

**Report of the workshop**

**Defining principles and guidelines for mobile apps and platform development for best practice in citizen science**

**Berlin, December 13-14, 2016**



Foto: Claudia Göbel

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# Summary

Mobile devices enable citizens to provide timely geospatial information which contributes to scientific understanding, ongoing knowledge of the Earth system, and decision-making. Several apps and platforms are being developed to efficiently gather and manage these data. Citizen science apps and platforms are related to different participant groups, project durations, aims and goals. In order to address the complexity and pitfalls of app and platform development in citizen science, the first workshop of a planned series “Defining principles of mobile Apps and platforms development for best practice in citizen science: Interaction, Interoperability, Innovation” was held on December 13th- 14th in Berlin. With 46 citizen science practitioners, with different technical and engagement experience and knowledge, we identified and developed principles for best practice in three areas: (1) *Interoperability and data standardization* (including openness, accessibility, reusability and back-end system design); (2) *User Interface & Experience Design: Interaction, Mechanisms to support Motivation* (including usability, engagement, gamification, feedback and procedure to improve data quality and assurance); (3) *Outreach, Learning, Education, and other Rewards of Participation* (including recruitment and retainment).

The main outcomes from each working group are summarized below:

## *(1) Interoperability and data standardization*

With respect to “interoperability and data standardization”, a common structure and scheme for metadata is needed about: citizen science projects, tools used in these projects (software, hardware, apps, instruments, sensors), and, where applicable, observations made by participants. The preliminary principles include reuse or adaptation of existing platforms, project-portals, and apps, use of existing standards and metadata schema until a recommendation is made available by CSA-ECSA-ACSA (foreseen by May 2017), documenting all new developments (including quality assessment methods), and provision of an API to share as much data as possible.

## *(2) User Interface & Experience Design*

There is already a wealth of knowledge about effective app design in the technology industry, and people designing apps for citizen science should incorporate this as much as possible into the design stage of new projects. The early years of citizen science apps have seen considerable (near) reproduction of already existing apps (for example for noise monitoring). App developers should first see whether their planned app already exists, and should ideally build their app for re-usability in future projects. It is particularly important for citizen science apps to involve participants throughout the entire process, from concept, to design, to iterative user-testing, and of course to outcomes. This naturally helps in considering the context the app will be used in (e.g. how weather affects its use). Citizen science projects using apps need to plan for and provide two-way communication, even if this communication takes place outside of the app. Sufficient long-term resources and commitment should be ensured before long-term monitoring projects are undertaken.

## *(3) Outreach, Learning, Education, and other Rewards of Participation*

The communication on recruitment, retainment, volunteer management and care as well as ethics should be part of long-term strategy of the project from start on. Here, we identified some of the factors that are important and need to be considered beyond the technical aspects of building apps and platforms. The core issue for designers and project coordinators is to remember that citizen science projects are socio-technical, and the social aspects require attention from the start as it should influence design and development decisions. We suggest that projects will consider conscious inclusiveness, which means to be clear about the degree in which the project aims to reach a wider group of participants or a more exclusive one, while considering the benefits of inclusiveness - for example, engaging with blind people who might be good at sound identification. Next, there is a need to be transparent on project goals, the process of recruitment, commitment etc. This can be

communicated in the introduction to the app or the information that is used to get people engaged. Beyond recruitment, there is a need to consider retainment and being aware of people's motivations and reasons for participation. This is also linked to volunteers' management and duty of care towards the participants - for example carefully understanding why someone is contributing a lot to the project, and being alert to issues of mental and physical well-being, potentially integrating such information into project dashboards. There are also ethical aspects such as considering how much or little of personal information will be captured. Finally, we should consider the wider ecosystem of citizen science projects, and find ways to share information among projects, so to be able to offer to a participant other interesting projects if they find a specific project not interesting, or when the project is ending.

A common objective is to encourage and facilitate the sharing and reuse of software, data, and knowledge. We identified three activities to support the app and platform development in citizen science besides continuing to work on principles and guidelines:

1. Develop a list of descriptors which would be useful in terms of reuse.
2. Implement a catalog of existing apps/platforms with focus on reuse.
3. Implement a methodology for collecting and sharing the learning of citizen science practitioners around the designing and building of their apps & platforms, managing data and engaging and retaining participants.

# 1. Introduction

Mobile devices and low cost sensors enable citizens to provide timely geospatial information to contribute to scientific understanding, ongoing knowledge of the Earth system and decision-making. Several apps and platforms are being developed to efficiently gather and manage these data. Citizen science apps and platforms are related to different user bases, project's durations, aims and goals. When projects are about Earth observation, data are often collected for a single purpose and not shared or made discoverable. In order to address the complexity and pitfalls of app and platform development in citizen science, we planned a series of workshops and activities.

The first workshop "Defining principles of mobile Apps and platforms development for best practice in citizen science: Interaction, Interoperability, Innovation" was held on December 13th- 14th in Berlin. It was co-organized by [Naturblick](#), a project of the Museum für Naturkunde Berlin and the [European Citizen Science Association](#) (ECSA) and was supported by Bridging in Biodiversity Science (BIBS) and Berlin-Brandenburgischen Instituts für Biodiversitätsforschung (BBIB). The event welcomed 46 participants with experience in in citizen science apps and platform development, Data, Tools and Technology, Best Practice, Education and Communication. The workshop was open to a broader participation by using the open tools [trello](#) and [google drive](#) to share and exchange ideas and results. Twitter input was collected using the hashtag [#citsciapp](#).

The objective of the workshop was to start a process of identifying and putting together principles to develop mobile Apps and platforms for environmental and biodiversity data management, with reference to the [10 Principles of Citizen Science \(ECSA 2015\)](#). To achieve this, we first discussed and established a common definition for app, platform and portal. Presentations focused on citizen science data, app development and projects' experiences about success and failure in development, engagement and user interaction. In working groups we defined preliminary principles building on different perspectives and explored the application of some of them by rapid prototyping.

In this report we provide a summarized overview of the results of the workshop. Notes of the workshop participants were compiled and slightly edited. First overarching principle and guidelines were identified and drafted. All original notes can be viewed in [google drive](#) and [trello](#).

## 1.1 Definitions

In order to establish a common understanding, Sven Schade from the Joint Research Center (JRC) led the discussion and agreement on the definition for app, platform and portal. Considering that the boundaries are not always clear and in some cases tools might act as a portal and a platform at the same time, the following definitions were used for the workshop:

**App:** "a self-contained program or piece of software designed to fulfil a particular purpose. It is an application, especially as downloaded by a user to a mobile device." (Oxford English Dictionary)

**Platform:** A (computing) platform is a technical framework on which one or more applications may be run and where data are kept. For the purposes of user interaction (UI) and user experience (UX), the term "website" instead of platform will be used.

**Portal:** web-site providing access or links to other sites. Here, especially pointing to apps, platforms, projects etc.

## 1.2 Workshop participants

- Gaia Agnello, ECSA
- Leon Barthel, Leibniz Institute for Zoo and Wildlife Research (IZW)
- Rainer Borchering, Project coordinator CS-Platform BeachExplorer.org
- Daniela Campobello, University of Palermo
- Sofia Capellan, BirdLife International
- Luigi Ceccaroni, 1000001 Labs
- Bernat Claramunt López, CREA
- John Cornell, BirdLife International
- Olha Danylo, International Institute for Applied Systems Analysis
- Daniel Edler, University of Gothenburg, Sweden
- Carolin Ehmig, Universität Potsdam
- Margaret Gold, Natural History Museum London
- Claudia Göbel, ECSA
- Volker Grescho, UFZ/iDiv
- Gregor Hagedorn, Museum für Naturkunde Berlin
- Niclas Hagen, Gothenburg University
- Muki Haklay, UCL
- Jana Hoffmann, Museum für Naturkunde Berlin
- Clemens Jacobs, GIScience group, Department of Geography, Heidelberg University
- Kostas Karatzas, Aristotle University of Thessaloniki, Greece
- Dick Kasperowski, University of Gothenburg
- Itzhak Khait, Tel Aviv University's Steinhardt Museum of Natural History & Nature apps Inc
- Renzo Kottmann, MPI for marine Microbiology
- Christopher Kyba, German Research Centre for Geosciences (GFZ)
- Soledad Luna, ECSA
- André Mascarenhas, ECSA
- Gerald Pape, senseBox
- Antonella Radicchi, Technical University Berlin
- Robert Richter, Museum für Naturkunde Berlin
- Veljo Runnel, University of Tartu Natural History Museum
- Franziska Sattler, Museum für Naturkunde Berlin
- Sven Schade, European Commission, Joint Research Centre
- Katrin Schneider, Unabhängiges Institut für Umweltfragen
- Julia Schnetzer, MPI für marine Mikrobiologie Bremen
- Wolfgang Schröder, netzweber GmbH
- Andrea Sforzi, Museo Naturale Maremma
- Michael Strohbach, TU Braunschweig
- Ulrike Sturm, Museum für Naturkunde Berlin
- Tobias Sturn, IIASA
- Erik Thorelli, Gothenburg University
- Iris Wessolowski
- Florian Wetzel, Museum für Naturkunde Berlin
- Mirjana Zabic, University of Banja Luka, Bosnia and Herzegovina
- David Ziegler, Museum für Naturkunde Berlin

## 2. Presentations and Working Groups

### 2.1 Presentations

During the two day workshop Bernat Claramunt, CREAM outlined the contribution of citizen science towards international biodiversity monitoring. Several projects shared insights into success and failure in development, engagement and user interaction. The [EU BON project Apps and guidelines](#) were presented by Veljo Runnel (University of Tartu), [Naturblick](#) by Ulrike Sturm (Museum für Naturkunde Berlin), [Loss of the Night/ My Sky at Night](#) by Christopher Kyba (Helmholtz-Zentrum Potsdam Deutsches GFZ), [NatureWatch](#) by John Cornell (Bird Life International), [Platform Natusfera](#) by Bernat Claramunt, CREAM & Luigi Ceccaroni, 100001 Labs and [Fotoquest](#) go by Olha Danylo from International Institute for Applied Systems Analysis (IIASA).

Sven Schade from JRC reflected on the diverse landscape and definitions of apps and platforms. He also shared lessons learned from making apps and highlighted the importance of integrating citizens contributions into the European policy making process. Renzo Kottmann, MPI expressed ideas about balancing open scientific data with closed personal data. Finally, Claire Born guided us through a rapid-prototyping exercise for exploring the applicability of the first identified principles.

All presentations can be retrieved under the following link: [google folder](#).

### 2.2 Working group Principles for Interoperability: Data Standardization & Data Quality

The working group *Principles for Interoperability: Data Standardization & Data Quality* discussed the development process with objectives on openness, accessibility, reusable data and back-end system design and was led by Luigi Ceccaroni and Bernat Claramunt.

To ensure interoperability of data in future a common structure and scheme for metadata is needed. This includes e.g. metadata about: citizen science projects, tools use in project (software, hardware, apps, instruments, sensors), and observations made by participants (domain specific). In the three mentioned areas, standardization initiatives are currently under way.

Especially in citizen science the aspect of data privacy of citizen related data needs awareness and common standards. For all citizen science projects there is the question if quantity or quality of data is needed.

#### 1. Citizen science apps and platforms use existing standards.

- A recommendation of existing standards and metadata schema will be made available by CSA-ECSA-ACSA in 2017 (foreseen in May 2017). This ontology of citizen science is being developed by the international "Data and metadata working group" and should be taken into account and adopted.
- Examples of other existing standards and metadata schema: ALA - BioCollect, SciStarter, PPSR-CORE - CitSci.org, the US Federal Crowdsourcing and Citizen Science Catalog, Dublin Core, GBIF - IPT, Project Open Data Metadata Schema - POD v1.1, CKAN API, DCAT, Schema.org, OGC, CobWeb, ADIwg, ISO 19115/19110, Inspire.

#### 2. Citizen science apps and platforms are open for reuse and reuse existing software if possible.

- The reuse of existing apps should be encouraged.
- Apps and platforms should be registered in a general catalog of existing apps/platforms with relevant information that enables reuse.

- New developments should be well documented. For example, methods for data quality validation/assessment should be described. Also, language translation should be documented and taken into account.
  - Openness of code is valuable in principle, but there are contextual situations where some limited closeness is necessary (e.g. long-term monitoring projects not wanting forks).
- 3. Citizen science apps and platforms facilitate data sharing.**
- Apps (*sensu lato*) should have an API to share as many data as possible. But not all data is suitable to be shared, there are contextual situations where some limited closeness is necessary (e.g. species distributions). Therefore project leaders decide which, how much data and when they wish to share the data. These points, however, should be communicated to participants.
  - Each observation/data point should have a universally unique identifier (UUID). In that way, this information can be uniquely identified without significant central coordination.
  - Special attention should be given to licenses. The license should allow reuse and attention needs to be paid to international differences, especially if data is shared with other countries.
  - To ensure that the data is publicly available there should be transparency about where data are stored.
  - Data and metadata should be made available to participants. Either directly via the corresponding project's portal, or indirectly via overarching portals like EMODnet [<http://www.emodnet.eu/>], or GEOSS [<http://www.earthobservations.org/geoss.php>], or GBIF: providing full & open access to global and regional Earth observation data sets. The GEOSS Portal is accessible from [<http://www.geoportal.org/>].
- 4. Citizen science apps and platforms respect data privacy of citizen related data.**
- Take as few personal data as possible according to the objectives of the project and provide participants ways to decide about the privacy of their data. Secure data transmission and storage. Delete personal data as soon as possible if they are not needed anymore in relation to project objectives.

#### **Proposed Activities:**

1. Develop a list of descriptors which would be useful in terms of reuse. First ideas are: information on availability of managers, cooperation offered by the platform/portal, scope of existing apps, adaptability of the existing apps, mobile platform availability (Android, iOS), attractive interface, missing functionalities, and availability of existing-app code, accessibility of observation data, available budget and expertise.
2. Inquiry on existing catalogs of existing apps/platforms and adapt a catalog with descriptors for reuse. The information on reusability should be easy to discover.
3. EU BON table for collecting information about online CS tools. It is developed into webpage but still needs new information added. <http://biodiversity.eubon.eu/web/citizen-science/cs-tools-list>
4. Promotion and use of standards and best practices for data management, quality, curation and preservation for citizens' data.
5. Investigation of algorithms and best practices for integration of citizens' data with other in-situ sources.
6. Collecting best practices for discovery and access to this kind of data through the GCI/GEOSS.
7. Reduce the cost of using standards for CS projects.

## **2.3 Working group Principles for User Interface & Experience Design: Interaction, Mechanisms to support Motivation**

The working group Principles for User Interface & Experience Design: Interaction, Mechanisms to support Motivation, defined principles with objectives on usability, engagement (gamification, feedback) and procedure to improve data quality and assurance. This group was led by Margaret Gold and Christopher Kyba.

The discussion followed the rule-of thumb that User Experience (UX) design is what drives the User Interface (UI) design, and the universal principle that the 'user' (a human being who is invited to participate in a project) should be involved throughout was applied.

The technology world is full of guidelines for UI/UX that people have gathered from deep experience with designing apps and websites. Therefore the proposed principles were selected to be specific for apps in citizen science and are to be seen as additional to industry guidelines. Your first step should be to familiarize yourself with existing principles and app development guidelines.

- 1. Citizen science apps and platforms are reused and designed for reuse.**
  - Do not duplicate efforts. Do not rebuild something. Design for reusability.
  - When writing the code, take into account the different levels of technical ability and keep with reusability in mind (i.e. new projects can reuse the app or platform, and it's not too hard to adapt it for their purposes).
  - Open Source the code base, but there are contextual situations where some limited closeness is necessary (e.g. long-term monitoring projects not wanting forks).
  
- 2. Citizen science apps and platforms are designed for the participants.**
  - Respect your participants by designing in a way that appreciates their time and lowers the barriers for entry. Think about: ease of use and user friendliness, accessibility, context.
  - Plan and understand your necessary level of engagement: do you need lots of on-off participants, or do you need deeper long-term engagement?
  - Citizen scientists should be co-creators of apps, and in particular should contribute to the design from the very start of development (i.e. not limited to testing).
  - Consider the context in which the participants are using the app or the website during the design phase. For example, consider the weather: will the participants be using mittens?, consider the natural environment: is it wet? Connectivity?
  - Check your assumptions about the participants, e.g. do the people you want to reach have e-mail? Internet? Smartphones? Are they comfortable with technology? Do they have Wi-Fi connectivity or data in the field?
  - Take different levels of physical abilities into account when designing the interface, but accessibility is not necessarily always possible (e.g. mobility outdoors).
  - Take considerations of inclusivity and accessibility into account. In particular design for people with visual difficulties.
  - Do not invent new user interfaces. Closely follow existing standards, often to the minutiae so that users feel at home and things react in ways subconsciously expected.
  
- 3. Citizen science apps and platforms support two-way communication between the project developers and the project participants.**
  - Communication should be as direct as possible, both sides should profit. Develop meaningful thanks/giveback within the app itself.

4. **Citizen science apps and platforms give transparent and easy to access information about the app and project.**
  - Participants need a way to get DETAILED information outside of the app, particularly regarding data sharing policies, what the user will do, long term sustainability, etc. Participants shouldn't need to download the app to find out what it does.
5. **Citizen science apps and platforms have a long-term strategy.**
  - If you're planning a long-term project, you need a long-term strategy (that includes tech support and communication). Otherwise, don't start!
  - Plan the lifetime of the project and the legacy of the project: does it have a natural ending point? (not just the end of funding, but an end to what you're looking for). Communicate that ending point throughout. If it can continue beyond the end of funding, plan for longevity and sustainability, commit to support or a hand-over. Data should be stored long-term; therefore you need to plan this from the beginning on.
  - Remove your app when it's no longer useful (and if you can't analyze or store data)!

**Proposed Actions:**

1. Implement a catalog of apps and platforms for reuse or for adapting.
2. Develop a Memorandum of Understanding for involving citizen scientists in co-design.
3. Implement a system for opt-in to mailing list (dealing with huge numbers of emails is a pain).

## **2.4 Working group Principles for Outreach, Learning, Education, and other Rewards of Participation**

The working group Principles for Outreach, Learning, Education, and other Rewards of Participation was formed with objectives on recruitment and retaining and was led by Muki Haklay. Questions raised addressed how people find out that a particular project exists, are attracted to participate, and have the opportunity to learn something new, enhance their education in formal or informal context, or benefit from participating in other ways. The core issue for designers and project coordinators is to remember that citizen science projects are socio-technical, and the social aspects require attention from the start as it should influence design and development decisions.

1. **Citizen science apps and platforms support recruitment of participants.**
  - Contemplate doing a pilot of the recruitment<sup>1</sup> process, considering:
    - Enrolling (already existing network) or mobilizing (new network). In other words, recruit people in already existing networks or constructing new communities? The former usually works well as these people are already interested.
    - Consider reaching the two extremes (people who are very interested and who are not).
    - Consider what is the motivation and/or purpose of the campaign (e.g. if it's education you go to existing education networks).
    - Think about a communication approach, strategies and effective activities to reach out and mobilize specific groups.
  - Recruitment of participants should also plan for methods to keep recruitment over time and to recruit people other than focus groups or existing groups.
  - Communicate explicitly the different goals of the project and try for a balanced recruitment.
  - Explicitly mention expectation management: by being transparent about what it is possible to do and what is not and in relation to available funding.

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<sup>1</sup> Recruitment: get someone involved and make the first observation.

- Consider implementing a communication approach that balances the different aspects of citizen science.
- Take in account the benefits and motivations of participants payment and remuneration. Be transparent in respect to payment.
- Be transparent about longevity of the project and/or research agenda: Considering issues of democratic consideration, of balancing political goals, of raising awareness or achieving specific goals, or achieving the scientific output.

## **2. Citizen science apps and platforms keep participants engaged.**

Retention<sup>2</sup> may go against recruitment. The ideal is to cultivate a continuous engagement and maintain dialogue. To achieve retention of participants, consider:

- Motivations and expectations over the run of the project.
- Cultural and social issues that may vary in different countries.
- That the project coordinator should have personal contacts with participants (NOT only virtual contact) and should provide more ways to communicate other than platform.
- The need to make people aware of the potential of taking part in all stages of the project, or just in some stages. Don't assume that everyone want to participate in all stages. People will have different journey - even if we give people specific expectation and roles they might want to do more.
- Offering a portfolio of options for different participation levels in the project (progressing career).
- Offering rewards. Consider what the issues of the volunteers are: meetings, communication, recognizing achievement. Be explicit about what the participants get.
- Motivations and the options and pathways through the use of the system. Open data from the project can allow the participants to use data in the system.
- Cognitive or effort threshold that can be created to people who participate, such as in FoldIt where you need to work hard before becoming part of the project. That can influence long term engagement and should be done consciously.
- Participants are well informed about the specific long term societal goals that are being furthered by their projects (beyond "some kind of science").
- Reuse of apps and platforms but also of the underlying already existing communities (offering as an option).
- Participants understand the advantages of their content collected being reused by further CS projects.
- Designing the platform for transparent community rewards beyond individual projects.

## **3. Citizen science apps and platforms support volunteer management and care.**

- Monitor and pay attention to the needs of volunteers.
- Consider situations that put the participant at risk and contemplate how that should be discussed.
- Let volunteers access their own data.
- Be aware about the culture of online communities and the way the culture evolves.
- Be aware about your responsibility of care towards volunteers. Monitor how much people participate and work.

## **4. Citizen science apps and platforms consider inclusiveness in its design.**

- Issues of inclusiveness have influence of the design of backend and interfaces. What does it cost? Can everyone participate?

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<sup>2</sup> Retainment: keeping engaged and using the system for the duration of the project.

- Be inclusive when defining the focus group. How to avoid being selective in defining your focus group.
  - Consciously considering who is excluded.
  - Include participants in different phases of the project.
- 5. Citizen science apps and platforms communicate transparently.**
- Transparency on project goals, recruitment, retainment, ethics etc.
- 6. Citizen science apps and platforms consider ethics.**
- Consider that login via Google or Facebook forces authorisation and personal data are collected. Think about how much data is being disclosed, and offer a local login (this is a cross groups' issue).
  - Consider how much private information is leaking to infrastructure providers.
  - Consider the tension between researching objects or subject.
- 7. Citizen science apps and platforms motivate through sharing and caring.**
- Advertise your projects reciprocally. Ideally share your users actively within a common authentication system with other projects. Do not try to lock your users. The risk is that some participants may leave, but you will also gain users.
  - Promote reuse of content collected and the existing content.
  - Projects help each other in build communal, re-usable, shared resources (geolocation, species identification, etc.).
  - Share documentation and templates: brochures, consent forms, instructions, things that worked well with other projects.
  - Consider the issues of motivation that are reciprocal and the synergies among the practitioner/ project owner/researcher and the practitioners.
  - Consider the wider aspects of the project: motivations are related to being part of a longer and greater impact - for example contribution to science.

### 3. Conclusion and next steps

This document includes the outcomes of the first of a planned series of workshops for continuing the process of defining principles and guidelines for apps and platform development for best practice in citizen science. In the next workshops we will further differentiate and adjust these results.

We identified three activities to support the app and platform development in citizen science besides continuing to work on principles and guidelines:

1. Develop a list of descriptors which would be useful in terms of reuse.
2. Implement a catalog of existing apps/platforms with focus on reuse.
3. Implement a methodology for collecting and sharing the learning of citizen science practitioners around the designing and building of their apps & platforms, managing data and engaging and retaining participants.

Get involved in this process and contact [Ulrike Sturm](#) and [Soledad Luna](#)

## 4. Resources and further information

1. Storify in twitter #citsciapp: <https://storify.com/iwess1/workshop-berlin-principles-for-citizen-science-app>
2. Trello board: <https://trello.com/b/lxeEUzvj/defining-principles-of-mobile-apps-and-platforms-development-for-best-practice-in-citizen-science>
3. Google docs folder:  
<https://drive.google.com/drive/folders/0B7OC90YMxUOXTDktTEZZMWliM00?usp=sharing>
4. EU BON table for collecting information about online CS tools (Veljo Runnel)  
<https://docs.google.com/spreadsheets/d/1o2zPCc6JmieewJtAw-Z1-EDDa6yj6dPLP2WznMP2yIE/edit?usp=drivesdk>  
This list is developed into a webpage, but still needs new information to be added  
<http://biodiversity.eubon.eu/web/citizen-science/cs-tools-list>
5. Examples of Industry Principles:
  - a. <https://www.codementor.io/design/tutorial/mobile-app-ui-design-principles>
  - b. <http://www.slideshare.net/search/slideshow?searchfrom=header&q=mobile+app+design+principles>
6. Examples of Industry Guidelines:  
<https://blog.hubspot.com/marketing/great-call-to-action-examples>
7. Mobile specific design principles:  
<http://www.uxforthemasses.com/mobile-ux-design-principles/>
8. Lists of existing CitSci Apps, Platforms and Tools
  - a. The SciStarter Project database: <http://scistarter.com/finder>
  - b. The [new Tools Database](#) being built by SciStarter: <http://sandbox.scistarter.com/tools>
  - c. <http://www.ceh.ac.uk/citizen-science-apps>
  - d. <https://ssec.si.edu/stemvisions-blog/mobile-apps-citizen-science>
  - e. The Public Lab's list of tools and techniques: <https://publiclab.org/tools>
9. Blogs reviewing / listing citizen science apps
  - a. <http://www.citizensciencecenter.com/category/app-based-citizen-science/>
  - b. <https://www.scientificamerican.com/article/8-apps-that-turn-citizens-into-scientists/>
  - c. <https://www.bustle.com/articles/93141-6-citizen-science-apps-that-use-your-phone-to-help-aid-important-research>
  - d. <http://www.openscientist.org/p/citizen-science-for-your-phone.html>
10. Project / App / Platform Design Resources
  - a. Cornell's Toolkit, the outcome of the [Citizen Science Toolkit Conference](#) in 2007.  
<http://www.birds.cornell.edu/citscitoolkit/toolkit/steps/question/overview>
11. UI/UX Design Tools
  - a. Check whether the language you use is sufficiently accessible for your target audience -  
<https://readability-score.com/>
  - b. <https://www.useronboard.com/>
  - c. OS specific guidelines: <http://www.mobilexweb.com/blog/ui-guidelines-mobile-tablet-design>

- d. Mobile App UX principles: [https://storage.googleapis.com/think-v2-emea/docs/article/Mobile\\_App\\_UX\\_Principles.pdf](https://storage.googleapis.com/think-v2-emea/docs/article/Mobile_App_UX_Principles.pdf)
- e. 10 principles of mobile interface design: <http://www.creativebloq.com/mobile/10-principles-mobile-interface-design-4122910>
- f. Smashing Magazine guidelines: <https://www.smashingmagazine.com/2011/07/seven-guidelines-for-designing-high-performance-mobile-user-experiences/>
- g. Testing with Users:  
[http://downloads.usertesting.com/white\\_papers/UserTesting\\_eBook\\_User-testing-mobile-app-prototypes.pdf](http://downloads.usertesting.com/white_papers/UserTesting_eBook_User-testing-mobile-app-prototypes.pdf) and [http://downloads.usertesting.com/white\\_papers/UserTesting-eBook-mobile-web-testing.pdf](http://downloads.usertesting.com/white_papers/UserTesting-eBook-mobile-web-testing.pdf)
- h. <http://blog.careerfoundry.com/ui-design/how-to-design-a-mobile-app-using-user-interface-design-principles>
- i. Design Principles FTW <http://www.designprinciplesftw.com/>
- j. Principles for Considerate products:  
<http://www.designprinciplesftw.com/collections/principles-for-considerate-products>
- k. 20 guiding principles for experience design:  
<http://www.designprinciplesftw.com/collections/20-guiding-principles-for-experience-design>

## 12. User Interface Principles:

### **The Structure Principle**

Design should organize the user interface purposefully, in meaningful and useful ways based on clear, consistent models that are apparent and recognizable to users, putting related things together and separating unrelated things, differentiating dissimilar things and making similar things resemble one another. The structure principle is concerned with overall user interface architecture.

### **The Simplicity Principle**

The design should make simple, common tasks easy, communicating clearly and simply in the user's own language, and providing good shortcuts that are meaningfully related to longer procedures.

### **The Visibility Principle**

The design should make all needed options and materials for a given task visible without distracting the user with extraneous or redundant information. Good designs don't overwhelm users with alternatives or confuse them with unneeded information.

### **The Feedback Principle**

The design should keep users informed of actions or interpretations, changes of state or condition, and errors or exceptions that are relevant and of interest to the user through clear, concise, and unambiguous language familiar to users.

### **The Tolerance Principle**

The design should be flexible and tolerant, reducing the cost of mistakes and misuse by allowing undoing and redoing, while also preventing errors wherever possible by tolerating varied inputs and sequences and by interpreting all reasonable actions.

### **The Reuse Principle**

The design should reuse internal and external components and behaviors, maintaining consistency with purpose rather than merely arbitrary consistency, thus reducing the need for users to rethink and remember.

**Mobile specific design principles:** <http://www.uxforthemasses.com/mobile-ux-design-principles/>

13. Principles for App Design from Think With Google

“...we sought to uncover the key ingredients of a great mobile app. We partnered with AnswerLab to conduct a user study of more than 100 people on 100 different apps across a variety of verticals including e-commerce, insurance, travel, food ordering, ticket sales and services, and financial management. (Gaming apps, social networking apps and music services were not included in the study.)” (<https://www.thinkwithgoogle.com/articles/principles-of-mobile-app-design-introduction.html>)

# 5. Appendix

## Agenda



museum für  
naturkunde  
berlin

### Defining principles of mobile Apps and platforms development for best practice in citizen science: Interaction, Interoperability, Innovation

Venue:  
VKU Forum  
Invalidenstraße 91  
D-10115 Berlin  
(Tram station „Invalidenpark“ walking distance from Berlin Main Station)

13.12.2016

- 
- |       |  |
|-------|--|
| 16:00 | <b>Welcome</b>   |
| 16:15 | <b>Talk</b><br>Contribution of citizen science towards international biodiversity monitoring<br><i>Bernat Claramunt, CREAM</i>   |
| 16:45 | <b>Case studies</b><br>EU BON project Apps and guidelines<br><i>Veljo Runnel, University of Tartu</i><br>Naturblick<br><i>Ulrike Sturm, Museum für Naturkunde Berlin</i><br>Loss of the Night/ My Sky at Night<br><i>Christopher Kyba, Helmholtz-Zentrum Potsdam Deutsches GFZ</i><br>Naturewatch<br><i>John Cornell, Bird Life International</i><br>Platform Natusfera<br><i>Bernat Claramunt, CREAM &amp; Luigi Ceccaroni, 1000001 Labs</i><br>Fotoquest go<br><i>Oliha Danylo, International Institute for Applied Systems Analysis</i> |
| 17:45 | <b>Coffee break</b>  |
| 18:00 | <b>Where are we now?</b> Reflection on the landscape of apps and platforms<br><i>Sven Schade, Joint Research Center</i>  |



18:30

### Introduction to the Working Groups

- 1) Principles for Interoperability: Data Standardization & Data Quality

*Bernat Claramunt & Luigi Ceccaroni*

Data should be open, accessible, reusable, and able to be added to & enriched by others. Back-end system design, meta data sharing, etc. – the design of PLATFORMS

- 2) Principles for Outreach, Learning, Education, and other Rewards of Participation

*Muki Haklay, University College London*

People need to find out that the project exists, be attracted to participating, and have the opportunity to learn something new, enhance their education in formal or informal context, or benefit from participating in other ways. – the design of PROCESSES

- 3) Principles for User Interface & Experience Design: Interaction, Mechanisms to support Motivation

*Margaret Gold, Natural History Museum London & Christopher Kyba*

The application should be easy to use, clear in its purpose, consider mechanisms that can support engagement (gamification, feedback), procedure to improve data quality and assurance. – the design of APPS

19:00

**Dinner** (self-paid), SpeiseKOMBINAT, Chausseestrasse 116, 10115 Berlin  
<http://www.kombinat-lounge.de/>

14.12.2016

9:00

### Talks

Why we decided to develop a new app... and what we will do different from now on

*Sven Schade, Joint Research Center*

Data Sharing and Privacy

*Renzo Kottmann, Max-Planck-Institut für Marine Mikrobiologie*

9:45

### Working Groups

- 1) Principles for Interoperability: Data Standardization, Data Quality
- 2) Principles for Outreach, Learning, Education, and other Rewards of Participation
- 3) Principles for User Interface & Experience Design: Interaction, Mechanisms to support Motivation

10:30

### Coffee Break

- 11:00**      **Working Groups**
- 1) Principles for Interoperability: Data Standardization, Data Quality
  - 2) Principles for Outreach, Learning, Education, and other Rewards of Participation
  - 3) Principles for User Interface & Experience Design: Interaction, Mechanisms to support Motivation
- 12:30**      **Lunch**
- 13:30**      **Rapid Prototyping**  
Rapid Prototyping: a method for technological development  
*Claire Born, Consultant on Digitalisation, Collaboration and Communication*  
Testing and Evaluating Citizen Science Principles through Rapid Prototyping
- 15:00**      **Presentation of results and discussion**
- 16:00**      **End of Meeting**
- Visit the Museum für Naturkunde (optional)