-prices/
http://www.fuel-economy.co.uk/calc.html
https://donbur.co.uk/gb-en/calculator/carbon-emissions/
https://www.unitconverters.net/weight-and-mass/tonne-to-kilogram.htm