Benchmarking of Mobile Data Collection Solutions

WHAT ASPECTS TO CONSIDER WHEN CHOOSING A TOOL/PLATFORM

Solutions tested: December/January 2017

Report compiled: May-June 2017

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Acronyms

API   Application Programming Interface (allows communication between different programs and interaction with data stored in the cloud)

CAPI   Computer Assisted Personal Interview

CSV   Comma Separated Values, spreadsheet format

DDC   Digital Data Collection

GIS   Geographic Information Systems

HIPAA   Health Insurance Portability and Accountability Act; prescribing standards for data privacy and security.

JSON   Javascript Object Notation, open standard format for sharing data over the internet

KML   Keyhole Markup Language, file format for sharing geographic information

MDC   Mobile Data Collection

NGO   Non-Governmental Organization

PAPI   Paper Assisted Personal Interview (in contrast to CAPI)

XLS   Microsoft Excel spreadsheet format (newer version XLSX)

XML   Extensible Markup Language, open standard format for encoding documents in a human and computer readable format

Icons used in this report were purchased from Noun Project.

Most mobile data collection solutions evolve fast, new versions are often released several times a year. This report is based on tests conducted in January 2017. Readers are strongly advised to verify features and functions of newer releases when interested in a particular tool/platform. This report only serves to give a general overview and a comparison based on a snapshot in time.

Executive Summary

Humanitarian response operations as well as development projects require accurate information to use their resources in the best possible manner, be it to determine the urgent needs of communities affected by natural disasters or conflict, or to ensure that people and households receive ongoing support to improve their situation.

In the best case, making decisions based on no, limited, outdated or incorrect information means that time and money is lost. In the worst case it can mean that people's lives are irrevocably harmed.

Mobile Data Collection (MDC) can help improve the quality of data, information, analysis and decision making. By using one of the MDC platforms described in this report, organizations can collect data faster and with fewer errors than on paper. The sharp decline in hardware costs for mobile phones also means that MDC is often cheaper than doing a survey on paper.

As the report shows, the question is no longer *if* organizations should use MDC, but *how*. The short profiles for each solution, as well as the detailed table at the end of the report, show the main strengths and weaknesses of the different platforms.

The most significant differences between the tools tend to fall into three different categories:

1) How easy is it to import or export data and forms to and from other applications?
2) Does the platform support individual case management and/or monitoring situations over time?
3) What level of data analysis is supported out of the box?

There is no single solution that can fit all possible needs and the report advises against trying to force a single solution on staff. Instead, the report recommends that organizations either agree on a small pool of approved platforms from which staff can choose, or on a preferred solution, from which teams can diverge if necessary. This approach ensures a blend between uniformity - which is important to maximize familiarity, compatibility and support for the platform - and flexibility, which enables teams to respond quickly to operational needs and changes in the MDC marketplace.

Part I. Where the sector stands on Mobile Data Collection

According to a survey conducted during the NOMAD[1] MDC event in Amman 2016, only 25% of the participants had never used MDC before, whilst during a similar NOMAD event in Paris in 2013, 58% of the participants claimed they had not used MDC before.

The rapid proliferation of smartphones, as well as the massive decline of their price, has turned smartphones from a luxury item to a common, multi-use tool that hardly raises an eyebrow anywhere in the world. Where previously, the high value or the high status associated with owning a smartphone or tablet exposed NGOs and their staff to potential security risks, these concerns have abated to a certain extent[2] and many NGOs are providing their staff with mobile devices.

Programmatic areas that have benefited greatly from the proliferation of smartphones are those that are related to monitoring or data capture - be it through spontaneous photos of project assets (for example when something has broken) or through highly structured assessment tools that run on digital devices. This report looks at the latter and provides the reader with an overview of the tools that are state of the art in late 2016/early 2017.

Given that the main audience of this report are non-profit organizations working in developing countries, the report limits itself to mobile data collection (MDC) applications and services that run on low-cost Android devices, even when no data or cellular network is available. Applications and services that require iOS, a stand-alone notebook computer or a stable internet connection are not part of this overview, since these are less common in the field.

A. What are the main advantages and challenges of Mobile Data Collection?

Advantages

Mobile data collection has many advantages over paper-based alternatives:

Fewer errors: "Garbage In - Garbage Out" is the mantra of many evaluators. MDC is able to reduce the amount of "garbage" significantly by eliminating or reducing two potential sources of errors:

- **Inconsistent/impossible/missing data:** All products and services tested for this report include internal checks that highlight impossible or inconsistent data during the data capture phase in the field, so that it is not possible to enter 114-year-old children or pregnant men. In many cases this type of automatic plausibility check also includes errors of summation, for example during household survey when expenditure for individual household items don't add up to the total amount. Since the software can alert the enumerator to issues on the spot, the data

No more pregnant men♂

Image: GPPi

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can be corrected immediately. The same goes for fields that on a paper survey might be accidentally skipped or omitted. This is particularly relevant since research[3] has shown that errors in the data capture phase are not random, but biased towards households with distinct characteristics, which might skew the whole data set.

- **Re-keying errors:** At some point, data from all paper based surveys has to be entered into a computer. During this process errors invariably happen. Because data collected digitally does not need to be re-entered, this source of errors is effectively eliminated.

Faster data collection: Data collection via mobile devices tends to be faster than on paper, partially because of built-in functions that can automatically skip questions based on previous answers. For example: if a household does not have any children, questions related to the children can be skipped automatically. The time savings increase with complexity and length of the survey. For example, Fitzgerald et al. found that by using MDC with skip-logic, they were able to save close to one hour per household during an in-depth household survey in Ethiopia and Malawi that, on paper, ran to 50 pages.[4] Given that most households were subsistence farmers, the researchers also found that respondents were more likely to answer all questions when the survey took less time.

Faster analysis: Because the data doesn't have to be manually entered, it is also much faster to run simple analyses on the data, even while the survey is still underway. All applications and services tested for this report include at least a basic tool to visualise data out of the box. In addition to providing NGO staff with answers more quickly, this can also be an important feedback tool for communities that have been surveyed.

Better quality control: Many MDC applications are able to capture the GPS coordinates where an interview takes place, as well as the time the interviewer took to complete the interview. The GPS coordinates allow supervisors to ensure that staff have visited the right location and facilitates repeated visits which might be necessary for monitoring. The duration can help to identify enumerators who are either extremely fast or extremely slow, either of which might be an indicator of quality issues.[5]

Costs: Costs are frequently listed as one of the areas where paper-based data collection has an advantage over digital data collection. However, this depends heavily on the individual case especially on the number of surveys conducted and the number of submissions and length of each survey. While MDC have higher initial costs for software, development and hardware and capacity building, they do have cost benefits in other areas. Changes to digital surveys, for example, can be rolled out easily to all enumerators, while paper survey forms might have to destroyed and reprinted. Also, the costs for subsequent data entry are completely removed with MDC. In a 2015 study in Thailand and the Philippines, Oxfam found that MDC was cheaper than paper unless new mobile devices had to be bought for the

survey and were not used for any other survey afterwards.[6] The cost benefits of MDC grow even further when the same survey is run multiple times, for example for projects where changes over time are being tracked with the same indicators.

Multimedia: Smartphones are much more than a touchscreen to enter data. Organizations can use a variety of different tools and features to enrich the data by collecting GPS points without a stand-along GPS receiver, taking photos without bringing along a separate camera, scan barcodes, record audio and video etc. Most of the time this additional data is automatically integrated into the survey without requiring any extra efforts or manual work.

In short: **through mobile data collection, NGOs are able to get more accurate information faster and at a lower cost than with paper.**

Free Online Course: Introduction to Mobile Data Solutions

https://course.tc/catalog/course/c06a1489-51e4-43bb-9b50-27fa4446327f

TechChange offers a free, self-paced online course that provides a basic introduction to mobile data solutions. The course was developed with assistance from USAID and FHI360.

Challenges

Survey design: As described above, mobile surveys can prevent enumerators from entering impossible data or omitting questions.[7] However, other risks are *only* encountered in MDC. Sometimes the excitement about a new technology leads to an increased focus on the technical aspects of a survey, at the expense of designing the survey itself conceptually. Often, such a shift in focus means that creating a complex form logic is perceived as the key to a good survey while other important elements, such as defining the goals of the survey or questioning the ethics of questions are neglected.

Survey coding: Unlike paper surveys, MDC surveys require that someone implements the desired skip logics and other restrictions on data entry, usually through some visual form builder or template that will provide the smartphone application with the instructions as to how the survey should behave. There is a learning curve associated with the acquisition of these skills and some level of competence is required to be able to reap the full MDC potential with regards to data quality.

Hardware failure: Applications can bug, mobile devices can break, run out of electricity and their batteries are particularly sensitive to high or low temperatures. Replacement devices, paper forms as backup, car chargers and battery packs can mitigate these issues, but in many cases, a severe hardware failure will mean that an enumerator cannot continue her/his work until s/he has returned to the office. In some cases, the data stored on the device might be lost as well.

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[6] **Going Digital - Using digital technology to conduct Oxfam's Effectiveness Reviews,** http://oxfamilibrary.openrepository.com/oxfam/bitstream/10546/578816/4/cs-going-digital-effectiveness-reviews-290915-en.pdf, Emily Tomkys and Simone Lombardini, Oxfam GB, September 2015, Retrieved: 6 December 2016
[7] For more details see: http://blog.cartong.org/2015/10/15/conceiving-survey-1/ and http://blog.cartong.org/2015/11/10/conceiving-survey-2/

Lack of connectivity: Most MDC solutions require an active online connection to synchronise data, which can add logistical issues to the deployment of MDC. Given that this report is primarily intended for NGOs working in developing countries, only products have been included that allow data collection in offline mode.

Lack of compatibility: All MDC solutions in this report can export data at least as comma-separated-values (csv) or Excel files (xls), but many provide additional export options that are better suited for further analysis and visualisation in tools such as SPSS, Tableau or other Business Intelligence tools. Most solutions even offer access to an API that once set up allow creating visualisations (such as online dashboards or web maps) showing the collected data in real-time. Nevertheless, when exporting results or questionnaires or accessing the data through an API, the structure and format of the outputs will often vary between competing providers. This can make it difficult and time-consuming to collate data collected with different MDC solutions and it can make it impossible to switch platforms during an ongoing survey. The reviews in this report make note of compatibility options and issues where relevant.

Familiarity with the technology: While smartphone literacy is increasing steadily, this is not the case across all demographic groups and geographic zones. Smartphone literacy can be an issue especially in surveys where, for example, enumerators should be older because the survey is aimed at the elderly.

Languages: Many MDC solutions provide the user interface for their server and analysis module only in very few languages - sometimes just in English. But, apart from two exceptions, all tools included in this report can create surveys in any major alphabet including Arabic and Hindi. However, not all solutions allow enumerators to switch between languages within the same survey which, is necessary for examples when you work with different ethnic groups who speak different languages.

Security and privacy: Surveys often collect personal information. Based on the right to privacy, recognised in most international human rights treaties, such data is protected.[8] It is the responsibility of the organization collecting the data to ensure that the collection, storage, analysis and publication of data conforms to security and privacy standards and do not pose threat to the individual or his rights. Depending on the type of survey, different levels of security can be acceptable. For example, data on the health of a patient requires a very high level of security and care should be taken that any public visualisation of health data can never be traced back to an individual. A key informant interview on general needs in a camp, on the other hand, might require much less protection. While only a few solutions encrypt data when stored on server or phone, all solutions benchmarked here can use HTTPS for data transfer between phone and server. The reviews in Part II will mention if solutions adhere to recognised security standards. User authentication processes and security were not benchmarked for this document. This could, however, be an additional requirement if a very secure environment is needed.

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[8]"Professional Standards for Protection Work" (2nd Edition, 2013, ICRC): https://www.icrc.org/eng/assets/files/other/icrc-002-0999.pdf

B. What are the most differentiating factors of the day concerning MDC?

MDC solutions evolve over time, and the differentiating factors between solutions also evolve based on the requirements of the user community and the technical constraints of the moment. Here are three of the most important of these factors today:

Analysis possibilities of MDC platforms

An important aspect where tools differ is their ability to make the analysis of the data on the server easy for the user. Here we can distinguish between solutions providing support throughout the entire surveying process including the data analysis and those that focus more on the collection and simply provide a range of export formats to allow an easy integration with external analysis tools. More sophisticated platforms will allow you to filter your data directly on the server and represent the filtered information in graphs or maps, have data quality checks embedded and even export reports directly from the platform.

Monitoring of a situation over time

A second aspect where we can cluster the solutions into two separate groups is their ability to monitor a situation over time. This option requires that the user can either edit existing records and a history of the different submissions is kept on the server or the user can submit several submissions all relating to a "parent" entry. For example the enumerators could first collect data on water points or patients with some unchangeable attributes (such as a unique identifier, the water point's location or a patient's date of birth) and then submit variable data associated with each entry (such as a flow rate at a water point measured regularly or the blood pressure of a patient). The platforms making this possible are few and are usually those that are at the higher end in terms of costs seeing the added value that this component brings.

ODK-Based Technologies

A third aspect that is very frequently used to differentiate MDC solutions is whether it belongs to the ODK-based technologies.

The OpenDataKit is one of the projects that uses a common language-XML[9]- and a common standard- Xforms[10]- for data collection. They developed an open-source suite of tools and apps to collect data. Being one of the first to use Xforms, their contribution to defining and using the Xform standards was key to the subsequent developments. Many other tools have emerged that either built on top of ODK directly or that used the Xforms standards as laid out by the ODK team (with only minor adaptations or changes) for developing their own solutions. The advantage of these developments for the user is the interoperability between the tools especially for those being built directly on top of ODK. It ensures that data and surveys can be shared between tools and platforms - the format of the data is, in fact, independent of the platform, a key idea in the age of file sharing and multi-machine networks. Being based on standards specifically developed for data collection both ODK and Xform based solutions support natively difficult logical operations (skip patterns, cascading selects,....) or question types (calculations, dates,…). In the remainder of this document the authors will refer to:

- ODK-based solutions - for solutions that are built on ODK and use the Xform standards

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[9] XML is an eXtensible Markup Language - it defines how to structure a file in order to make it easily readable to humans and machines alike using tags. XML is used as a framework/a set of rules based on which more explicit languages where created further defining the tags such include HTML or KML.
[10] The Xform standards further define and detail how XML can be used for data collections: this includes key tags representing questions types and logical operations such as skip patterns.

- Xform-based solutions - for solutions which use Xforms but are not necessarily built on top of ODK
- other toos - tools that do not comply with the open Xform standards. Those may use un-standardized XML or a proprietary format for their data

As the ODK based solutions are in many ways similar to each other and provide often a certain number of similar functionalities, we will regroup them in our comparison of solutions to make it easier to compare them.

If you want to know more about what advantages there can be for NGOS to use ODK-based technologies, you can refer to Annex 3: *What Are the Advantages in Using ODK-based technologies for NGOs/IOs?*

Summary graph

Here is an infographic regrouping all solutions looked into through the prism of these differentiating factors:
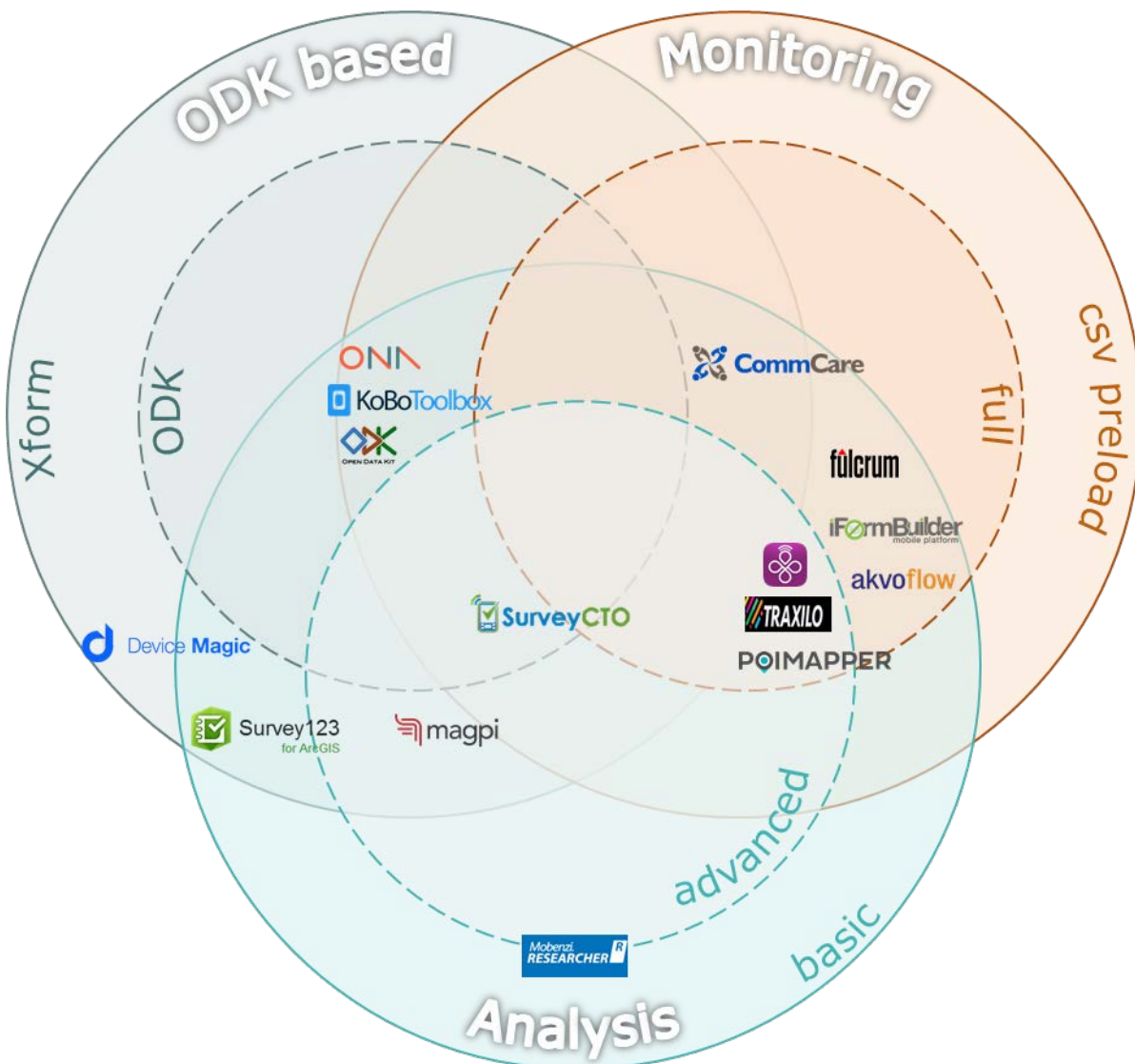
C. Is having "one MDC tool for your whole organization" a viable option?

Selecting a single MDC platform to be *the* solution for the entire organization is an aspiration for many International Organizations and NGOs. The idea is to select and promote, whenever possible, one specific solution to be used across operations. Advocates of this approach emphasize the better integration and better support that it can entail. The opponents criticise that it is often a bad compromise that never fully fits the needs of all cases.

This chapter looks more closely at the advantages and inconveniences of a one-platform approach for Mobile Data Collection and highlights key questions that need to be answered before making such a decision.

Advantages of Using a Single Platform

Four arguments are key to understanding why a one-platform approach can be beneficial for an organization:

Better integration: If data needs to be integrated into existing workflows, synchronised with another organizational database, and especially if IT support is required for these tasks, a single solution for the whole organization can help to ensure that data and workflows are stable and that IT can adjust processes as needed.

Better knowledge: This is an advantage for both IT and users: enumerators, form builders, project managers and IT staff know what to expect from a solution, where to find support and how to best use the tool.

Compliance with organizational standards: Key departments including IT can verify that a tool meets requirements which have been established for the entire organization. This is specifically relevant for security standards. While an operational department might not have the capacity to evaluate the security features of various products, for an organizational tool those key features (should) have already been evaluated and departments can trust that the solution meets the requirements.

Bargaining power: Having an entire organization (especially one with several projects in the pipeline) can improve the bargaining position when discussing the licensing and pricing with a provider. It can also impact the priority of feature requests as the provider knows that there is a concrete need for improvement in the requested area.

Disadvantages of the One-Platform Approach

Despite these advantages, imposing a single platform as the only option to all departments is not always the best approach:

Varying needs: Different MDC tools have different features and no tool can meet all needs. Often that means making compromises and whether those compromises are acceptable needs to be decided during the project's inception phase.

Staff frustration: The two main reasons for staff frustration are: 1) being forced to use a tool that does not meet the exact needs and 2) having to switch tools, which means investing time in training and data migration (not always compatible with skills, budget or project deadlines).

Keeping pace with new developments: The MDC sector is a fast-paced environment where different solutions appear and disappear from one year to the next and where providers release new versions with additional features several times a year. Different solutions improve or decline each year. This means that there is no guarantee that a solution which is best suited

for a task this year will still be the best, or still be supported, next year. This makes it hard to make a single tool part of the organisation's MDC strategy over time.

Organizational inertia: An organization that once decided on a one-platform approach will find it more difficult to switch to another tool. It becomes more difficult to justify changing workflows and requesting staff to learn another tool once a solution is put in place, even when a new tool might have become better suited for the majority of tasks or when organizational needs might justify a transition.

From a Single Platform to a Preferred Solution

Whether or not a one-platform approach is beneficial will vary from one organization to the next. The main question is whether the benefits can outweigh the inconveniences that come with the decision.

This is, in fact, not a binary question with only "yes" or "no" as an answer. There is no reason why all MDC projects need to be treated alike. It can be possible to recommend a *preferred* solution but embrace other solutions for certain projects. Another possibility is to let teams choose from a pool of pre-approved options.

Generally speaking, projects which require integration with an organization's technical infrastructure benefit from selecting and staying with one solution. Examples include when a server for data collection is set up behind an organization's firewall or where data from the project is used in different tools and databases across the organization.

On the other hand, projects that are independent of the existing enterprise data and infrastructure and do not require any special IT support can use different platforms more easily as they don't require the entire organization to restructure its workflows. In these cases, there is no harm in using several solutions within the same organization, provided that the departments switch platforms based on needs, and not out of curiosity for the latest innovation, and don't unnecessarily burden staff and enumerators with ever changing solutions.

For these independent projects, there is often an added value in giving staff the flexibility to use the tool they deem best for a given project. Not narrowing down their options unnecessarily allows them to take advantage of new product developments, be it new features and functionality in an existing solution or an entirely new product. After all, the MDC sector is a fast-paced environment where considerable changes take place from one year to the next.

How to Choose a Preferred Solution?

Organizations should consider the following five key factors when attempting to find a platform that can serve as the preferred solution for the whole organization:

Factor	Component
User and role management	- Which levels of management are required? *Organization, Region, Country, Project, …* - How strictly do tasks need to be attributed to certain roles? *Viewer, Enumerator, Administrator, Project Manager can do X, Y or Z in the system.* - How strictly do projects need to be separated from each another? *Access to folders/projects can be set independently of roles.*

Security	- How sensitive is the data collected? - What are the legal and moral obligations to protect (sensitive) data that the organisation has? - Are there organizational standards where and how such data is stored? *Cloud, encryption, behind organizations firewall, ...*
Data integration and analysis	- Are specific data formats or a certain data structure needed for analysis with existing software? - How is data linked or integrated into existing enterprise databases? *Only manual export, API, custom developed workflows*
Additional requirements	- Is monitoring or case management needed? - What are the language requirements? *Application and online interface languages (especially if non-Latin characters)*
Migration of existing projects *(if required)*	- Can the new tool continue to perform the same tasks? *Specific needs of existing projects* - Is it easy enough for staff to adapt and adopt the new tool? *Capacity building needs* - Does data need to be migrated from existing solution(s) to the one chosen and if so, what are the available options?

Only if at least one solution can be found that fits the identified requirements or is an acceptable compromise, does it make sense to choose a preferred solution for an organization. Nevertheless, a compromise is always possible and it needs to be established how strictly a preferred solution should be imposed. Different options are available, for example to

a) use only one solution in the future but allow existing projects to stay with their solution
b) ensure capacity building, IT support and allow stronger integration for only one solution, while accepting other solutions for more independent projects (potentially requesting justification for a deviating choice)
c) suggest a pool of 3 to 4 solutions to account for different project requirements

A less rigid setup such as this allows staff to keep some flexibility while, at the same time, providing guidance on which solution(s) should be considered.

D. What are the aspects to keep in mind when you budget your MDC?

Budgeting for Mobile Data Collection in general

Budgeting for data collection, independent of the approach, comprises two types of expenses: initial and recurring costs. The initial costs for a mobile approach to data collection are often significantly higher than for a paper-based approach given that phones have to be purchased and staff or enumerators trained to use the software and hardware. On the other hand, a paper based approach has considerably higher recurring costs, particularly when several surveys are conducted or a situation is monitored over time. The biggest cost differentiator between paper and mobile based surveys are the costs associated with data entry clerks. For example, in 2015 Oxfam estimated that it would cost close to 1,500 GBP (approx. 1,900 USD) to employ clerks for 15 days to enter data from a survey they were planning to conduct in Thailand and the

Philippines. This was 10 times as much as was budgeted for the same survey using mobile devices.[11]

Another recurring expense of paper-based surveys are printing costs, which Oxfam, in the same study, estimated to be 200 GBP (approx. 250 USD) – or approximately the price of one smartphone.

In addition, even with a paper-based approach, IT and software costs can be considerable depending on where and how data is stored and analysed.

The overall costs of data collection depend on the factors listed in the table below. For comparison we list the most important expenses for both, paper-based and mobile data collection:

		MDC approach	Paper-based approach
Initial costs	Hardware, including replacement handsets, batteries and chargers, Sim cards if required	*yes*	*no*
	Software development	*possible*	*no*
	MDC software licenses (possibly recurring)	*possible*	*no*
	Analysis software license (possibly recurring)	*possible*	*possible*
	In-house IT costs	*yes*	*possible*
	Training enumerators to use the hard- and software	*yes*	*no*
	Training data entry clerks to use the software	*minimal, only for backups*	*yes*
	Training enumerators in survey techniques	*yes*	*yes*
Recurring costs	Printing costs	*minimal, only for backups*	*yes*
	External MDC expert/consultant	*possible*	*possible*
	Piloting the survey questions *(incl. technical implementation)*	*yes*	*yes*
	Enumerators' salaries	*yes*	*yes*
	Staff time for data entry	*no*	*yes*
	Staff time for data validation/verification	*minimal*	*yes*
	Staff time for administration/user management of platform	*yes*	*no*
	Staff time for in-house data analysis	*yes*	*yes*
	Backup costs	*yes*	*yes*

One of the biggest budget items for any MDC project are the costs for using the chosen MDC software platform. This also applies to Open Source solutions, as the use of Open Source tools also incurs costs. Unfortunately, these costs can also be surprisingly hard to calculate.

The three most common ways to charge for MDC platforms are:

- Pay per user, submission, form or question

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[11] Going Digital - Using digital technology to conduct Oxfam's Effectiveness Reviews, http://oxfamilibrary.openrepository.com/oxfam/bitstream/10546/578816/4/cs-going-digital-effectiveness-reviews-290915-en.pdf, Emily Tomkys and Simone Lombardini, Oxfam GB, September 2015, Retrieved: 6 December 2016

- Pay for features and functionality
- Pay for storage space

Many plans combine these three elements, for example by charging a fixed amount for certain features multiplied by the number of users. Since each tool in this report weighs and combines these elements differently, it is impossible to fully compare the plans and identify an overall best-priced option since this will depend on the design of the project.

In addition, many of the tools included in this report offer enterprise plans that provide clients with more flexibility than their basic plans. This can be discussed with the sales teams. Some providers also offer a special discount for non-profit organizations.

Part II. Product Evaluation

New MDC solutions are appearing and disappearing every year, making the pool of potential products overwhelming and hard to assess. For this report, the authors have not attempted to assess *all* possible solutions but rather to provide an overview of *good* solutions for different scenarios in the field. Only platforms that met the following criteria were considered:

- Must facilitate data collection on the ground and not remotely (e.g. by SMS)
- Must allow data collection without any network (internet and/or 3G)
- Must have significant user buy-in or track record in humanitarian organizations
- Must have been used in multiple contexts and countries
- Must be designed for MDC (MDC is not just as an add-on)

Initially, 26 products were identified for this report, a list that was eventually narrowed to 16, all of which can add value to programs in humanitarian and development contexts. The list of all 26 tools and the reasons for the exclusion of certain solutions of this benchmarking is available in the annex (see *List of All*).

1. Common Aspects and Features of All MDC Platforms

As mentioned, this report only includes viable solutions for organizations that are working in a humanitarian or development context. As such, many of the solutions seem very similar. In fact, the main differences are frequently related to price, specific sectors where the product originated from, or usability. In other cases, it is a question of specific features that are better in some products than in others.

All solutions discussed on the following pages can be used to create surveys and to collect and manage the data. However there are big differences where the analysis of the data is concerned. Here, some solutions provide no or only very limited support.

The following paragraphs lists the basic features and functionality that you can expect from the tools during the different steps of MDC:

All tested solutions offer a visual form builder where surveys can be created, for example by dragging different types of question (such as multiple choice or text field) onto a blank form where details for each question can be added. For some solutions creating complex forms might require the use of Excel (following Xform standards). While the products differ in the question types they support, all solutions include at least: free-text fields, single and multiple-choice questions, GPS points and permit skip-logic. Some, more advanced products include features to monitor aspects over time, collect dates, photos, repeat certain questions several times, scan QR- or barcodes or calculate values based on previous questions.

Once a survey has been created, data can be collected in the field and saved offline on the phone. None of the reviewed products require a constant internet connection or a SIM card to collect data. All solutions, with the exception of DeviceMagic and Traxilo, use UTF-8 encoding for their survey questions so that questionnaires can be created in almost any language and alphabet. However, not all solutions can switch between languages during a survey which is useful in a culturally diverse setting.

After the data has been collected, it has to be sent to the MDC platform. For this step, most solutions require a WiFi or 3G internet connection. Only ODK tools that are used with an offline server setup, as well as Briefcase, can retrieve data manually from the phone and push it to

the server to work entirely offline. On the server the data is displayed in a table. In some solutions it is possible to edit, add or delete data directly on the server, others only allow the data to be viewed but not modified. It is also through the server interface that forms, projects and users can be managed.

Analysis is where the platforms' abilities vary the most. The two main differences are:

- How many analysis features (and which ones) are available
- The available level of refinement (basic/advanced).

The following table summarises typical analysis features.

Analysis features	Basic features	Advanced features
Mapping (assuming GPS coordinates collected)	• Shows data points on a map.	• Ability to show data on a map, based on attributes • Ability to filter which answers are shown • Some level of formatting is possible (custom base maps, colour theme, legends, etc.)
Graphs	• Bar graph and/or pie chart • May or may not be possible to select the type of graph • Little to no ability to adapt the graph presentation (colour themes etc.)	• Ability to edit styles to fit existing report templates • Filters: showing only data for specific admin levels and/or exclude some answers (such as NA, DNK) • Cross-tabulation
Indicators	• 1 question = 1 indicator	• Scoring or other calculations based on the data are possible • To some extent it is possible to build indicators by combining questions or making calculations
Dashboards	• Not available	• Ability to construct a set of graphs for questions and/or indicators and save them • May be possible to share the dashboard • Dashboard can be saved & edited

No matter which solution you choose, the option to export the collected data at least in csv/xls format is available in all platforms. This enables you to analyse or visualise the data further using external software such as Excel, Tableau or SPSS.

2. Platform Reviews

CartONG staff tested the selected platforms using two existing surveys (see annex). They created similar forms on the platform (or imported the existing form where possible), collected sample answers offline, synced the phone data with the platform, visualised and filtered the data in the online interface where possible and tested the export options and format of the output. In addition, staff used internet research and direct discussions with the solution providers to get additional information on API access, security features, user management, offline setup and different pricing schemes.

The snapshots on the following pages summarise the main strengths and weaknesses of each product. They consist of a short introductory text for each solution, a table highlighting the pros and cons and one or several screenshots of the user interface.

The test criteria, including examples, are available in the annex (see MDC Technical Requirements)

Features that are common to all platforms (see: *Common Aspects and Features of All MDC Platforms)* will not be mentioned again. To save space, other features are only mentioned in the short profiles if they stand out or differ significantly from the average solution (positively or negatively). This was done to save space. A detailed table with all features for all solutions is available at the end of the chapter.

The tools are for simplicity's sake presented in three sections first looking at ODK-based solutions then at other Xform based solutions and finally looking at other solutions. Within each section, the tools are listed alphabetically and the order does not indicate any preference or ranking.

A. ODK- based solutions

KoboToolBox

http://www.kobotoolbox.org/

Tested version: with ODK Collect v1.4.14 (31.01.2017)

KoBoToolbox is a free and open source MDC tool that is supported by OCHA (United Nations Office for the Coordination of Humanitarian Affairs) and that was developed by the Harvard Humanitarian Initiative. It is used widely in the humanitarian and development community. KoBoToolbox is based on the Xform standard which makes it very easy to share forms between many MDC platforms.

Strengths and weaknesses

KoBoToolbox is free, open source and easy to set up and deploy for a majority of mobile data collection needs. It is possible to map results or access data through the API for use in more advanced analysis tools.

Its main weaknesses are issues of user-friendliness, a lack of stability as well as a lack of related user support and communication.

When is it a good solution?

KoBoToolbox is a good and to date free solution for most mobile data collections that do not require certain features, such as monitoring, sensitive data protection, or advanced user/role management.
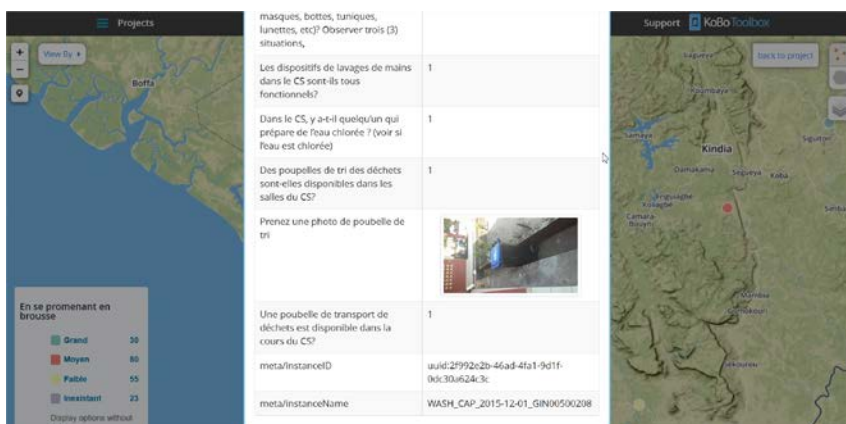

Figure 1: Kobo Map interface showing a submission, including photo

	PROS	CONS
Form features	- All standard questions - Standard metadata - Possible to switch language in form	- External lists don't work on web form - No monitoring or editing on phone
Server features	- Edit & delete of individual submissions possible (uses Enketo) - Interface in four languages including Arabic - Versioning of projects after deployment possible	
Import/export	- Briefcase compatible - Export format includes sav - Form and data upload possible through Briefcase - Flexible options to export groups - API with read/write access	
Analysis & visualisation	- Map offers data viewing options based on responses and legend - Prepackaged Excel tool for offline analysis available	- No filters - Only basic charts
User rights	- Forms are shared with users who have their own account	- No custom roles - Some rights are at account and not at project level
Security	- Encryption on phone and server possible	- No specific management for Personal Identifiable Information Not HIPAA compliant
Additional details	- Free plan for humanitarian orgs - Offline setup possible although this requires IT skills	

ODK Aggregate

https://opendatakit.org/

Two setups were tested for this report:

Aggregate v 1.4.13

    a) servlet Tomcat 8 on AWS with Mysql DB 5.7.18.
        Install on Ubuntu Server 16.04 LTS (16.01.2017)
    b) on Google App Engine (17.01.2017)

ODK Aggregate is the core engine at the heart of many of the closely related platforms. It has been developed with flexibility in mind so that users can download, install and configure their own server.

Strengths and weaknesses

An installation on Google App Engine retains much of the flexibility and is easier to setup than the alternative, a custom installation in the cloud (Amazon Web Service was tested, but many other providers exist). This approach allows any organization to run their entire MDC operation on their own servers and keep full control over all updates. It is, however, more technically demanding and the challenges of maintaining software should not be underestimated.

When is it a good solution?

ODK Aggregate is a good solution for organizations with strong IT resources that have specific needs for their MDC infrastructure. For example, because they require certain security features such specific standards that are not easy to find with providers or that need to operate behind an organization's firewall. Another reason could be the need to retain full control of the database, for example, to integrate MDC data with other processes.
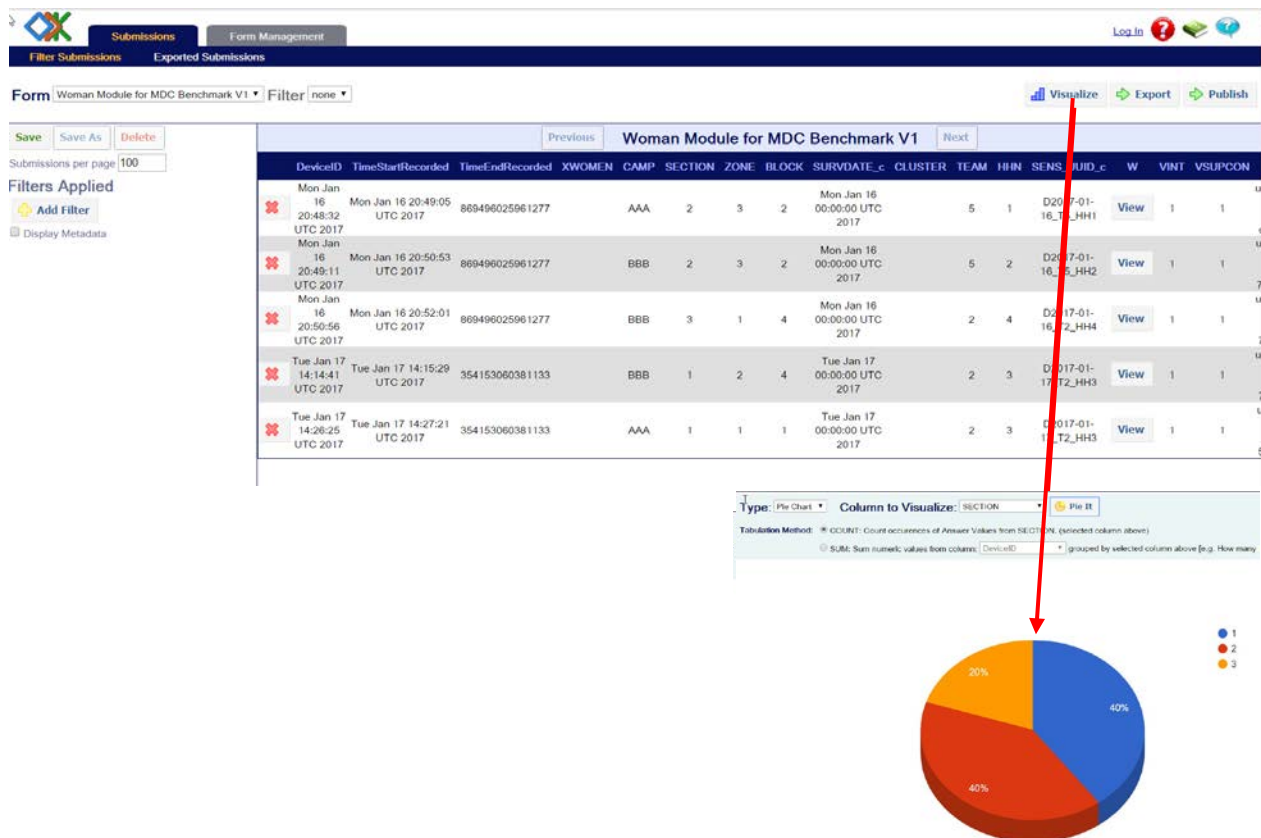

Figure 2: Aggregate User interface, including pie chart

	PROS	CONS
Form features	- all question types supported (but not all available in visual form builder) - all standard metadata - possible to switch language in-form	- no monitoring or editing on phone
Server features	- filters available (but not very user-friendly) - delete possible	- no edits on server (except if set up with Enketo) - English only interface
Import/export	- Additional formats: kml, json - Form & data upload - API (read & write) available - Briefcase compatible	
Analysis & visualisation	- Charts (pie charts & bar graphs) possible - Some mapping possible	- Analysis is are much more advanced on Google Earth/Fusion tables (but this is easy to set up)
User rights	- Anonymous submission can be set up and also prevented	- No custom roles and only basic predefined roles - Access only on full account
Security	- Encryption on phone and server possible - https can be used by default on Google App Engine	- If https is required, must be configured separately for AWS installation
Additional details	- Free but server & installation required - On Google: free quota for submission (then manipulation costs)	- On AWS: hosting and bandwidth costs - Offline setup possible with pre-built VM

ONA

https://ona.io/home

Tested version: v1.3.25 (19.01.17)

ONA is an actively maintained solution whose developers are responsive to the needs of their users, which include a large number of humanitarian organizations.

Strengths and weaknesses

ONA is based on the Xform standard, therefore the coding of the survey will meet most requirements. The analysis features on the website are getting better and while ONA is still not a complete analysis solution in itself, it can probably answer a significant share of an operation's needs, especially closer to field level. User management options are particularly rich, especially for an organization looking at managing different units (country, regions, types of programs) on a single account.

It doesn't offer advanced features such as case management and isn't well-suited for monitoring. There's also no option to filter data on the website.

When is it a good solution?

ONA is particularly well-suite for simple MDC (with no monitoring or case management), especially if many different users require limited access to a large number of surveys. It really shines when managing larger work teams is a requirement.
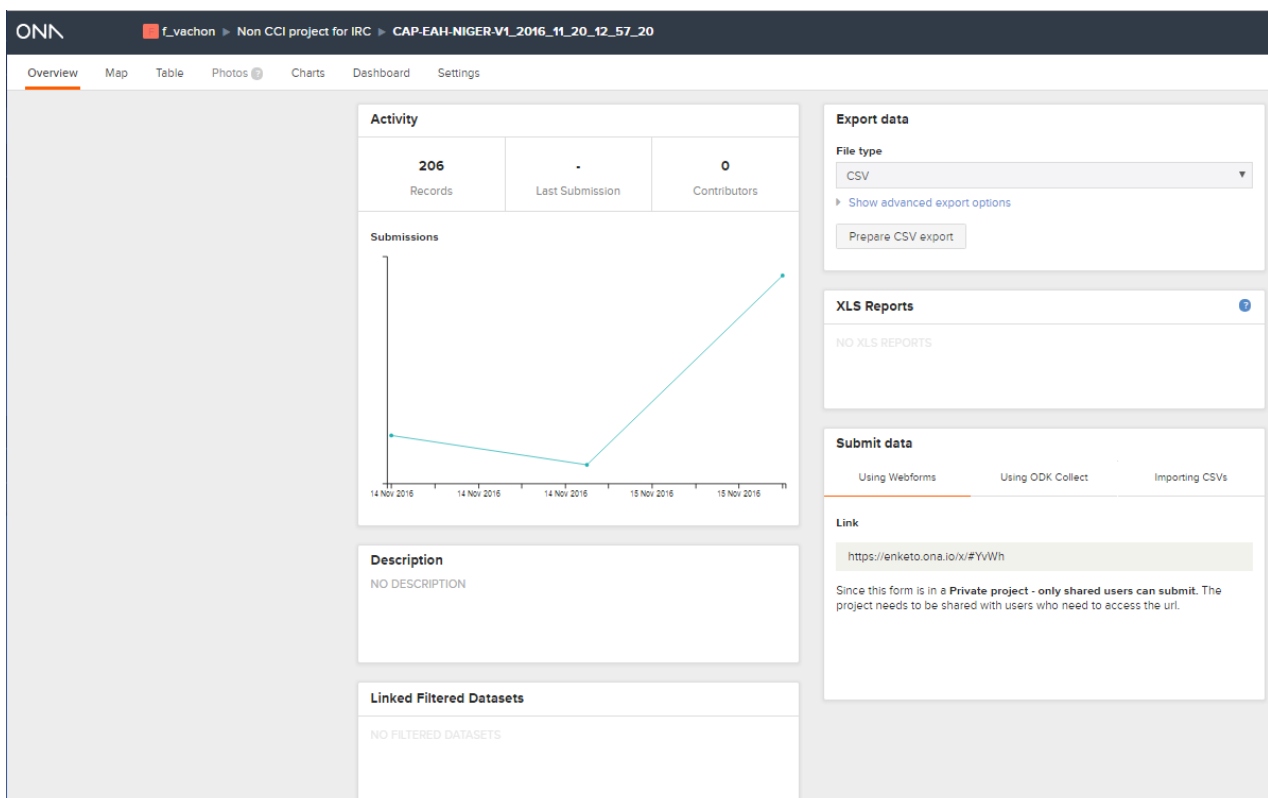

Figure 3: The online data analysis platform

	PROS	**CONS**
Form features	- All question types supported - Standard metadata - Possible to switch language	- No monitoring, only csv preloading
Server features	- Editing & deleting possible (except for data pushed with Briefcase from another platform)	- Interface only in English
Import/export	- Briefcase compatible - Form upload possible - Data upload possible - Export formats include json, sav, kml - Flexible export options for groups & choices - API to view, query, for form definition, …	- Data upload only at beginning of project
Analysis & visualisation	- Map with advanced options including filters and legend	- No filters - Very basic charts
User rights	- Four predefined roles - Access can be limited, inviting "collaborators" to a project - Access can be set on a project basis (many projects per account possible)	- No custom roles
Security		- No encryption
Additional details	- Free plan available but with limited forms and features	

SurveyCTO

http://www.surveycto.com/

![SurveyCTO logo]

Tested version: v2.212 (19.01.2017)

SurveyCTO is a platform that has fed back a number of features to the broader ODK community and seems to have gotten many important elements of MDC right. While it isn't a fully-fledged case management tool, it is possible to configure a survey drawing in responses that have been submitted before to be displayed on the phone.
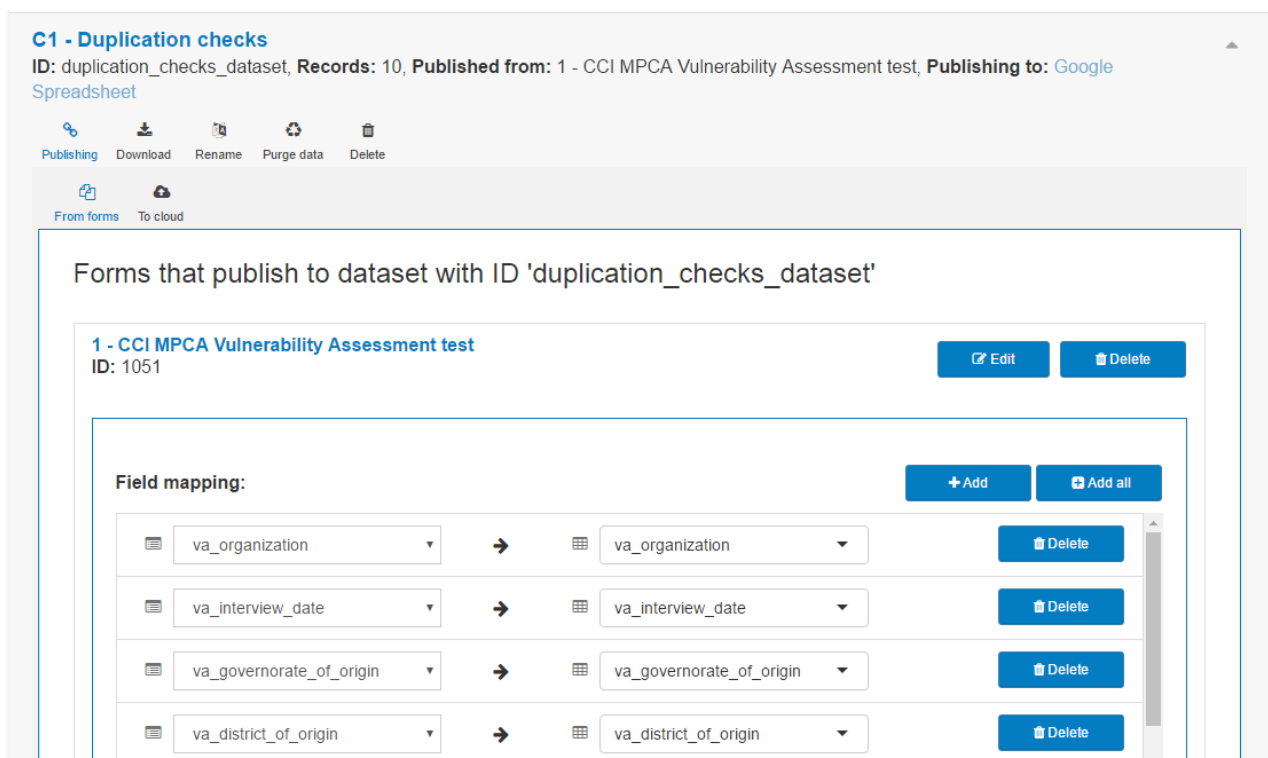
Strengths and weaknesses

All of the basic features for MDC are in place and work reliably, with extensive documentation and user support to help in their use. Some advanced features are also in place: analysis on the account is improving and includes filtering and grouping options as well as the capacity for combining data from different surveys for analysis.

User management, on the other hand, isn't very advanced compared to other platforms: rights are very broadly disaggregated. Also, rights are always granted to an account, meaning it isn't possible to limit access to a specific survey, or only to the analysis tabs.

While the documentation is extensive, it is not well illustrated and perhaps a little dense for new users.

When is it a good solution?

Organizations that are looking for a complete, flexible and versatile platform and that have only very limited needs for user and access management should consider SurveyCTO. Short of full-on case management and monitoring, this platform covers most use cases.

Figure 4: Data workflows one can easily set up

	PROS	CONS
Form features	- All question types supported - Standard metadata - Possible to switch language in form - External data works on webform as they do on the phone - Monitoring and case management capacities (albeit limited and as paid features only)	- Limited monitoring and case management are paid features
Server features		- Interface in English only
Import/export	- Briefcase compatible - Data upload - Form upload - Options for export of groups and choices	- Info on API not part of available documentation during test
Data visualisation options	- Advanced charts - Images available on server - Basic map (display data point location only) - Basic filtering	
User rights		- No custom roles - Access limitations cannot be set
Security	- Encryption on phone and server possible	- Can't prevent anonymous submissions
Additional details	- Free plan available but with limited forms, data and features	

B. Other Xform-based solutions

CommCare

http://www.dimagi.com/products/

Tested version: 2.32.1 (17.01.2017)

CommCare, a solution developed by Dimagi, has originally been designed for field based, mobile health care workers. Because of this legacy, the solution comes with a suite of case management features, such as setting up a list of cases (patients) and having forms and surveys associated with each case. CommCare can also be used for ordinary surveys and comes with an online form builder assisting users to set up their forms.

Strengths and weaknesses

Whilst CommCare is using XForms and offers a formbuilder as well as direct xml editing, only forms directly created in CommCare import easily, other xml forms can only partially import.

To access the forms, users need a dedicated user account. Using the mobile app is straightforward, however, the platform itself is less intuitive and has a steep learning curve before someone can navigate and use it with ease. Analysis and visualisation options are limited and most users requiring instant visualisations, maps or dashboard-like features will have to set up a third-party tools and use the API. CommCare comes with advanced activity monitoring features, which can be useful if the project requires that staff and case activities are closely watched. Reports and data exports can be customized so that only selected fields get exported, which can come in handy when the core data needs to be shared but not all of it should be made available.

When is it a good solution?

If your project would benefit from case management features, such as reminders for your staff, and surveys linked to case management, then it can be well worth investing the extra time necessary to become comfortable with the platform. This is particularly true if you would like to submit reports from the field by SMS in areas where mobile internet is not readily available.
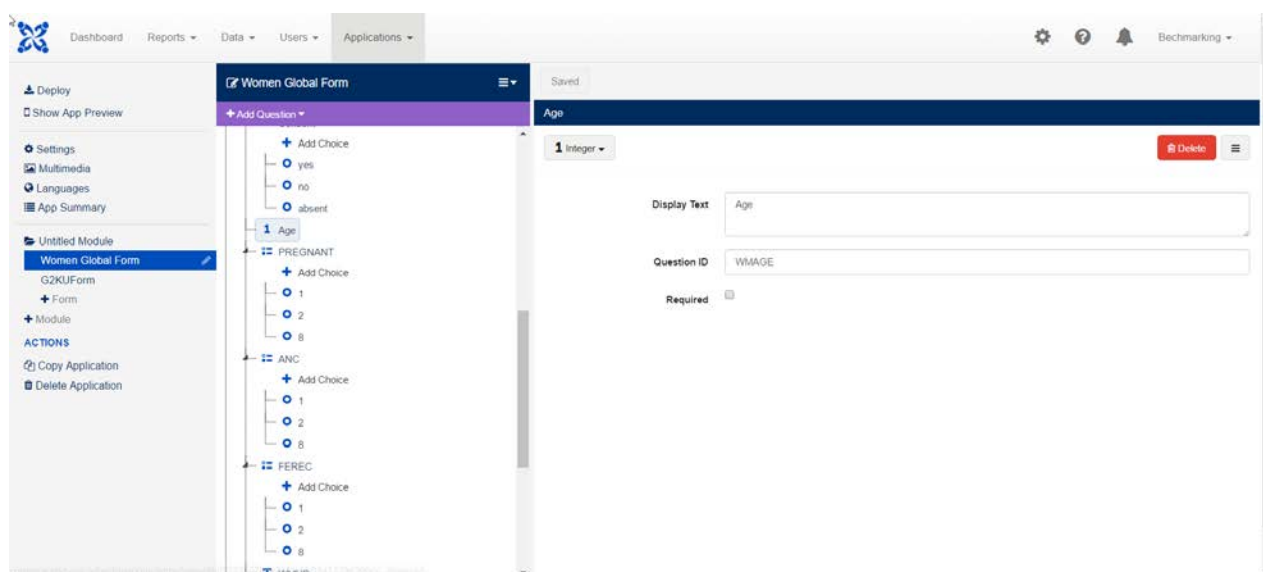

Figure 4: CommCare's form builder interface

	PROS	CONS
Form features	- All main question types - All standard metadata - Monitoring possible (with Pro account) - Possible to switch language in form	- Lacking support for external lists - Setting up calculations is not straight forward even with XLS and XML coding knowledge
Server features	- Editing and deleting on the server is possible (with Pro+ account) - Interface available in EN, FR and ES	- No filters for questions (only metadata) - The customizable report builder is only available as an add-on to a Pro account for an extra fee - No maps
Import/export	- Data upload possible incl. bulk upload (only for cases, not for all data) - Form upload possible (but different structure from other solutions) - Exports can be created to only include some of the fields	- Xml forms created by other applications using Xform standards can't by easily imported: labels do not import fully, languages aren't imported - Only csv and Excel as exporting formats
Analysis & visualisation	- Limited to monitoring activities, like number of submissions, mobile workers, etc. - API (on Pro plan)	- No built-in server options to visualise the data
User rights	- Access can be limited on form basis, anonymous submissions prevented - Variety of predefined roles	
Security	- Server encryption possible - Compliance with HIPAA and de-identifying data available as part of advanced and enterprise plans	
Additional details	- Free plan available but limited features and number of users	- *Not available with free plan*: Case management, web-based app, case importer, Excel dashboard analysis, HIPAA compliance, advanced user management, API access

DeviceMagic

https://www.devicemagic.com/

Tested version: Demo account (19.01.2017)

DeviceMagic supports most of the features you would expect from an MDC solution. Plans are priced by device and by month.

Strengths and weaknesses

Overall, DeviceMagic is easy to setup and use, including the graphical form builder. It is very advanced when it comes to data interoperability and sharing or sending data to shared folders like Dropbox and Google Drive, or common communications platforms like Slack, Evernote, Podio, Box, and Zapier.

Its main weaknesses are: lack of support for some non-Latin languages, inability of switching languages in a form, as well as a lack of data editing features. Another feature might be an advantage for some and a disadvantage for other organizations: all parent and child files are automatically combined in one Excel file which can be useful if this is required for your analysis as it allows easy filtering based on your meta or household data- however for surveys that collect quantitative questions about households and household members, this feature can make it challenging to extract indicators and statistics from both.

When is it a good solution?

DeviceMagic is easy to setup and use. As the pricing is device based, DeviceMagic can be an economical solution for organizations working with a small number of key informants that report regularly (for example once per week for a whole year).
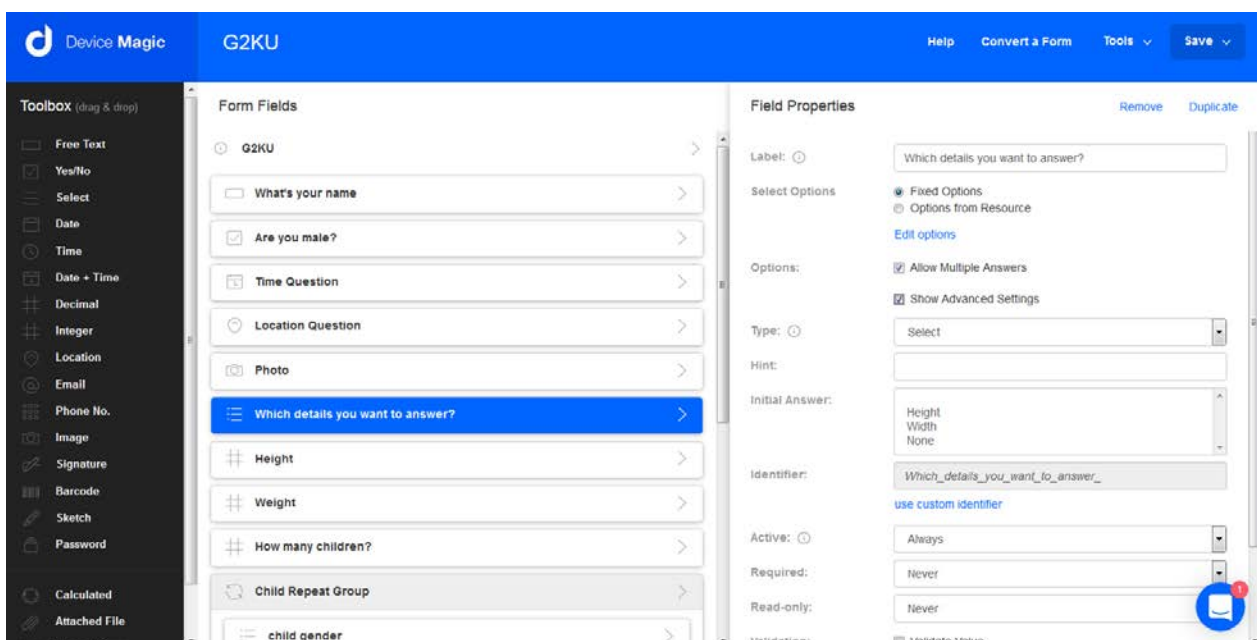

Figure 5: DeviceMagic's form builder interface

<div align="center">

PROS   CONS

</div>

	PROS	CONS
Form features	- Most question types supported - All standard metadata	- Missing question types or logic: no notes - GPS comparatively slow - No right-to-left language support - No monitoring - No option to switch language in form
Server features	- Deleting on the server is possible	- No edits on server - English-only interface
Import/export	- Additional formats: json, xml - Form upload possible but only in json format - Additional link with repositories such as drop box, OneDrive - API access for enterprise account	- No data upload - Form conversion service was not working, labels converted also to column names - When exporting forms with looped groups in xls or csv, the parent data will be duplicated and added to child data. This can make analysis on the parent file difficult.
Analysis & visualisation	- Map - Pushing to Google Spreadsheet is easy - API available	- No filters except on map by submission date - No charts except for staff tracking (not based on questions) - Map is only basic
User rights	- Customizable roles with detailed options - Access limitations by group	
Security		- No encryption on phone or server
Additional details		- No free plan

Magpi

https://magpi.com/

Tested version: DataDyne 5.4.8 (25.01.2017)
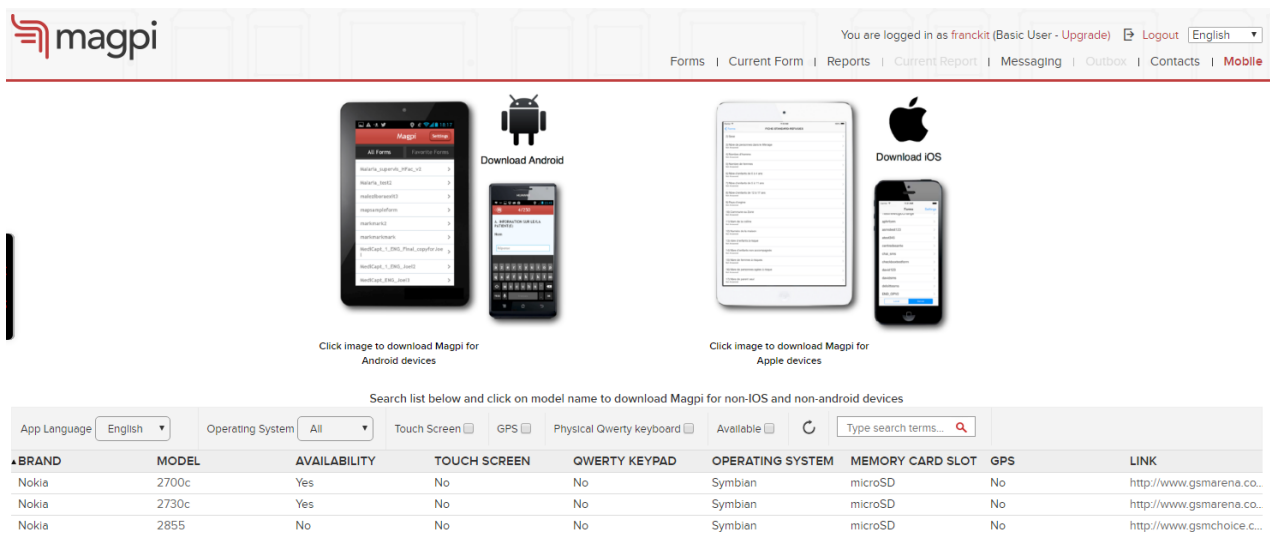
Magpi is part of the "wider" ODK family of platforms. It has a different feel than other ODK solutions and contains a number of less common features, such as support for IVR (Instant Voice Response) and SMS data collection (both for single-question surveys and more complex ones).

Strengths and weaknesses

Although the support for different question types is good, some more advanced form building features are not available, such as calculations based on dates and time. Some features are available but in a different structure compared to ODK. Magpi Enterprise users can easily integrate their data into other solutions, more information to be found here.

When is it a good solution?

Magpi is a good candidate for organizations that need to collect data via SMS or voice messages, for example crowd-sourced data or feedback from beneficiaries. It is good for MDC projects of average complexity. If your organisation is using Zapier, Salesforce, Zoho, MailChimp or any other similar solutions to manage contacts or other operational data and is planning to augment with MDC Data, Magpi might be a good match to complement your other systems.

Figure 6: Magpi online interface to download the app and follow the fleet of phones

	PROS	CONS
Form features	- Standard metadata	- Missing questions: calculation options are limited, no signature, images only with paid account - No monitoring possible - Only one language per form
Server features	- Editing and deleting is possible - Several language options incl. CN	
Import/export	- Additional mdb format - Form and data upload possible - Advanced data interoperability options for many other systems	- API access only with Enterprise account
Analysis & Visualisation	- Advanced options to filter, cross-tabulate data - Advanced chart/ reports with Pro+ account - Advanced map options	
User rights	- Form can be shared with other users	- Custom roles only with Advanced+ account
Security		- No encryption on phone or server
Additional details	Free plan available with very limited features and forms	

Survey123 for ArcGIS

http://survey123.esri.com/

Tested version: 1.10.25 (16.01.2017)

Survey123 for ArcGIS is an MDC solution designed by ESRI, a company specialised in geographic information. Accordingly Survey123 has a strong geographical component and is best used in organizations that have dedicated GIS staff who are already using ESRI products. Survey123 requires an ArcGIS Online (AGOL) account or alternatively a Portal setup[12]. While there is a Survey123 online interface which gives the user access to the uploaded forms and details some standard statistics, in order to interact with the data, to filter by fields or to see the data points on a map it is best to go through the standard ArcGIS Online interface.

Strengths and weaknesses

Survey123 is a solution where surveys have a focus on geographic data and mapping is a requirement. In addition, Survey123 supports all main question types except for monitoring and even allows anonymous submissions, with a server interface in over 30 languages.

Data analysis apart from mapping is the clear weakness of Survey123. While it is possible to filter data for mapping and visualise it creating heat maps, etc., there is no option to filter data for other visualisations such as graphs. In addition, the tool is weak if data is not needed in a GIS compatible format. Images and attachments can only be downloaded to the gdb format which is only useful if the users also work with ArcGIS Desktop..

When is it a good solution

Survey123 for ArcGIS is a solution which is ideal for an organization with strong GIS usage. If an organization has the ArcGIS Suite (Desktop, Server, Online/Portal) and also intends to collect data through mobile devices, Survey123 is an obvious choice especially given that enterprise support is available and that the solution has frequent updates.

While it is possible to collect non-geographic data with Survey123, there is no point in doing so as data is stored in geographic formats. Given that anonymous submissions are possible since early 2017, Survey123 has a strong advantage over most other solutions for citizen science projects which collect spatial data.

In April 2017 a new version was released including features like previously collected data can be edited on the phone.

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[12] Portal for ArcGIS is a platform for geographic data similar to ArcGIS Online but instead of being stored in the cloud and managed by ESRI it is stored behind an organization's firewall and managed by the organization
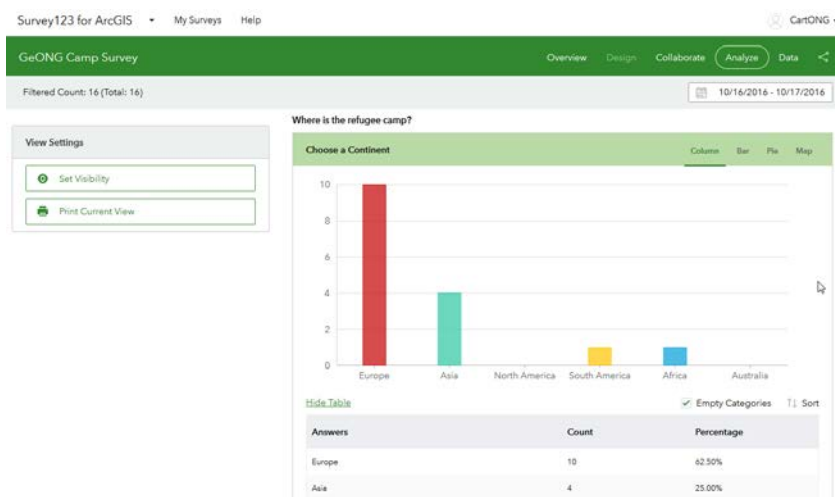
Figure 5: Survey123's interface for analyzing data

	PROS	CONS
Form features	- Standard question types supported - Standard metadata - Possible to switch language in form	
Server features	- Large variety of server interface languages (>30)	- Features can only be edited in AGOL, but no option to add related table data
Import/export	- Additional export formats: json,shp, gdb - ESRI REST API to access data - Form upload possible	- Only export as gdb allows download of images - Not possible to upload data
Analysis & visualisation	- Advanced mapping options in AGOL incl. heat maps etc.	- No filtering in Survey123 interface (layers can be filtered in AGOL) - Basic charts that do not allow any filtering except by submission date
User rights	- Anonymous submissions are possible - Customizable user roles	
Security		- No encryption on server or phone
Additional details	- Possible to set up on private server with Portal for ArcGIS (only with built-in identity store) - Active user community under GeoNet	

C. Other solutions

Akvo Flow

http://akvo.org

Tested version: Flow v.2.2.9 Dashboard v.1.9.11.1 (16.01.2017)

Akvo Flow is a relatively simple tool for basic monitoring operations that is well suited for situations where data with a geographic component (infrastructure, water points, etc.) has to be collected repeatedly. The platform is easy to setup and use, with acceptable user documentation and support. Data collection points can be displayed on an offline-map on the phone and historical data can be accessed easily, which is particularly useful for programs that include monitoring component. These features are not common in other products.

Strengths and weaknesses

The solution is expensive if only comparatively simple data collection is needed for a project and if the monitoring and mapping components are not required or not widely used. The analysis features provided by Akvo Flow are unlikely to be sufficient on their own and the platform has limitations that lessen the usefulness of some features. For example. GPS coordinates cannot be edited and while it is possible to bulk upload monitoring data related to a data point, the initial creation of these data points cannot be done in bulk.

When is it a good solution?

Akvo Flow is fairly easy to setup and use. It is a good solution in situations where data needs to be monitored over time and where being able to see the data collection points (such as water points) on an offline map on the phone adds real value. It can be a good starting point for MDC projects that require cloud-based infrastructure monitoring.
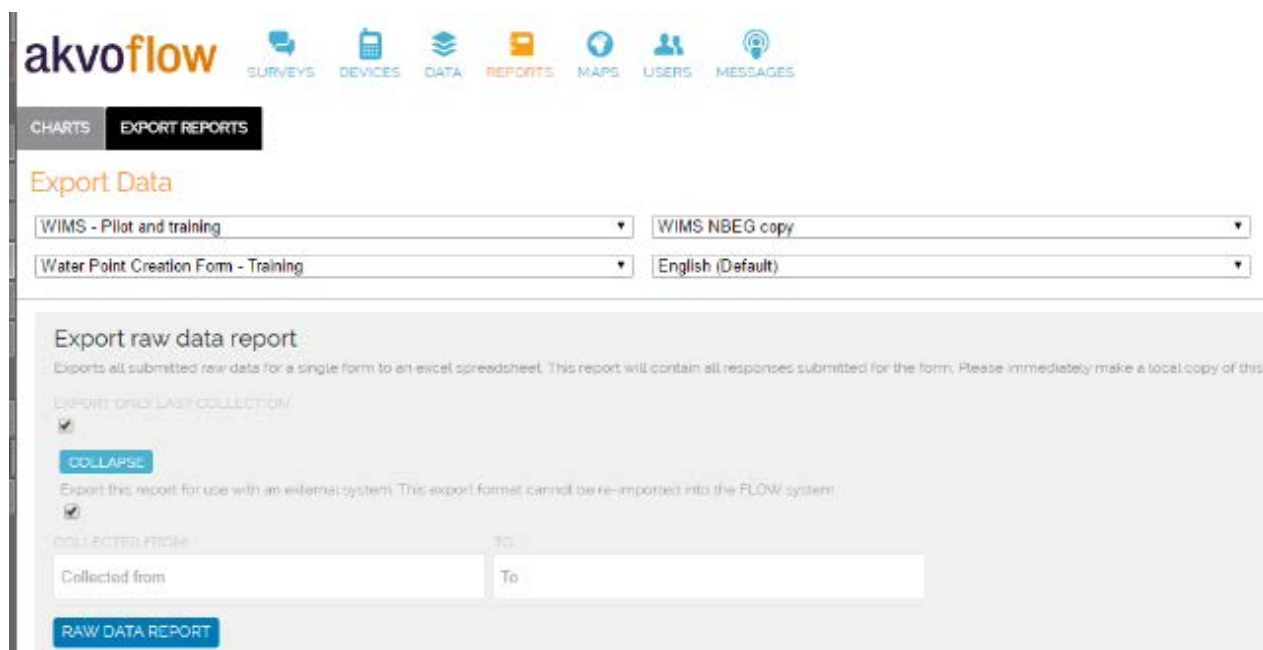
Figure 6: Interface to export data

	PROS	CONS
Form features	- Monitoring possible	- Missing question types & logic: calculations, notes, no external lists - Missing metadata: recording time
Server features	- Editing & deleting possible (except for GPS coordinates) - Several language options: EN,FR,ES,PT,VN,ID	
Import/export	- Data upload possible in bulk (but not to bulk-upload new data collection points) - Simple API (read-only)	- No form upload (must use the visual form builder) - API uses HTTP only
Analysis & visualisation		- No filters - Only very basic charts (one chart at a time) - Very basic map - Images not accessible on server
User rights	- Custom role creation - Access on folder basis - Detailed breakdown of tasks that can be assigned to each user	
Security		- No encryption options
Additional details		

Dharma Platform

Tested version: Version 0.47 (02.03.2017)

Dharma Platform is a stand-alone tool that can manage different data collection projects within one platform. Although very expensive, its way of grouping projects into teams and regions make it a good tool for globally operating NGOs and IOs.

Strengths and weaknesses

Dharma excels in monitoring and case management. Users can create a main entry which is then linked to attributes that are monitored and updated regularly. The server interface is at the same time easy to use and powerful, especially when it comes to filtering and visualisation, which makes Dharma a good choice for users that don't have a lot of experience with these type of tools.

However, there is also weaknesses: some very commonly needed field types or options are not (yet) supported: most importantly, calculations or the option to require an answer before submitting a form is not or not sufficiently implemented. For example, at the moment it is only possible to mark text input fields as mandatory but not multiple choice question.

When is it a good solution?

It is a good solution for projects that aim to monitor information regularly, such as health-related indicators for different patients. The focus on health is also reflected in the platform's security features, especially its HIPAA compliance.
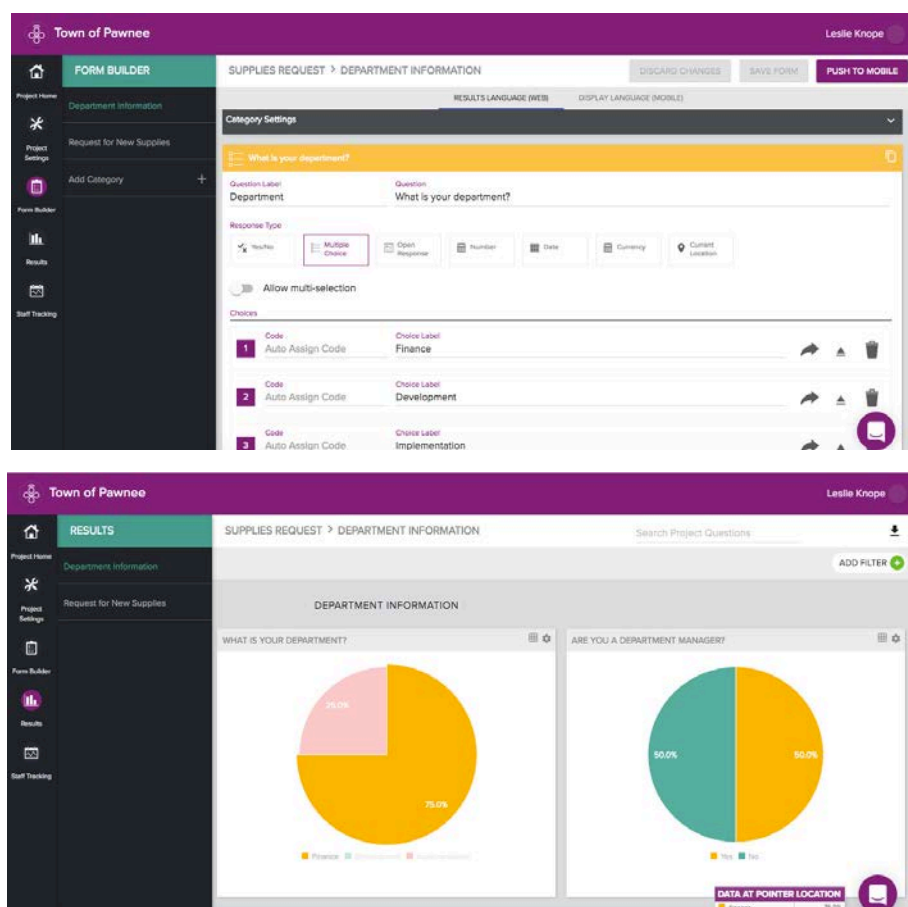
Figure 7: Visualisation of the analysis platform

	PROS	CONS
Form features	- Full case management options ("longitudinal study" (incl. edit and delete on phone) - Simple, yet powerful form creation interface - Can split projects by different regions, teams and compare them with each other - Standard metadata	- Only limited question types, missing are: calculations, pictures, barcode support, set up input constraints. Only text fields can be set as mandatory - Not possible to switch language within a form
Server features		- Map only available for staff tracking not as part of analysis/reporting - No option to manipulate the data on the server - Interface only in English
Import/export	- Dharma team can provide support for potential data migration	- No form upload - No data upload
Analysis & visualisation	- Advanced filtering and cross-tabulation options - Charts based on filter	
User rights	- Access on project basis with subset by team or region possible	- No custom roles - No anonymous submissions
Security	- Persistent encryption at database level on server and phone - Compliant with ISO 27001-27008, HIPAA, USFDA	
Additional details		- No free plan

Fulcrum

http://www.fulcrumapp.com/

fulcrum

Tested version: 2.22.1 (19.01.2017)

Fulcrum is used by many private companies but also counts UNICEF as one of its clients. It has a strong geographical component and provides most of the features that we find in advanced MDC tools, including editing. A free trial is available, which can help get to know the app.

Strengths and weaknesses

The app excels through its ability to work with geographic data. It provides an option to include basemaps from OpenStreetMap, Mapbox or custom mbtiles to identify survey locations more easily in an offline environment. In addition, a tutorial on how to integrate data into the online mapping platform CARTO.com is available and users can export their data in various geographic formats including shp, kml or gdb. This makes the integration with desktop GIS application such as Google Earth, ArcGIS or QGIS very easy. At the same time, almost all question types can be created with the exception of custom constraints or references to previous answers. Fulcrum will even keep a history of the data allowing users to see changes made to the entries. This makes it a very useful tool for many data collection projects.

However, Fulcrum does not perform as well when it comes to analysis and security. The app doesn't provide advanced security features like encryption and the only option to view the data on the server is using a map or table. Charts or filters cannot be created directly through the server interface so that additional tools are needed for most forms of analysis.

When is it a good solution?

While Fulcrum is not a full case management solution, it allows users to update information on the phone and keeps a history of that information. Given that it also provides strong geographical features, it can be very useful for monitoring and mapping facilities and infrastructures.
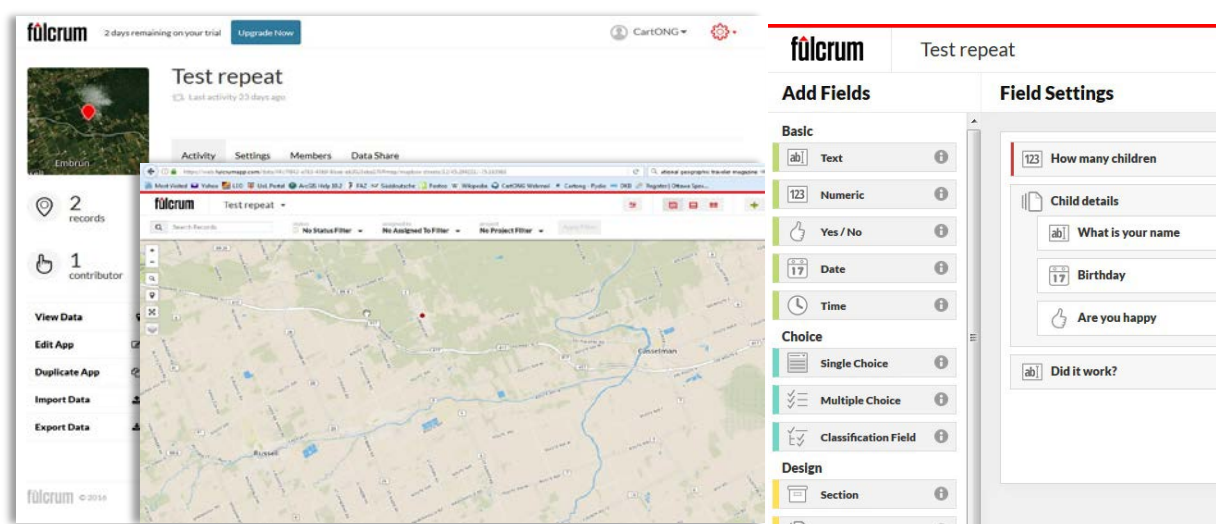
Figure 8: Geographical interface to view the data and form conception interface

	PROS	CONS
Form features	- Edits on phone possible - All standard metadata	- No switching between languages - No custom constraints or reference to previous answer
Server features	- Edit & delete on server	- Only in English
Import/export	- Many GIS formats incl. shp, gdb sql (PostGIS) - Advanced options for uploading data matching fields (incl. in bulk) - API allows querying	- No form upload
Analysis & Visualisation		- No filters or charts - Only basic map
User rights	- Detailed options for custom roles - Access to form can be limited to certain users	
Security		- No encryption available
Additional details		- No free plan

IformBuilder

Tested version: App: 6.9.11.266.
    Dashboard: 10.0.2.3938 (17.01.2017)

An intuitive tool with some advanced features and comprehensive documentation. The tool is easy to use and based on a graphic interface. It supports basic case management, such as linking different forms to a specific case, or assigning a case to a specific staff member. It is developed actively and offers good documentation as well as an active community forum.

Strengths and weaknesses

IformBuilder's plans are comparatively expensive and although the platform offers advanced features that are lacking elsewhere (such as email alerts), it doesn't offer some features that are very basic for MDC: for example, calculations are possible but use of logical statements (true/false) is limited.

When is it a good solution?

IformBuilder is a good choice when a simple tool to perform basic monitoring is needed, as the platform is easy to learn. An iOS version of the application is also available, which may be useful if the existing hardware in the organization is also based on Apple products.
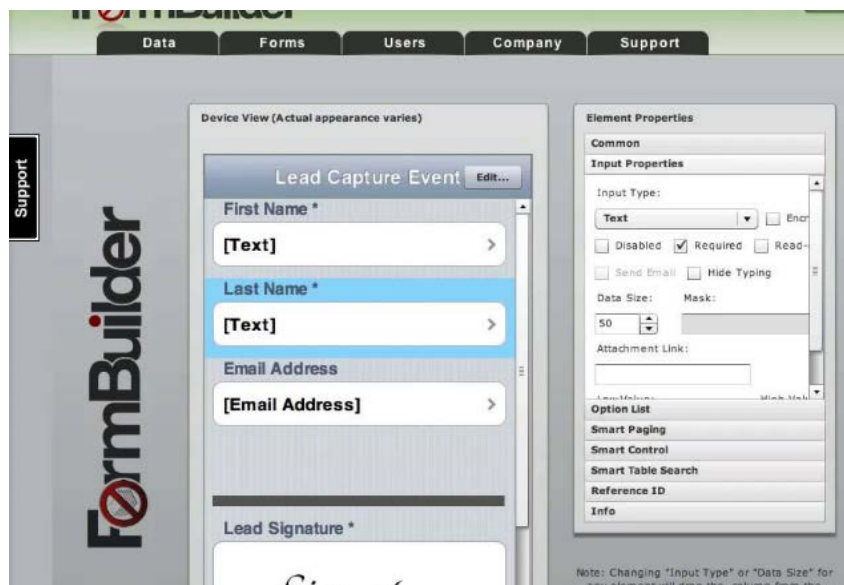
Figure 9: Form conception interface

	PROS	CONS
Form features	- Monitoring possible through "smart tables" but export options limited	- Missing option: calculations cannot be set to invisible to the user - Metadata details vary by output format (most in json)
Server features	- Editing and deleting on the server is possible	- Interface is only in English
Import/export	- Additional export formats: json, xml, atom - Bulk data upload possible	- Creates empty rows in csv if no child (for groups)
Analysis & visualisation		- No filters - Only one point can be shown on a map at a time
User rights	-	- Only full account access - No roles
Security		- No encryption for current version of the app
Additional details	- Onsite forum for help & questions	- No free plan

Mobenzi Researcher

http://www.mobenzi.com/researcher/Home

Tested version: "Researcher" v5.5.1-i (07.02.2017)

Mobenzi count Oxfam, amongst other, as one of their most prominent NGO clients. While the company provides different solutions, only *Mobenzi Researcher* was included in this report.

Strengths and weaknesses

Mobenzi Researcher comes with some very strong features, including detailed user and role management, analysis options that allow for very detailed filtering as well as the ability to work in different languages within the same project. However, the platform also falls short in areas that are standard in other solutions. For example during an export images are simply copied into the cells of an excel file with no clear identifier or link to the original input. In addition the GPS did not always work properly during testing. Finally, the interface, while powerful, is not intuitive and user will have to spend some time to learn how to use some functions such as setting custom filters for analysis.

When is it a good solution?

The platform's strengths in user management and the ability to export data in the stat/transfer format make it a good solution for larger data collection projects that need to be analysed further in a statistical tool.
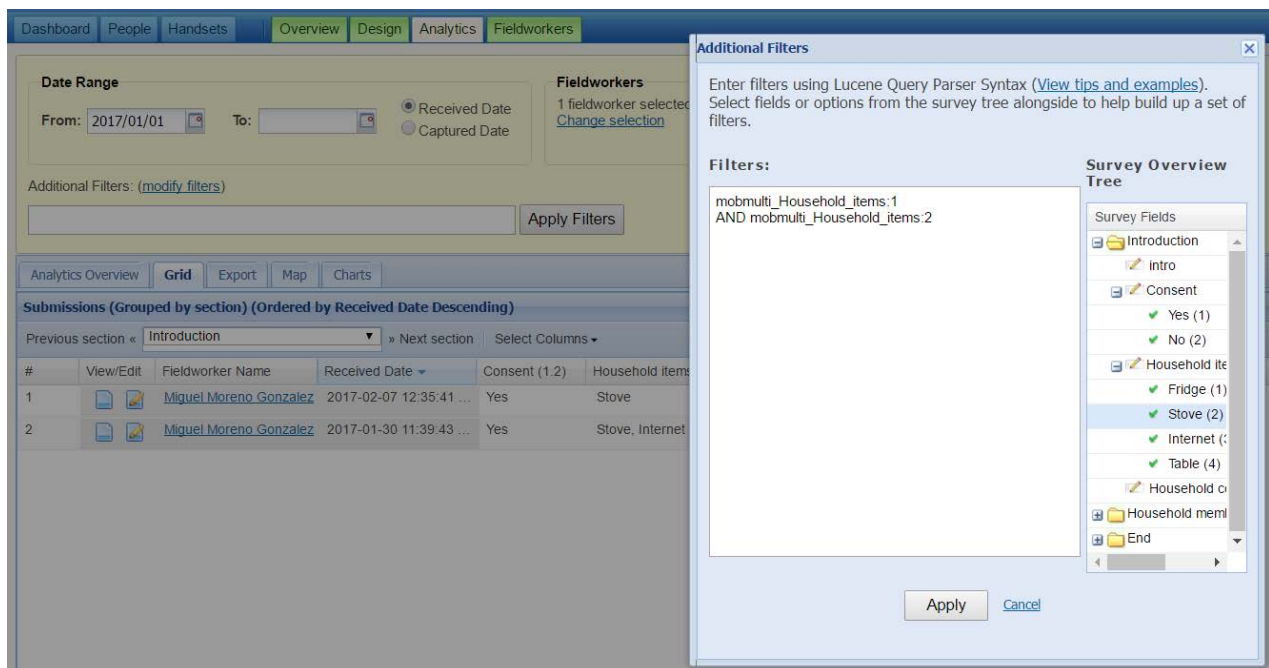
Figure 10: Interface to visualize data

	PROS	CONS
Form features	- All standard metadata	- Missing question types: custom constraints, hints; - Problems with GPS during testing - No monitoring or editing on phone possible
Server features	- Editing and filtering is possible	- Interface only in English
Import/export	- Stat/transfer as additional export format - API allows query, update, …	- No data upload (feature still in beta) - Picture embedded in xls without strong link to cell
Analysis & visualisation	- Advanced filter options (but text input not very user-friendly) - Charts take into account filter options	- Map view allows no customization
User rights	- Very detailed support for role definition - Access limited on a project ("study") basis	
Security		- No encryption
Additional details		- No free plan

Poimapper

http://www.poimapper.com/en/

POIMAPPER

Tested version: POI Mapper Plus 1.6.5m (24.01.2017)

Poimapper, as the name suggests, focuses on mapping points of interests in the field and putting them on a map. However, it is not just a geographic application but has become a full MDC tool. Complex form logic is supported as well as visualisations including charts and filters.

Strengths and weaknesses

Poimapper supports the collection of GPS points and can display data on a map, both on the phone and on the server. Unfortunately, the map's functionalities are limited and cannot be customised, aside from clustering. However, Poimapper provides other options that make it a compelling tool. Most data types are accepted, data can be edited on the phone and a history is kept on the server. Filtering is strong which helps when analysing the data.

Less impressive is the user and role management, which is relatively limited, and the visual form builder. While being powerful and working without problems, the form builder's design makes it often difficult for the user to verify the logical setup of the form, especially when several skip patterns were implemented.

When is it a good solution?

NGOs can use Poimapper to collect and even monitor data on facilities that have a clear geographical component. As data can be exported in SPSS, statistical analysis of the results is possible.
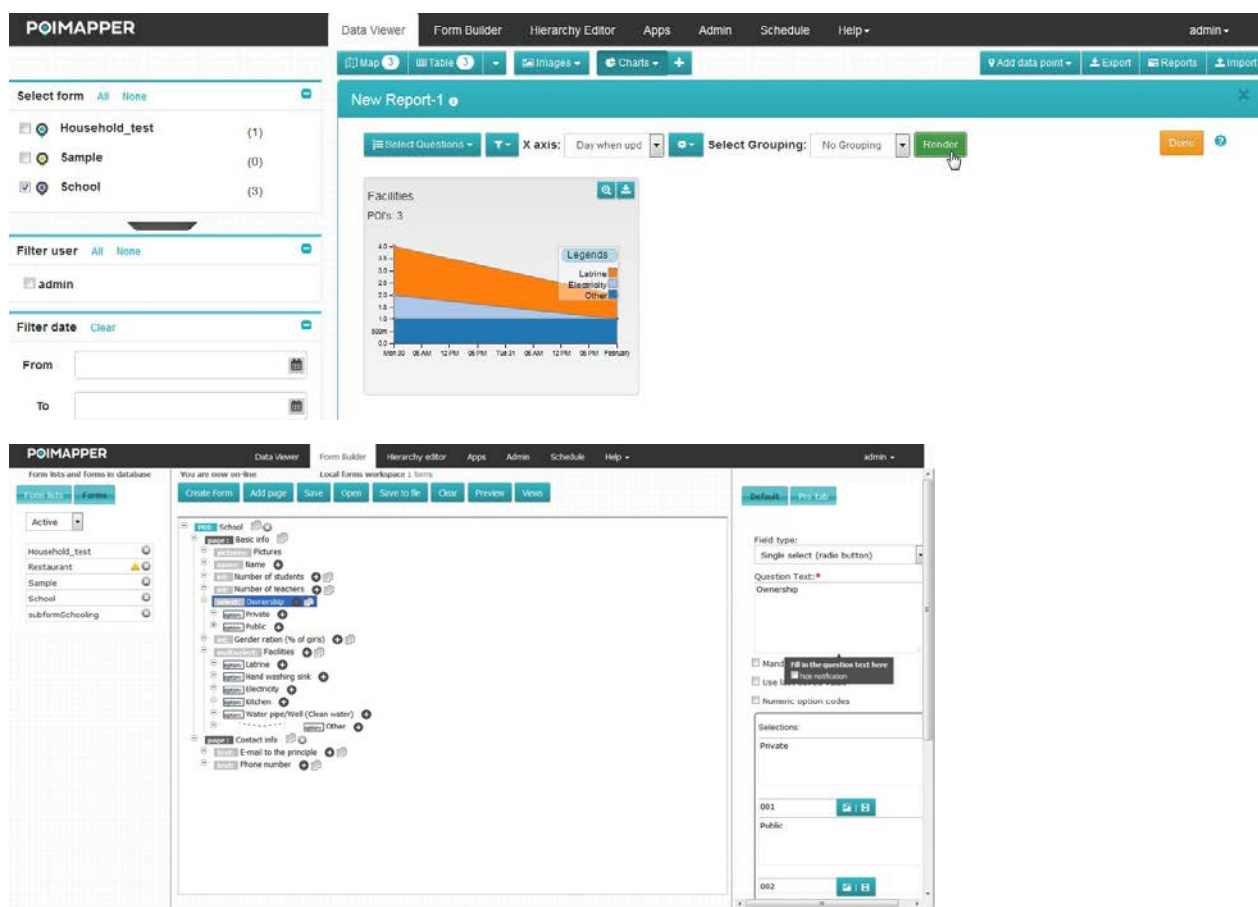
Figure 11: Poimapper's form builder and reporting and analysis interface

	PROS	CONS
Form features	- Most questions types are possible - Standard metadata - Different languages are kept in different "views" of the same form - Keeps history of edits	- No hints or signature questions - Form creation interface needs some time to get used to
Server features	- Editing and deleting on the server is possible	
Import/export	- Export format includes SPSS, kml - Allows upload of forms and data	- API for enterprise accounts mentioned but no documentation openly accessible
Analysis & visualisation	- Advanced filter options - Good charts support that takes into account the filter settings	- Map view is only very basic
User rights	- Access can be limited on a per-form basis	- No anonymous submissions - Only three basic roles and no customizable roles
Security	- For highly sensitive data a security chain-of-custody solution can be provided	
Additional details	- 30% discount for NGOs	- Free plan available but limited to one user

Traxilo

https://traxilo.com/

Tested version: 1.5.5 (03.02.2017)

Traxilo is a tool that was developed to follow clients/beneficiaries as well as the activities linked to them. Traxilo is used by a number of NGOs including Doctors of the World. It is extremely easy to set up and to use.

Strengths and weaknesses

Traxilo's strength lies in tracking services that are linked to specific beneficiaries. The interface is very user-friendly. The system is very secure and built to favour anonymised beneficiaries for better protection of sensitive data. For this purpose Traxilo can easily replace a person's name with a code. The idea is that data collection should mainly be used to focus on trends, not on individuals. Whenever questionnaires are modified, they are automatically updated on the phone.

When is it a good solution?

Traxilo is an ideal tool for one very specific use case: if an organization wants to build a list of beneficiaries and then gather data linked to those beneficiaries (for example services provided by the organization) or to monitor general services that are not related to a specific beneficiary, but are part of a program.
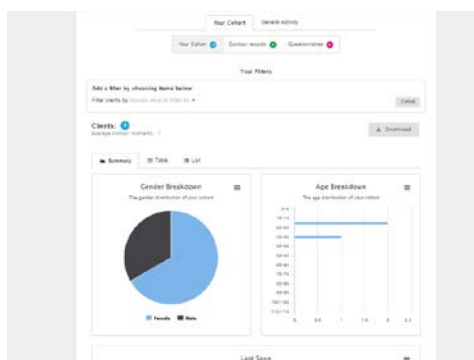
Figure 8: The type of dashboard available to view information on a cohort

Figure 12: Traxilo's advanced filtering and chart options for beneficiary tracking, and below its mobile interface

	PROS	CONS
Form features	- Monitoring or beneficiary tracking	- Key question types are missing; Only number, single/multiple choice, text and required fields are available. - Only Latin characters - No option to switch language inside a form
Server features	- Editing and deleting on the server is possible	- Only English interface
Import/export	-	- No data or form upload - No API
Analysis & visualisation	- Advanced filter options - Advanced charts based on filters	- No map view
User rights	- Easy access management via email - Access can be limited on form basis and shared with other accounts	- Only two roles with no customization
Security	- Phone and server encryption - Demographic data for a cohort can be captured without identifying them (a code can be used)	-
Additional details		- Not adapted for non-cohort follow-up use cases

Figure 9: Print screens of the mobile application

D. Table 1 – ODK and Xform based solutions

		KoBoToolbox	ODK Aggregate	ONA	SurveyCTO	CommCare	Device Magic	Magpi	Survey123
	Tested version	ODK Collect v1.4.14	a) Aggregate v 1.4.13 on Tomcat Ubuntu b) Aggregate v1.4.13 on Google App Engine	v1.3.25	V2.20	v 2.32.1	v 1.72.0	Magpi DataDyne 5.4.8	v 1.10.25
Form features	Question types	all but importing external lists does not work on Enketo web form	all	all but importing external lists does not work on Enketo web form	all	most: no external list	most: no notes, difficult to set constraints, only calculation fields can be hidden, GPS doesn't use WiFi network to improve location accuracy and speed	most: limited calculations, no signature, no external lists	most: no calculations/ reference in label text (i.e. data input cannot be included in label (only answer)
	Metadata	all (start/end time, device id, phone nb, sim serial can be set or not)	all (can be set or not)	all (start/end time can be set or not)	all (start/end time, device id can be set or not)	all (included by default)	all, except IMEI, some are loaded by default. Optional: geostamp, time stamp identifies user not device	all (identifies by username, not device)	all (identifies by username, not device)
	Language/ charset support	all (UTF-8)	all (UTF-8)	all (UTF-8)	all (UTF-8)	all (UTF-8)	limited, no right-to-left languages	all (UTF-8)	all (UTF-8)
	Switch language in form	possible	possible	possible	possible		no	no	possible
	Monitoring	limited (only csv preloading)	no	limited (only csv preloading)	limited (no csv with paid account)	yes with Pro account	no	no	no (released in April 2017)
	Details								
Server features	Filters	no	advanced but difficult set up	no (data can only be sorted)	basic	no (only metadata filters)	no (only option is to filter map by date)	advanced: filters, disaggregation, cross-tabulation	advanced, but not directly in survey123 interface. Can be set up in AGOL viewer using sql
	Charts & reporting	basic: can't be filtered or customised	yes, on selected fields, but not possible to change layout	basic	advanced	basic: the more customizable report-builder is only available as an add-on to a standard+ account for an extra fee.	no: only to track staff, not based on input	advanced options with filters (for paid account only)	basic: can't be filtered or customised

		KoBoToolbox	ODK Aggregate	ONA	SurveyCTO	CommCare	Device Magic	Magpi	Survey123
	Tested version	ODK Collect v1.4.14	a) Aggregate v 1.4.13 on Tomcat Ubuntu b) Aggregate v1.4.13 on Google App Engine	v1.3.25	V2.20	v 2.32.1	v 1.72.0	Magpi DataDyne 5.4.8	v 1.10.25
	Map	advanced: with category options and legend	yes, if Google Map API has been set up; applying a filter to a map is possible	advanced: with filter options and legend	basic: displays data points on a map	no	basic: GPS accuracy reduced	advanced: with filters (paid account only)	advanced when using the AGOL map interface: heat maps, filters, custom colours, legend, …
	View images	yes	yes	yes	yes	yes	yes	pictures are an advanced feature (not tested)	yes
	Edit	possible (opens in Enketo)	no, unless Enketo is set up	possible but not for data pushed with briefcase	no, only possible to edit datasets	possible with PRO account	no	possible	possible through ArcGIS Online viewer (not survey123 page)
	Delete	possible	possible	possible	Possible (data, but not form)	possible with PRO account	possible	possible	possible but not to delete related entry (group)
	Languages	EN, FR, ES, AR, though translation incomplete for some	EN	EN	EN	EN, FR and some ES	EN	EN, FR, ES, PT, CN	~20 languages (defined by AGOL profile), including Arabic, Hindi,…
	Details:		Enketo can be installed to edit. Alternative workaround: export, change and delete the original, then upload changed dataset						
Export & Import	Data export format	csv/xls, kml, sav	csv, kml, json (some Briefcase, some server export)	csv/xls, kml, json, sav	csv/xls	csv/xls	csv/xls, json, xml, docx, pdf	csv/xls, mdb	csv/xls, json, shp, gdb
	Form upload	possible: xls	possible: xml	possible: xls	possible: xls or xml	possible: xml but adaptations required if form comes from other tools	possible: json but only coming from Device magic	possible: xml	possible: xls (through Survey123 Connect but adaptations required if data comes from other tools)
	Data upload	possible with Briefcase (although not always reliable)	possible with Briefcase	possible for new data (Briefcase or csv upload) but not for ongoing project	possible (Briefcase or CTO sync). Another option is to upload a csv to a dataset	possible: Excel case uploader (Pro feature, could not be tested)	no	possible: copy-paste or upload	no

		KoBoToolbox	ODK Aggregate	ONA	SurveyCTO	CommCare	Device Magic	Magpi	Survey123
	Tested version	ODK Collect v1.4.14	a) Aggregate v 1.4.13 on Tomcat Ubuntu b) Aggregate v1.4.13 on Google App Engine	v1.3.25	V2.20	v 2.32.1	v 1.72.0	Magpi DataDyne 5.4.8	v 1.10.25
	Group/sub-form exporting	flexible: excel - related table, csv - flat table	defined: csv flat table	flexible: csv: flat table, xls: related tables	flexible: direct export - flat; briefcase or CTOsync export: related tables	defined: csv flat table	defined: xls flat table	defined: subforms are exported independently	defined: related tables
	Multiple choice questions exporting	defined: both all in one column and each choice in one column	defined: all in one cell	flexible: all in one column or each choice one column	flexible: all in one column or each choice one column	flexible: each choice one column or all in one cell	defined: all in one cell	defined: each choice one column	defined: all in one cell, separated by comma
	Picture export	export media as .zip and with id in table	direct download: url in table briefcase: media folder as zip	link: full url in table, export media as .zip	link: full url in table, briefcase-export media as .zip	link: full url in table	link: full url in table	pictures are an advanced feature (not tested)	only downloaded if gdb chosen, no cell in csv table
	Briefcase compatible	yes (but pushing data has often been unreliable)	yes	yes	Yes	no	no	no	no
	API	yes, read & write https://kc.kobotoolbox.org/api/v1/	yes, read & write https://opendatakit.org/use/aggregate/data-transfer/#APIs	yes: view, query, form definition,... https://ona.io/static/docs/index.html	yes: (contact customer support for more details - not part of general documentation)	yes, (at least standard plan): read & write using HTTP https://confluence.dimagi.com/display/commcarepublic/CommCare+HQ+APIs	yes, with Enterprise account https://devicemagic.zendesk.com/hc/en-us/articles/218720498-Device-Magic-Database-API	yes: HTTPS read (Enterprise only) http://support.magpi.com/support/solutions/articles/4865-magpi-outbound-api	yes, ESRI REST API; view, query, update, delete http://resources.arcgis.com/en/help/rest/apiref/index.html?mapserver.html
	Easy integration with	Excel, SPSS, Google Earth	Excel, Google Earth, Google Fusion	Excel, SPSS, Google Fusion, Google Earth	Excel, Google Fusion, Google Docs and Google Earth		Excel, Drives (Google, OneDrive, Dropbox, Box, ...)	Excel, Google Fusion, Access	Excel, ArcGIS (especially Online), QGIS
	Details	to view data attributes in Google Earth, better to import the csv than the kml	when exporting without briefcase sub-forms not exported (only url reference given)						
User Rights	Anonymous submission	possible	possible; depends on server setup	no, always requires authentication	possible in web form	no, always requires authentication	no, registering the phone is required	no, always requires authentication	possible (since version 1.9)
	Predefined roles/ permissions	3 (view, edit, submit)	4 (collect, view, manage form, site admin)	4 (view, view & submit, submit, edit)	5 (view, submit, create form, admin user, full admin)	5 (admin, app editor, billing admin, field implementer, read-only)	no, only "owner"	3 (form admin, data manager, collector)	4 (viewer, user, publisher, viewer in ArcGIS Online)

		KoBoToolbox	ODK Aggregate	ONA	SurveyCTO	CommCare	Device Magic	Magpi	Survey123
	Tested version	ODK Collect v1.4.14	a) Aggregate v 1.4.13 on Tomcat Ubuntu b) Aggregate v1.4.13 on Google App Engine	v1.3.25	V2.20	v 2.32.1	v 1.72.0	Magpi DataDyne 5.4.8	v 1.10.25
	Custom permissions or role creation	no	no	no	no	no	yes, very detailed options that can be chosen separately including sending messages and checking errors	no	yes defined in ArcGIS Online e.g. to permit editing on server
	Access per role limitations	yes, on form basis (except anonymous submission, on account basis)	no, only full account	yes, on project basis or account basis	no, only full access	yes, on form basis	yes, on group basis. (forms are shared with a group and its members have access)	yes, on form basis	yes, on group basis. (forms are shared with a group and its members have access)
	Details	users are not added to an account. Instead, forms are shared with users who have their own accounts		ONA allows adding collaborators who have their own ONA account. Therefore the options are quite flexible.				users are not added to an account. Instead, forms are shared with users who have their own accounts	
Security	Phone encryption	possible	possible	possible	possible		no	no	no
	Server encryption	possible	possible	possible	possible	yes, encrypted on the server	no	no	no
	Compliance with security standards					HIPAA for Advanced and Enterprise plans (not for Pro or lower)			FISMA low
	Details	possible to install on your own server for increased security	depending on install HTTPS for transfer has to be set up manually (Tomcat), install on own server possible			https://wiki.commcarehq.org/display/commcarepublic/De-Identify+Data			
Additional details	Offline setup	possible but still in beta, requires high IT skills	possible with prebuilt VM	no	possible: allows sending data to CTO Sync (similar to Briefcase). Data can be exported into csv. Requires paid account. Web interface necessary to manage surveys.	possible but would need development, i.e. use code from Github	no	no	no

		KoBoToolbox	ODK Aggregate	ONA	SurveyCTO	CommCare	Device Magic	Magpi	Survey123
Tested version		ODK Collect v1.4.14	a) Aggregate v 1.4.13 on Tomcat Ubuntu b) Aggregate v1.4.13 on Google App Engine	v1.3.25	V2.20	v 2.32.1	v 1.72.0	Magpi DataDyne 5.4.8	v 1.10.25
	Free plan	yes: for humanitarian organisations - no limits	yes: hosting of aggregate costs depending on bandwidth and size. For App Engine, free quota available	yes: limited forms and features	yes: limited forms, data and features	yes but very limited features and limited users	no, only 15 days trial	yes: limited features and forms	no
	Pricing scheme	free for humanitarian organisations	free solution but potential charges for hosting server	pay for number of projects/forms & advanced features	pay for number of forms/submissions and advanced features	pay for features	pay per user	pay for number of forms and many form feature	pay per user (ArcGIS Organization), not-for-profit discount
	Help & support	active Google Group, website and email support	active Google Group	email support, Google Groups	email support, ODK Forum/Google Group	Google user group, dedicated support for Pro users	forum, email support	only limited documentation, Skype, phone, on-ground-support available (not clear about extra costs)	GeoNet forum & blog, other support depends on AGOL account, dedicated support for Enterprise users

E. Table 2 – Other solutions

		Akvo Flow	Dharma	Fulcrum	Iformbuilder	Mobenzi Researcher	Poimapper	Traxilo
	Tested version	Flow 2.2.9 on Dashboard version v1.9.11.1	v0.47	v.2.22.1	App: 6.9.11.266. Dashboard: 10.0.2.3938	v5.5.1-i	Poimapper Plus 1.6.5m	Mobile version 1.5.5
Form features	Question types	most but no calculations, notes, external lists	few: no custom constraints, hiding calculation questions, external lists. Only text input can be defined as required questions, no calculations, no signature / barcode / picture	most but no reference to previous questions, no custom rules/constraints	most, but no hidden calculation questions	most, but GPS buggy. No hints, limited constraints	most but input cannot be referenced in a label, no hints, no signature	few: no photo, signature, external list, no calculations, skip patterns, group questions, barcodes, structured date type
	Metadata	all. Uses create and update time, not submission time.	all (identifies by user not device)	all (identified by user not device)	most: depends on output (json best)	all	all (identified by user not device)	most: no device ID
	language/ charset support	all (UTF-8)	all (UTF-8)	all (UTF-8)	all (UTF-8)	all (UTF-8)	all (UTF-8)	limited, Latin characters only
	Switch language in form	yes	no	no, requires creating a new survey	only through a workaround: languages are managed through the phone's settings (must change phone language to change form's language)	create different views for different languages but link is kept	create different views for different languages but link is kept	no
	Monitoring	yes, full longitudinal study, case management options	yes, full case management (longitudinal study) options	yes, keeps history of edits	limited for some data types but possible through "smart tables"	no	yes, keeps history of edits	yes, full beneficiary tracking
	Details					metadata exported to a different tab/sheet		The app can be set to English or French (but not the forms itself)
Server features	Filters	no (data can only be sorted)	advanced: filter or cross-tabulation	no (only filter by metadata: status, project, enumerator,..)	no (data can only be sorted)	advanced: but statements need to be written as text input	advanced: filter any field type and input	advanced
	Charts & reporting	basic	yes, based on filters	no	basic: can't filter or customise	advanced: based on fields and filters	yes, based on filter and fields (pro account)	yes based on fields and filters
	Map	basic: no layout options	basic: only as "staff tracking" points on map	basic	basic: only one point at a time (as part of the details when clicking on a record)	basic: markers on survey location	basic: based on filter, choose to cluster or not	basic
	View images	no	(no picture support)	yes	yes	Yes	yes	(no picture support)
	Edit	possible, but not the GPS coordinates	no, but on phone	possible	possible	possible	possible	possible

		Akvo Flow	Dharma	Fulcrum	Iformbuilder	Mobenzi Researcher	Poimapper	Traxilo
	Tested version	Flow 2.2.9 on Dashboard version v1.9.11.1	v0.47	v.2.22.1	App: 6.9.11.266. Dashboard: 10.0.2.3938	v5.5.1-i	Poimapper Plus 1.6.5m	Mobile version 1.5.5
	Delete	possible	no, but on phone	possible	possible	possible	possible	possible
	Languages	EN,FR, ES, PT, VN, ID	EN	EN	EN	EN	EN, FR, ES, DE, FI	EN
	Details							
Export & Import	Data export format	csv/xls	csv/xls	csv/xls, json, kml, sqlite, shp, gdb, sql (postgis)	csv/xls, json, xml, atom	csv/xls, stat/transfer	csv/xls, kml, SPSS, doc	csv/xls
	Form upload	not possible	no	no	possible	possible: xml (but not xform standards)	possible	no
	Data upload	possible but not for GPS points and not to add new points to monitor	no	possible: advanced options for matching columns, indicating conflicts, …	possible: xls	possible but in beta (not tested)	possible (but skip-logic not supported)	no
	Group/sub-form exporting	defined: flat table	defined: flat table	defined: related table	defined: related table (either export only sub-form or as part of main form but never flat main table)	flexible with four options: flat (repeat as additional row or column), related (each repeat group extra or all repeats in one)		n/a
	Choice exporting	defined: each choice one column	defined: each choice one column	defined: all in one cell	defined: all in one cell	defined: each choice one column	defined: all in one cell	defined: all in one cell
	Picture export	Link: full url in csv table	(no picture support)	Link: full url in table	Link: full url in table	embedded in xls table, but lost in csv, download one by one possible	csv: image info is lost xls: choice to download media as .zip	(no picture support)
	Briefcase compatible	no	no	no	no	no	no	no
	API	yes: view only, uses HTTP https://github.com/akvo/akvo-flow/wiki/Akvo-FLOW-API	yes: DJANGO REST API, contact customer support not part of existing documentation	yes: view, query http://developer.fulcrumapp.com/query-api/intro/	yes: view only https://iformbuilder.zendesk.com/hc/en-us/articles/205353910-API-6-0-Documentation	yes: query, read, update, add http://help.mobenzi.com/article/AA-00431/40/Guides/API/API-Overview.html	yes, but not part of documentation, contact support	no
	Easy integration with	Excel	Excel	Excel, QGIS, ArcGIS, Google Earth	Excel	Excel, SAS, Stata	Excel, SPSS, Google Earth	Excel

		Akvo Flow	Dharma	Fulcrum	Iformbuilder	Mobenzi Researcher	Poimapper	Traxilo
Tested version		Flow 2.2.9 on Dashboard version v1.9.11.1	v0.47	v.2.22.1	App: 6.9.11.266. Dashboard: 10.0.2.3938	v5.5.1-i	Poimapper Plus 1.6.5m	Mobile version 1.5.5
	Details				sub-form export has empty rows if there is no "child" to parent data			

Annexes

1. List of All Solutions

The following table lists all solutions which were researched in a pre-benchmarking effort. Not all of them were retained for this benchmarking, reasons for exclusion listed in the last column.

Tool	Included	URL	Reason for exclusion
Akvo Flow	yes	http://akvo.org	
Commcare	yes	http://www.dimagi.com/products/	
DeviceMagic	yes	https://www.devicemagic.com/	
Dharma	yes	http://dharmaplatform.com/	
EpiCollect	no	http://plus.epicollect.net/	Still in beta
Formhub	no	https://formhub.org/	No longer maintained
Formitize	no	http://formitize.com/en/	No considerable track record with humanitarian orgs
Fulcrum	yes	http://www.fulcrumapp.com/	
GoFormz	no	https://www.goformz.com/	No considerable track record with humanitarian orgs
iFormbuilder	yes	https://www.zerionsoftware.com/iformbuilder/	
Kobo online	yes	http://www.kobotoolbox.org/	
Magpi	yes	https://magpi.com/	
Mobenzi Researcher	yes	http://www.mobenzi.com/researcher/Home	
mWater	no	http://www.mwater.co/	WASH specific initially, although this is changing
ODK with Aggregate on Tomcat online (Amazon web services install)	yes	https://opendatakit.org/	
ODK with Aggregate online on App Engine updated instance	yes	https://opendatakit.org/	

with Aggregate: 1.4.7; released 7 May 2015			
Ona	yes	https://ona.io/home	
Poimapper	yes	http://www.poimapper.com/en/	
Pushforms	no	http://www.getpushforms.com/	No considerable track record with humanitarian orgs
Socialcops Collect	no	https://socialcops.com/collect/	Used in limited context so far.
Survey 123 (ESRI)	yes	http://survey123.esri.com/	
SurveyBe	no	http://surveybe.com/	No considerable track record with humanitarian orgs but rather with universities and donors
SurveyCTO	yes	http://www.surveycto.com/	
TaroWorks	no	https://taroworks.org/	No demo in time to test
TrackVia	no	http://www.trackvia.com/	No considerable track record with humanitarian orgs
Traxilo	yes	https://traxilo.com/	

2. MDC Technical Requirements Checklist

All platforms were tested against the same criteria and assessed for the same features and functions. To make it comparable, a ranking system was set up for easier comparison.

	Question	Check for & example	Ranking
Form features	Question type	Simple fields: integer, double, free text	all: 14 most: 8-13 few: < 8
		Date fields (not a string)	
		Picture/ photo and signature	
		GPS coordinates (points)	
		Select: multiple & single	
		Hints & Notes	
		Calculations including based on previous answers: *age based on today's date and date of birth*	

		Simple constraints: *answer must lie between 1-10*	
		Custom constraints: e.g. for multiple choice *answer a and b accepted together but not a and c*	
		Skip logic: *skip question(s) if the previous answer was no*	
		Hide questions: *A calculation field is used but not shown to the enumerator*	
		Require questions: *form can't be submitted without an answer in this field*	
		External lists: *use a csv list to fill in multiple-choice options*	
		Recurring group, "child" questionnaire, sub-form: *for each child in household answer certain questions (number varies per hh)*	
	Metadata	Unique ID for submission	all: 7
		User or device identifier	
		Submission date and time	most: 4-6
		Start/end time of a survey	few: <4
		User or device identifier: user name or device ID	
		Submission date and time	
		Start/end time of a survey	
	Language & charset	Supports UTF-8 encoding, incl. right-to-left and non-Latin	all
		Allows only left-to-right languages or Latin characters	limited
	Switch language	Switch language in form: *Enumerator switches from EN to AR if question not understood by informant*	good
		Switch language on phone: *Enumerator can choose to open the survey in EN or AR before each interview. All languages stored and analysed together on server*	ok
		One language - one form: *Each language in a separate form not analysed together on server*	no
	Monitoring	Monitoring OR editing on the phone keeping track of edits or link different submissions to the same parent	yes
		Neither monitoring nor editing on phone	no
Server features	Filters	Filter by any field, allow several filters at a time	advanced
		Filter by some fields, only one at a time	basic
		No filters on question fields	no

charts & graphs	Takes filters into account when creating charts	advanced
	Only very simple pie/bar charts no filtering on chart	basic
	No charts on question fields	no
map	Customise map using filters, categories,...	advanced
	Only display of GPS points	basic
	No map available	no
view images	Images accessible on server	yes
	Images NOT accessible on the server	no
Edit	Edit any answer on server	yes
	Editing possible with the exception of certain fields	partly
	No editing possible on the server	no
Delete	Deleting is possible	yes
	No deleting	no
Languages	List language options for server interface	
Export format	Lists formats to export data	
Form upload	Forms upload if formatted correctly	yes
	Forms can NOT be uploaded	no
Data upload	Any records in correct format can be uploaded (except images)	possible
	Upload possible but with limitations	partly
	No option to upload data	no
Group exporting	Various options: *as flat table (all entries in one table each child one line) or related (child in separate table)*	flexible
	One option only	pre-defined
Choice exporting	Various options: all in one cell separated by comma or each choice one column	flexible
	One option only	pre-defined

	Picture export	Details how pictures are downloaded and link between table entry and image file kept	
	Briefcase compatible	Possible to push and pull data with Briefcase	yes
		NOT possible to push and pull data with Briefcase	no
	API	An API is provided for accessing the data and documentation available	yes
		NO API is provided	no
	Easy integration	Lists tools with which the data can easily integrate based on export formats or available tutorials	
User management	Anonymous access	Possible and avoidable	yes
		Possible but has limitations	partly
		Never possible	no
	Predefined roles	Lists predefined roles or permissions	
	Custom roles	Allows creating custom roles	yes
		Not possible to create custom roles	no
	Access per role limitations	Possible to limit access to certain forms/projects/...	yes
		NOT possible to limit access	no
Security	Phone encryption	Data is (or can be) stored encrypted on the phone	yes
		Data is NEVER encrypted on phone (other than phone encryption)	no
	Server encryption	Data is (or can be) stored encrypted on the server	yes
		Data is NEVER encrypted on server	no
	Compliance with standards	Lists compliance such as FISMA low/high, HIPAA,...	
Additional details	Offline setup	Possible to have a workflow without any connectivity or behind the organizations firewall	yes
		NOT possible to have a workflow without any connectivity or behind the organizations firewall	no
	Free plan	A free plan (other than trial) is available	yes

	NO free plan is available	no
Business model	Details on pricing scheme: per user/submission/…	
Help & Support	Detail ways to get help and support	

### 3. What are The Advantages to Using ODK-Based Technologies for NGO/IOs?

As many humanitarian organizations have opted to use ODK, there is sufficient technical knowledge within the sector to exchange sector-specific experience, code and standard operating procedures within the humanitarian community of practice. This can save time and avoid duplicating efforts.

Since ODK-based solutions share the same core architecture, some tools inside the ODK suite can be used across different products, which makes it easier to switch from one platform to another if necessary. Examples include the Briefcase application to download all data, including media files or Enketo, a tool to enter and edit data through a web interface.

While Open Source tools as such do not incur costs on software (though potentially on hosting), it strongly depends on internal resources and the availability to build and retain the competencies internally on whether or not they are really cost effective. Certainly, key considerations are the aspect highlighted above, how active are the developers, how active the user community and how long has a solution been around. Because ODK has been around for a while, the number of efficient users increases steadily and since easier ways of coding have been conceived as well as carefree hosting services which do not require any IT skills, chances are good that a respective organization will find or already has internal resources to support surveys built on ODK/related tools. This then leads to cost effective deployments and guarantees a certain sustainability.

The graph below highlights the interoperability between the closely related ODK tools. It is usually possible to build a form which can be used with any of the mobile apps or through a web form accessed through computer. The data can then be sent to the web platform of choice and analysed there if possible or exported and used in any external statistical packages.
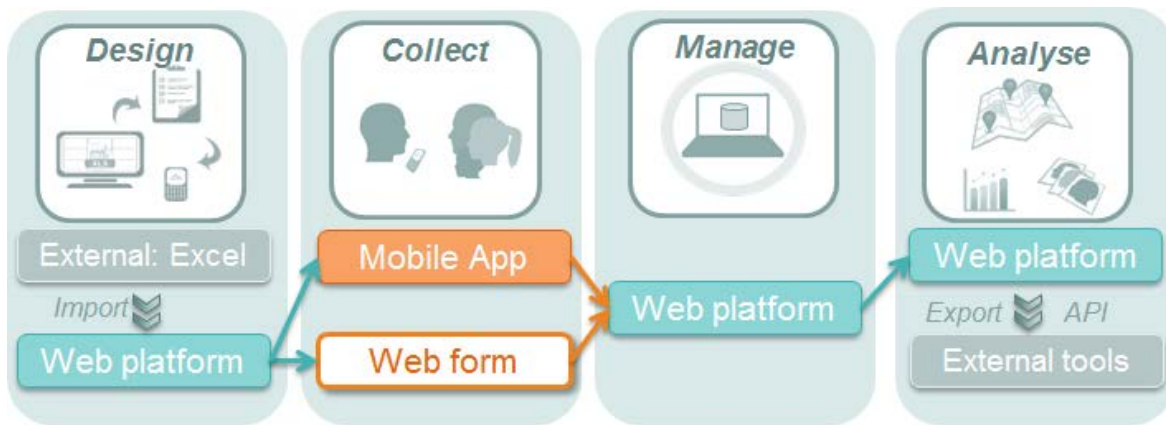
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