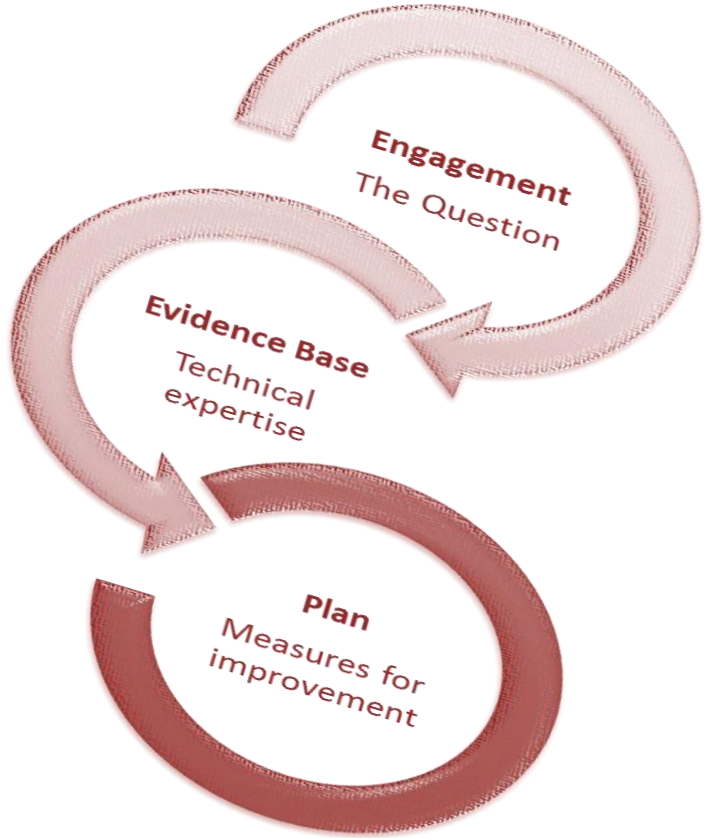
The Health Foundation

NHS

North East Quality Observatory Service

The Health Foundation - Advancing Applied Analytics Programme

Can interactive data visualisation help clinicians improve patient care?



Assessment of clinicians' requirements (final)

Aims of the project

1. To engage with clinicians, to understand their requirements for interacting with data on quality of care, and to explore the ways in which interactive data visualisation in real 'day-to-day' practice can help them improve patient care.

2. To use the insight gained in aim 1, to adapt 3 existing NEQOS products using 'off-the-shelf' data visualisation software, creating exemplar outputs for piloting in North East & North Cumbria acute trusts that subscribe to NEQOS. The products selected were:
   - *Maternity profile*
   - *Hip and knee dashboard*
   - *Mortality report/slides*

3. To share the learning from the project locally, regionally & nationally.

Engaging with clinicians (baseline): our plan

"We will undertake a number of 'one to one' and 'one to team' visits to a systematically identified sample of clinicians workplaces in the North East, to undertake a baseline assessment of clinician requirements for engaging with data on quality in general, and for Data Visualisation specifically".

Identifying clinicians

We wrote to 5 acute trusts that have a 'full' subscription to NEQOS services asking them to nominate *clinical teams* to participate in the project. We stressed that the success of the project was predicated on obtaining clinical input and feedback from a multidisciplinary range of clinicians with an interest in the areas covered by the three products we had selected for piloting.

Three of the five trusts nominated clinical teams / clinicians:

- North Tees & Hartlepool
  - Maternity
  - Mortality
- Northumbria Healthcare
  - Maternity
  - Orthopaedics
- South Tees
  - Orthopaedics

We attended 3 Regional meetings (2 x Orthopaedics, 1 x Mortality) – see slide 6 – where we asked for trusts to volunteer to be involved.

A further two trusts nominated clinicians:

- Co. Durham & Darlington
  - Mortality
- North Cumbria
  - Mortality

Engaging with clinicians

- Using a topic guide developed with input from a digital design company, we conducted **interviews** or **focus groups** with 27 clinicians from:
  - 4 Trusts (Northumbria Healthcare, North Tees & Hartlepool, County Durham & Darlington, North Cumbria)
  - In the following specialties/disciplines:
    - Trauma & Orthopaedics (Consultants, Surgical Care practitioner)
    - Physiotherapy (Head, Clinical Lead, Clinical Specialist)
    - Obstetrics & Gynaecology (Consultants, Clinical Lead/Director)
    - Midwifery (Head of Midwifery, Matron)
    - Infection Prevention and Control / Safety and Quality Lead (Clinical Director)
    - Early Detection and Resuscitation (Lead Nurse)
    - Clinical Governance (Assistant Director)
    - Gastroenterology (Consultant)
    - Deputy Medical Director

Engaging with clinicians cont'd

- Using a shortened version of our topic guide we explained what the project was about and asked some general questions about how clinicians engage with technology / data / NEQOS products at:
  - 3 Regional meetings:
    - Regional Hip meeting (25-30 clinicians)
    - Regional Knee Meeting (25-30 clinicians)
    - Regional Mortality Meeting (8 clinicians)

Engaging with clinicians: feedback on prototypes

- Interactive dashboard version of existing NEQOS products were produced as prototypes.
- Drop-in sessions were advertised to potential users at 3 local Trusts which resulted in prototype feedback from 24 members of staff:
  - 3 Trusts (Northumbria Healthcare, North Tees & Hartlepool, South Tees)
  - In the following specialties/disciplines:
    - Trauma & Orthopaedics (Consultant)
    - Physiotherapy (Head, Clinical Specialist)
    - Pharmacy (Principal Specialist)
    - Obstetrics & Gynaecology (Consultants, Clinical Lead/Director)
    - Midwifery (Head of Midwifery, Consultants, Matron)
    - Accident & Emergency (Consultants)
    - Clinical Governance (Assistant Director)
    - Quality (Director, Deputy Director)
    - Information & Statistics (Head, Analysts)
    - Network Managers

Feedback on prototypes

- Prototype dashboards were produced for:
  - *Maternity profile*
  - *Hip and knee dashboard*
  - *Mortality report/slides*

- Users were asked to assess all aspects of the dashboards (at drop-in sessions). Feedback was collected through semi-structured and open questions, observations and as 'post-it' note analysis (to obtain UX – user experience).

Digital design expert review

- Carried out by Orange Bus (Newcastle-based digital design agency)
- This focused on ease of use, navigation and content surrounding the visualisations (viz – in our case the dashboards).
- Key points:
  - Ensure consistency both within dashboards and between dashboards
  - Be aware of language on the viz
  - Using Tableau-embedded dashboards within a webpage may provide more control of the actual visualisation
  - Developing a pattern library will help with consistency

Findings – contextual

Technology typically used at work

- Predominantly Desktop PCs and Laptops.
- Limited use of tablets / one available for a whole department.
- Limited use of personal devices (Laptops, tablets, smartphones).
- Most clinical staff have to share computers / hotdesk.
- Laptops restricted to some managers or department may have one laptop for a whole department.
- Trainees and junior doctors not given laptops as move Trust too frequently.
- Looking at data / performance metrics: PCs and laptops were generally felt to be more suitable than other devices - **“Understanding a funnel chart is difficult enough on a computer and would be impossible on a phone”**.
- Data security was mentioned as an obstacle to the use of personal equipment.
- Outdated / slow / cumbersome NHS computer systems were mentioned as a barrier to engaging with data.

NEQOS products: How they are currently used

- To highlight issues that are then followed up / investigated using other systems or data sources;
- To establish outlier status;
- To change practice;
- For appraisal / reflective practice;
- Provides evidence to inform discussions with commissioners;
- A resource to support mortality assurance;
- To prepare for CQC inspection;
- Action planning;

NEQOS products: How they are currently used cont'd

- Emailed to other colleagues for investigation / Shared during internal discussions with other trust colleagues / Wanted to share but too big to email outside the Trust;
- Key information may be extracted for inclusion in the Trust's own reports / to supplement the Trust's own information (as the NEQOS products include benchmarking data);
- Full report goes unedited to meetings / committees;
- Slides used to identify areas of concern, then report used to provide more detail;
- Graphs used in presentations.

Perceived Advantages / Disadvantages of Online DV tools

- Online interactive Data Visualisation tools generally viewed in a positive light:
  - Online formats may facilitate wider circulation and sharing (currently this is problematic);
  - Everyone can see the same version of the information;
  - Benefits of interactivity;
  - Ability to track and log who is accessing the system and what they are accessing.
- Not seen as positive by all interviewees (some prefer outputs in static (e.g.PDF) formats, due to unreliability of outdated NHS computer systems).

Perceived Advantages / Disadvantages of Online DV tools

- Engaging with interactive products was seen as more time-consuming than using static outputs:

“Static report - good when you are time challenged / Dynamic report - good when you have time to spend.”

- Concern expressed that online interactive tool might be too complicated for clinicians to access or use:
  - Will the tools/dashboards be easy to access ?
  - **“Will the interactive format look different to what I’m used to”** ?

- Concern about information overload was a recurring theme.

Perceived Advantages / Disadvantages of Online DV tools

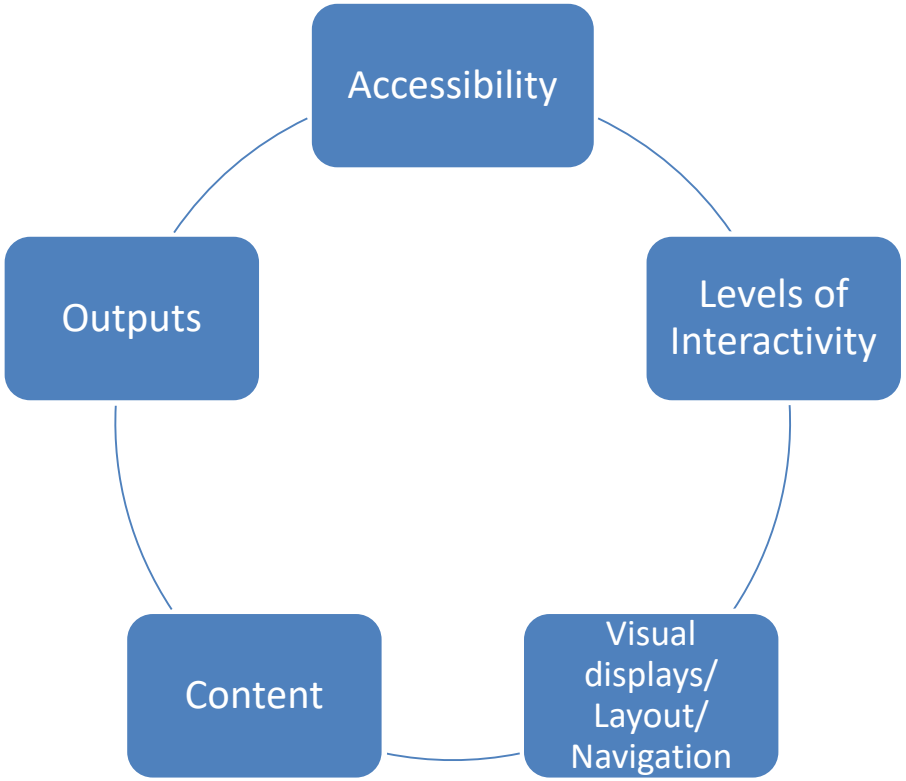
- Concern about duplication with other data sources such as national registries (e.g. National Joint Registry);

- The view was expressed that it may be necessary to move to 'self-service' information systems as a way of reducing the burden on Information teams – the move to DV in Business Intelligence services was regarded as a move towards more automated self-service facilities that the NHS would have to adopt.

Findings – Clinicians' requirements

Clinicians' requirements

Irrespective of the speciality / discipline the requirements of the clinicians could be grouped into 5 categorises.



Accessibility

- Would prefer not to login / Logging in must be as easy as possible:
  - The need to remember multiple passwords was a concern;
  - Unease about accessing systems with a number of login steps required (as Trust firewalls can be quite restrictive);
  - Would different levels of access with different login requirements be a solution / feasible ? (e.g. no login required to access high level summary data, but login needed for more detailed views of the data and increased functionality).
- Need to be able to download / print outputs due to concerns about IT system reliability when using online tools/dashboards for sharing information / accessing information “on the Go” (e.g. on the train):
  - Reservations expressed about presenting data at high level meetings using an interactive tool, because of the risk of running into technical difficulties;
  - Unease about outdated NHS computer systems that are cumbersome and difficult to use – a barrier rather than helping to improve productivity.
- Need to be able to access online tools using “standard” NHS web browsers – some websites need non-NHS standard web browsers to open / function optimally (e.g. Google Chrome).

Update after ‘drop in’ events

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Requirement	Prototype	Had NEQOS addressed the requirement? (UX)
The need to remember multiple passwords.	Single login to server.	No apparent issues.
Multiple accessing steps.	Single step to login.	No apparent issues.
Potential variable access.	Not investigated, single high level login provided.	
Need to be able to download / print outputs.	Tableau has built-in download/print function.	Most users were able to use the function.
Reservations about using an interactive tool at meeting.		Depended on specialisation but users were comfortable with prototype or ability to download images.
Unease about outdated NHS computer systems.		
NHS web browsers.	Tableau is built to be able to work on IE platforms (used by the NHS).	No apparent issues.

Levels of Interactivity

- Ability to **benchmark** was the most frequently mentioned requirement:
  - against all other trusts nationally (anonymity was not seen as helpful / not transparent);
  - Against other trusts in the North East (don't want to lose regional picture as currently presented in NEQOS products);
  - Against similar organisations/ recognised peers / User-defined peers;
  - Against trusts viewed as competitors (keen to see competitors' performance so can take action to improve, if required);
  - Some consultants want to benchmark at Consultant level.

Levels of Interactivity

- Ability to explore / interrogate / “deep dive” the data to ask their own questions, rather than a system providing pre-analysed metrics:
  - To be provided with the ability to drill down;
  - To perform sub-group analysis (e.g. by site, age-group, pathway);
  - To perform trend analysis / Aggregate and disaggregate by different time periods (monthly, quarterly, annually etc.);
  - To undertake user-defined analysis that can be saved and shared with others;
  - To perform user defined cross-tabulations / compare multiple variables simultaneously;
  - To manipulate / filter the data that is of interest.

Update after events

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Requirement	Prototype	Had NEQOS addressed the requirement? (UX)
Ability to Benchmark		
Against national markers	This varies between every dashboard and metric but is available on most vizes.	Users sometimes found it difficult to locate the peers they were interested in on the drop-down menus.
Against regional colleagues		Hip dashboard: Regional peers were pre-defined but not obvious to users how to enable this functionality.
Against peers (recognised, user-defined, “competitors”)		Mortality dashboard did not work if a peer was not selected.
At consultant level	This requires patient level data to which we do not have access.	
Ability to explore / interrogate / “deep dive” the data to ask their own questions	Exploration is limited by the data available.	Users requested options that we do not have the data to support but were able to explore the data available.

Visual displays / layout / navigation

- Considerable support for the inclusion of text/ narrative to explain/ interpret the data. Some clinicians don't look at the charts – they only read the text. Written explanation preferred over audio.
- Different levels of detail to be available - To avoid information overload users want to be able to quickly and easily access an appropriate level of information to answer their query:
  - a high level overview (summary) as well as ability to drill down. Ability to have an 'At a glance' version, and ability to delve into the detail.

Visual displays / layout / navigation

- Selections to be retained as you navigate through the dashboard.
- Guidance needed within the tool (e.g. via an icon or tool tip) on how to read and interpret certain chart types (e.g. funnel plots).
- Graphical formats preferred over tabulated formats.
- Consider whether some chart types could be simplified – e.g. replace stacked bar charts with more user friendly formats.

Visual displays / layout / navigation

- Include graphical formats that enable outputs from cross-tabulations to be viewed.
- Consider using colours other than Red/Amber/Green - colour-blindness issues.
- Consider infographic style for display of community services-related data.
- Consider whether font needs to be bigger than on some current NEQOS products.

Update after events

North East Quality Observatory Service

Requirement	Prototype	Has NEQOS addressed the requirement? (UX)
Considerable support for the inclusion of text/narrative to explain / interpret the data.	Depending on the dashboard explanatory text was included.	Users required more information to be available but not to overwhelm the charts / not be visible when they exported charts for their own presentations.
To avoid information overload users want to quickly and easily access an appropriate level of information to answer their query.	Dashboards made with clarity in mind.	No apparent issues.
Selections to be retained as you navigate through the dashboard.	Dashboards designed with as much retention in it as possible.	Maternity dashboard: Users' selections were not always retained / linked to data being related to different types of organisations (i.e. NHS Trust / CCGs / LA).
Guidance needed within the tool (e.g. via an icon or tool tip) on how to read and interpret certain chart types (e.g. funnel plots).	Guidance provided for funnel plots via both icon and tool tip.	Users required further guidance and its placement to be more integrated with the charts.
Clear graphics	Dashboards made with clarity in mind. For maternity some alternatives were provided.	Certain alternatives were preferred for maternity. No apparent issues with the other dashboards.

Update after events

North East Quality Observatory Service

Requirement	Prototype	Had NEQOS addressed the requirement? (UX)
Simplification of certain chart types.	Stacked charts were made to be interactive to allow the user to select the number of categories they wished to view.	Some charts need further simplification.
Include graphical formats that enable outputs from cross-tabulations to be viewed.	Not possible at this point in the project	
Consider colours other than Red/Amber/Green (colour-blind issues and their association with good/bad).	RAG rating not used in the dashboards	Some charts have similar (Pink/Yellow/Green) colours which require correction.
Consider infographic style for display of community services-related data.	No community services-related data included in the dashboards	
Consider whether font needs to be bigger than on some current NEQOS products.	Font size was increased where possible.	Users require improved layouts as on some vizes we presented too much information resulting in very small text.

Content

- More frequent updates / more timely data.
- Content may need reviewing to remove metrics that may no longer be relevant / present key metrics rather than all quality metrics (to address information overload).
- Consider incorporating additional metrics (e.g. outcomes across the system, not just acute hospital sector).
- Alerts: Would like an alert system:
  - when the chosen trust is an outlier;
  - When the data has been updated and more specifically if the data for “my organisation” has changed / significantly changed.
- Metric definitions need to be clear / Explanations needed when data appears to be “missing”.

Update after events

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Requirement	Prototype	Had NEQOS addressed the requirement? (UX)
More frequent updates / more timely data.	Dashboards used the latest available data, but they mainly rely on data published by others (e.g. national audits).	Some of the data is >2 years old and considered by clinicians to be of limited use.
Content may need reviewing to remove metrics that may no longer be relevant / present key metrics rather than all quality metrics.	All metrics presented were related to either NICE Quality Standards or to products routinely generated by NEQOS that have had clinician input.	
Consider incorporating additional metrics.	The project only ever planned to convert existing NEQOS products into DV formats.	The inclusion of additional metrics will be considered outside of the project.
Alert system.	Tableau has an inbuilt alert system that can be customised by individual users.	
Metric definitions need to be clear.	Text placed on vizes to explain the definitions	Insufficient information presented. Often the explanations cluttered the viz.

Outputs

- Ability to create bespoke outputs / Need to be able to tailor outputs to user requirements.
- Need for both a static and interactive version of outputs.
- Need to be able to extract charts from DV tool and insert into own presentations / reports, without the need for advanced IT skills.
- Need to be able to create PDFs of outputs.
- Need to be able to share the outputs via email.

Update after events

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Requirement	Prototype	Had NEQOS addressed the requirement? (UX)
Ability to create bespoke outputs .	Dashboards made with a focus on the North East and North Cumbria but Tableau could be altered per Trust/CCG.	Partially, but limited to some extent by the available underlying data.
Need for both a static and interactive version of outputs.	Static outputs had already been provided. Demonstrations were restricted to the interactive DV.	Users appreciated the interactive DV but some would still like to receive the static version.
Need to be able to extract charts from DV tool and insert into own presentations / reports.	Tableau has built-in download/print function.	Users tested this function with no apparent problems.
Need to be able to create PDFs of outputs.	Tableau has built-in download function to create PDFs.	Some users tested this function with no apparent problems.
Need to be able to share the outputs via email.	Tableau has built-in function to share outputs.	

Additional Requests - General

- Following the drop-in sessions there were a number of additional requirements identified, some of which may be possible to meet if time and finances allowed:

  - Up-to-date data
  - Clinician-level data
  - Real-time data where possible
  - Rurality as a peer group

Additional Requests - Mortality

- Additional requirements/changes to the mortality dashboard that would be possible if time and finances allowed:
    - Analyse the available data by CS group (bandings)(CCS group).
    - Add in Shelford group as a comparable unit.
    - True SPC charts – with the control limits that vary as the chart is added to.
    - Data by weekday / weekend.

Additional Requests - Hip

- Additional requirements/changes to the hip dashboard that would be possible if time and finances allowed:
    - Link time trends to cross-sectional displays.
    - Data to be provided for joint revisions (in addition to primary replacements).

Additional Requests - Maternity

- Additional requirements/changes to the maternity dashboard that would be possible if time and finances allowed:
    - Information on patient flow to assist with the data provided at CCG / LA level.

Implications of our findings and next steps

1. Refining of Prototypes

- Further details about the metrics were requested by some users
  - Plan is to provide metadata (Google Docs) so that the information is present but only accessed if further information is required.
- Dates/ timely data
  - When dates are referred to, it needs to be clear what they relate to.
  - The most recent data available should be used.
- Peer groups
  - The functionality associated with the selection of peer group needs to be modified. It should be easy to use and clear to find the peers you wish to add. Once set these should hold across the dashboard.
- Colour awareness
  - Colours and their meanings need to be clarified. Colours representing different groups (i.e. peer groups v selected Trust) should be distinct, and avoid colours to which users may attribute a meaning that we did not intend (e.g. RAG).

2. Implications for design of online interactive data tools

- There is an appetite amongst the majority of clinicians for online interactive data tools, but to maximise clinician engagement, we need to ensure that our dashboards:
  - are accessible via standard NHS internet browsers and that login processes are kept to a minimum;
  - are intuitive and easy to navigate;
  - are visually attractive;
  - are available in static formats (e.g. PDFs) as well as in interactive online formats;
  - allow users to export / extract good quality graphics for their own reports and presentations;
  - Avoid 'overloading' users with data/information – need to review/rationalise content, and consider 'layering' the information (i.e. users have a choice about the level of detail they access, depending on, for example, their role / whether organisational performance is "as expected" or not etc).

- Our priority in the short-term should be to design tools that will be accessible vis desktop PCs or laptops, as access to mobile devices in NHS work settings is limited at present.

Implications for design of online interactive data tools

- The ability to use tools to access benchmarking information was the most frequently mentioned requirement, but specific requirements vary considerably and we need to establish how best to incorporate these without compromising on usability.

- Some requirements cannot be incorporated due to type of data underpinning the dashboards. The requirement for functionality that allows users to "explore the data" and conduct "user-defined" analysis will be limited or not feasible in most cases, as most of the data underpinning the dashboards is aggregate information which is not available to NEQOS at record level.

- The inclusion of narrative to describe "what the data is telling us" appears to be important, as does the need to use "Tool Tips" functionality to explain how to interpret certain chart types (e.g. funnel charts).

Implications for design of online interactive data tools

- The review from the digital design company (Orange Bus) highlighted the necessity for consistency within a dashboard (e.g. all the vizes within a dashboard should share a visual theme) and across dashboards, NEQOS products should have a common look and feel. The generation of a formal pattern library is not feasible as part of this project; however, generating a more consistent set of dashboards will be paramount.

- A good visualisation provides clarity with regards to both the images and the text. The amount of information needs to be sufficient to be helpful and provide answers without the visualisation becoming too complex and "busy". To avoid "busy" visualisations consider the use of external metadata linked by a URL.

- The digital design company also highlighted that we need to be aware of our language, that if technical terms are used they are going to be understood by the end-user (clinicians in our case).

3. Implications for updating of NEQOS online interactive data tools

- Some requirements cannot be incorporated due to type of data underpinning the dashboards.

- Metadata will be used to explain the sources of the data and how the fields are calculated. These documents will be linked to the specific vizes that they relate to. This will include how to interpret certain chart types.

- The 4 prototypes will be refined to address as many of the points highlighted through the feedback process as possible.

- Feedback from the drop-in sessions indicated that there is potential for the new interactive dashboards to be used in clinical work in the future.

Next Steps

- Finalising improved “new” online interactive products.
- Final report on clinician requirements following events (this slide pack, Oct 2019)
- Distil design principles from the learning process that has taken place during this project (draft design principles slide pack, Nov 2019).
- Present and participate in Health Foundation Workshop (presented 8th Nov 2019)
- Webinar (27th Nov 2019) – share the learning.
- Final draft of refined outputs produced (Dec 2019).