



# Documentation — Avro

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## Table of Contents

1. Abstract	3
2. Introduction	4
3. Methods Applied	6
4. First Idea	10
5. Project architecture	13
6. What is Avro: functionality	15
7. App Structure	23
8. Conclusion	24
9. References	26

## Abstract

In the saturated market of web and mobile applications, success of a new service is tightly connected to the requirements in the field which they were developed for. A company can not ensure a smooth and efficient work of the team if the service they use in their work is not related to the typical field of its usage. Companies install and use general tools for their own purposes, trying to set it up and use in a narrow field of their interest. This process of app creation is a business challenge, as it has to be balanced with special needs, requirements and particular features of the company scope.

The project was started with research and ideation of design phase for creating a web application — workflow management system for restorers / conservators. The conducted user studies included interview with a group of specialists and individual interview and simple testing of concept user interfaces (UIs) with key UI elements and app's logic. In the end, the idea of this application found a positive response in the environment of restorers and caused a lot of question and discussion on this topic. The interviewed experts agreed that the system can help in the organization of the daily work of restorers, and also make work of the entire team more efficient and will help keep all the projects of the team in one place.

## Introduction

Researchers in the field of climatology in restoration business agree that humidity and temperature control during the entire restoration process is necessary (Atkinson, 2009; Brown, 2002) both for the restorer's understanding and for the Restoration Certificate (passport). Restoration Certificate is a document that each restorer have to prepare at the end of the restoration and enclose to the client together with the restored object.

As it became known during the interview with restorers that Restoration Certificate is a document prepared and certified by the restorer and it includes:

- descriptions of the object and all stages of its restoration;
- expert assessment of its initial condition (visual assessment and laboratory analysis data);
- restoration workplan step-by-step approved by Specialist of the Highest Qualification and also with measurements indication (Temperature and Humidity) of the room where the object had been restoring;
- photos and other additional documents;
- conclusion and description of the state of the object after the restorative manipulations.

Josephine Atkinson in his book «Practical Conservation: our guide to caring for your treasures» mentiones that humidity and temperature levels in a room where a specialist works are different and depend on the original material of the restoring object. She gives recommendations of temperature and humidity for different materials and explains why it is important to measure and to keep proper conditions. «With temperatures in the range of 15-20 degrees and within an RH (relative humidity) range of 40-55% will help prevent the cycling of contraction and expansion of soluble salts and minimise the ageing and weakening of old adhesives and the heat induced elongation of existing cracks» — Josephine's comment regarding ceramics (Atkinson, 2009).

So I spotted a few issues that can be solved by using the application, designed specifically to meet the restorers needs:

1. Possible integration with sensors helps track and keep the accurate temperature and RH data by using sensors;
2. The system can store information about every restored object and history of its changes — easy to print and prepare Restoration documentation for a client;
3. All projects collected together — easy access to the knowledge library.

Based on these assumptions, following questions are formulated:

1. Which kind of application logic can be taken as a basis (model) for creating a new application for restorators/conservators?
2. What methods could be used to collect data from specialists?

## Methods Applied

The research is done using mixed methods — qualitative methods of focus groups and key informant interviews and comparison of existing workflow management systems. This research aims to get in-depth understanding of restoration process organisation and main requirements for a possible future app. First I worked with an experienced conservator which work in a small university team of conservators. David Morgan in his work «Focus Groups as Qualitative Research» mentioned that the best way to get in-depth understanding of a person's opinions and experiences is to make a key informant individual interview (Morgan, 1997). So first I interviewed the most experienced conservator working in a small team of conservators. At this stage, I got an first understanding of how the restoration process is organized, requirements for the restoration work plans and requirements for work conditions. At the second stage I asked a whole team about group interview. Following Morgan's concept of «less structured interview» there is no preconstructed interview guideline or questionnaire I started with simple questions regarding their work and got vivid answers from every participant. The basic understanding taken during the first individual interview helped me quickly find a common language with specialists and guide the conversation in the right direction.

In my opinion, working with a small group or individual interviewees is definitely suitable for cases when the study is in short time and is aimed to obtain expert opinions on the issue under study. Moreover, since my project has a pronounced practical orientation, work should begin with communication with the specialists of the area which the project will be connected with. This method of research allows to get data quickly and informally, thereby saving time and gaining a deep understanding of the problems that can be solved in a future project.

Comparison is another method was used in the project. Deciding that app logic fits best for what project type was based on comparison of existig groups of apps. The most popular to-do apps have been rounded up, ranging from simple to advanced apps.

«There are approximately 17 million software applications and web sites out there built to manage your to do list», — Gina Trapani, founder of Lifehacker, wrote in 2006. There are the various methods of keeping track of to-dos, so traditionally they make up 3 groups such as Grocery Lists (Apple reminders, Google Tasks, others) for simple task lists; Getting Things Done (GTD) apps (Todoist, ToDo, others) for detailed task lists, Kanban Board apps (Trello, Wrike, Jira, others) to visualize task workflows.

It's important to research different methods of task managing to find what works better for the project and what are pros and cons of everyone.

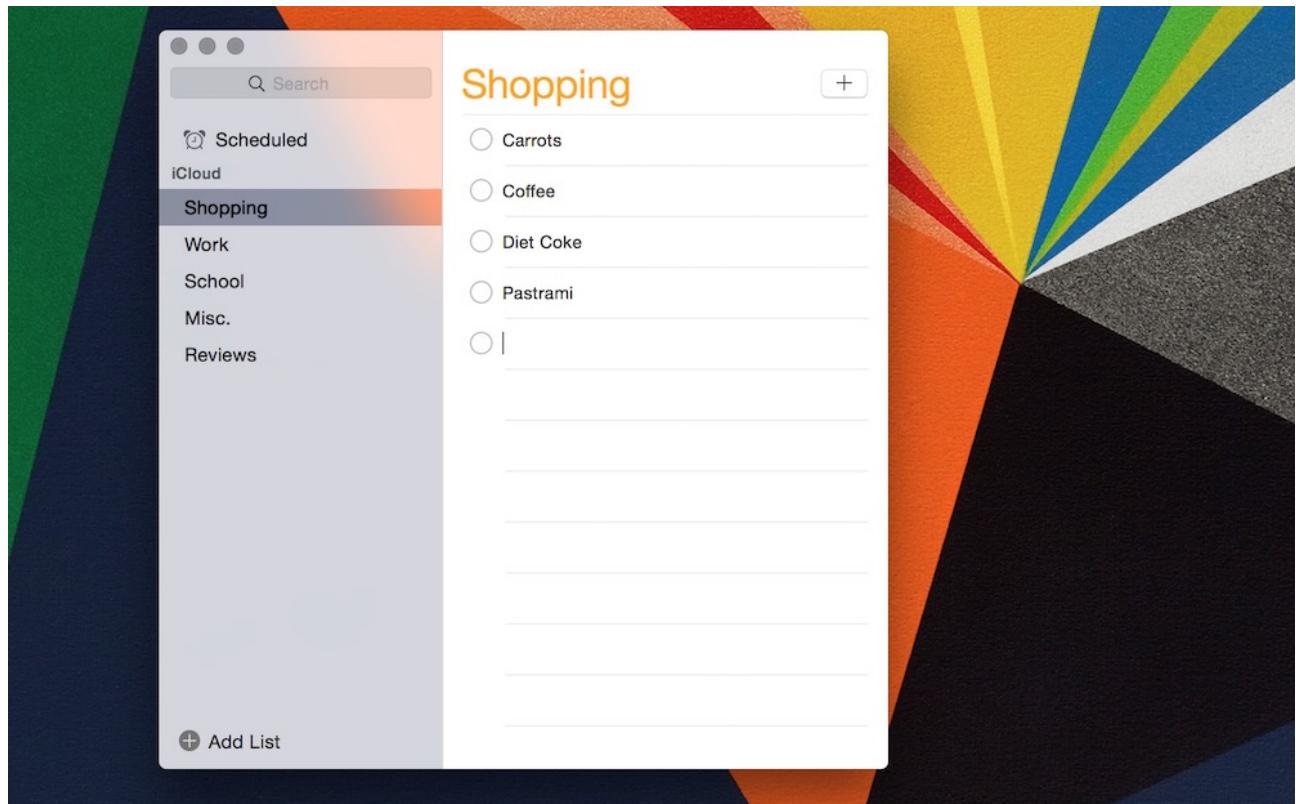
In this part, I will consider these 3 groups:

Grosery Lists

Getting Things Done (GTD)

Kanban Boards

## The Grosery List method



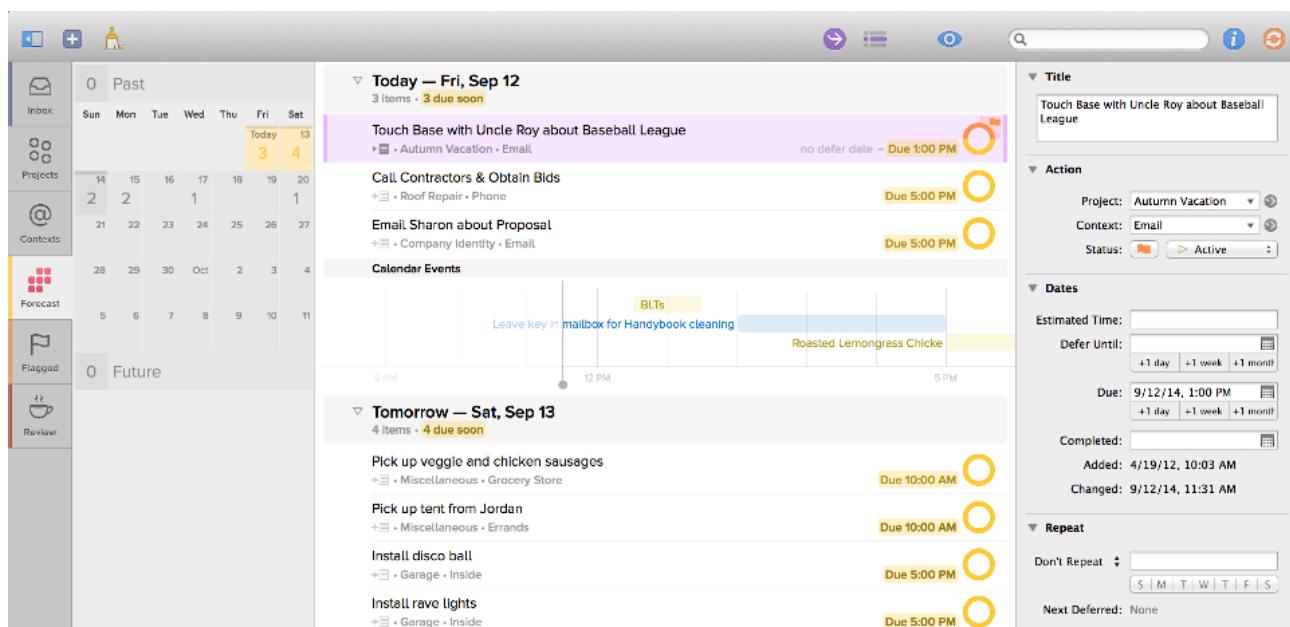
Apple Reminders app

Simple application logic «Grocery List» works perfectly for organizing tasks, this is the most popular method for daily use. They put all tasks and their respective due dates and then tick all tasks done. They called «Grocery Lists» because they look very similar to a grocery lists people usually make when heading to the store.

**Pros:** they have check boxes for ticking things done, they are clear and easy to use.

**Cons:** not good at handling large projects.

## Getting Things Done



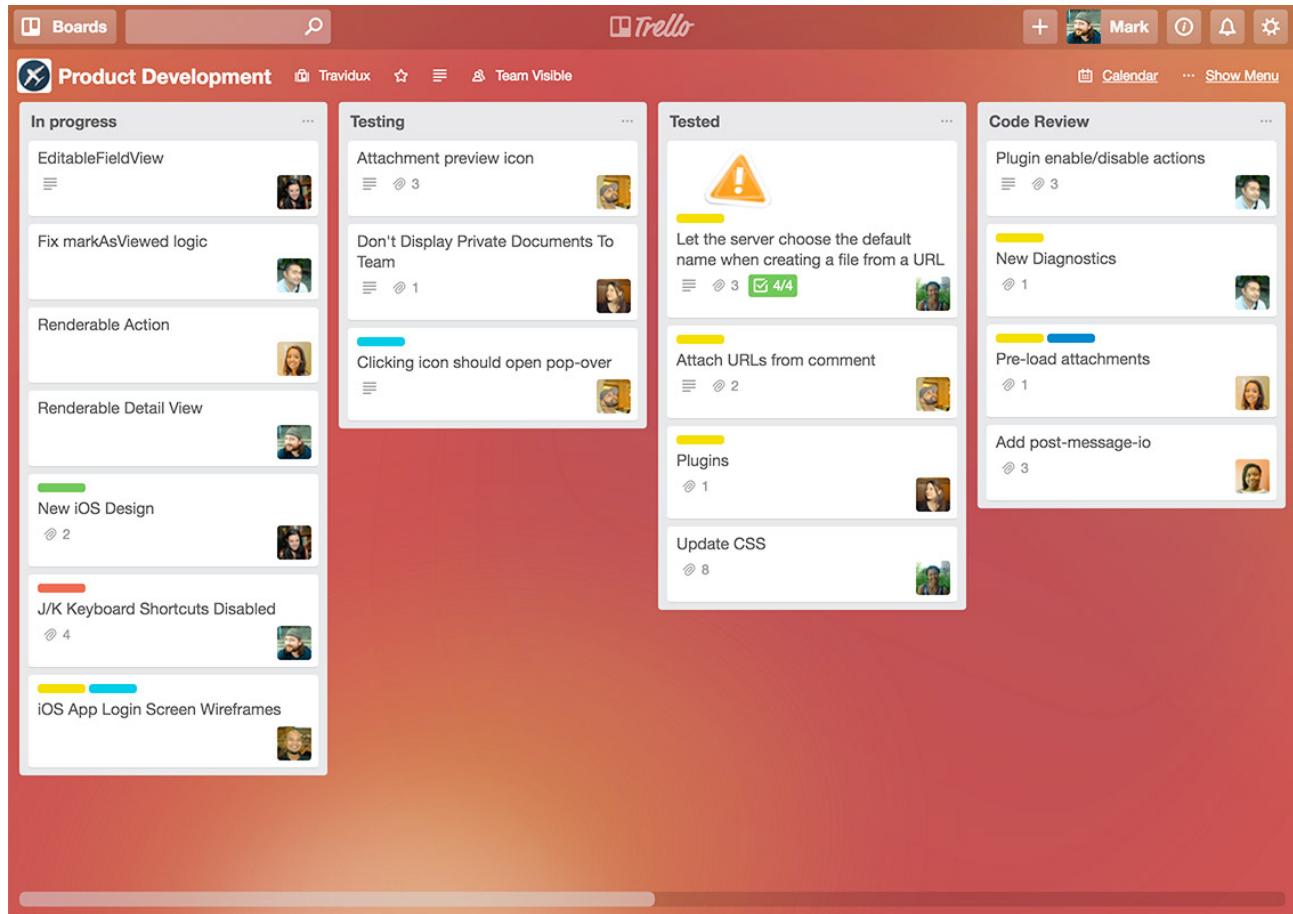
*OmniFocus app*

This method of task management is similar to Grosery List logic but at advanced level. GTD apps based on grosery list logic and also have sub-lists, time management tools and more built in. The basic idea of GTD is that users can get everything out of head and have it in to-do list app, organized in lists with tasks and sub-tasks with tags or categories. Users also can attach aaditional files to tasks.

**Pros:** GTD apps has branched structure with tasks, sub-tasks and other interesting features.

**Cons:** these apps could be too cluttered in use.

## The Kanban Method



Trello app

Kanban Boards show how work moves from left to right, each column represents a stage of the overall process («to-do», «in progress», «done»), or to be more precise the system that is visualized by the board. The team pulls cards from one column to another to the right to show progress, and to coordinate their efforts with others (Wikipeadis, Kanban Board). Thus, this method is the best for teams who like to see the project stages, task progress and understand how busy the team is.

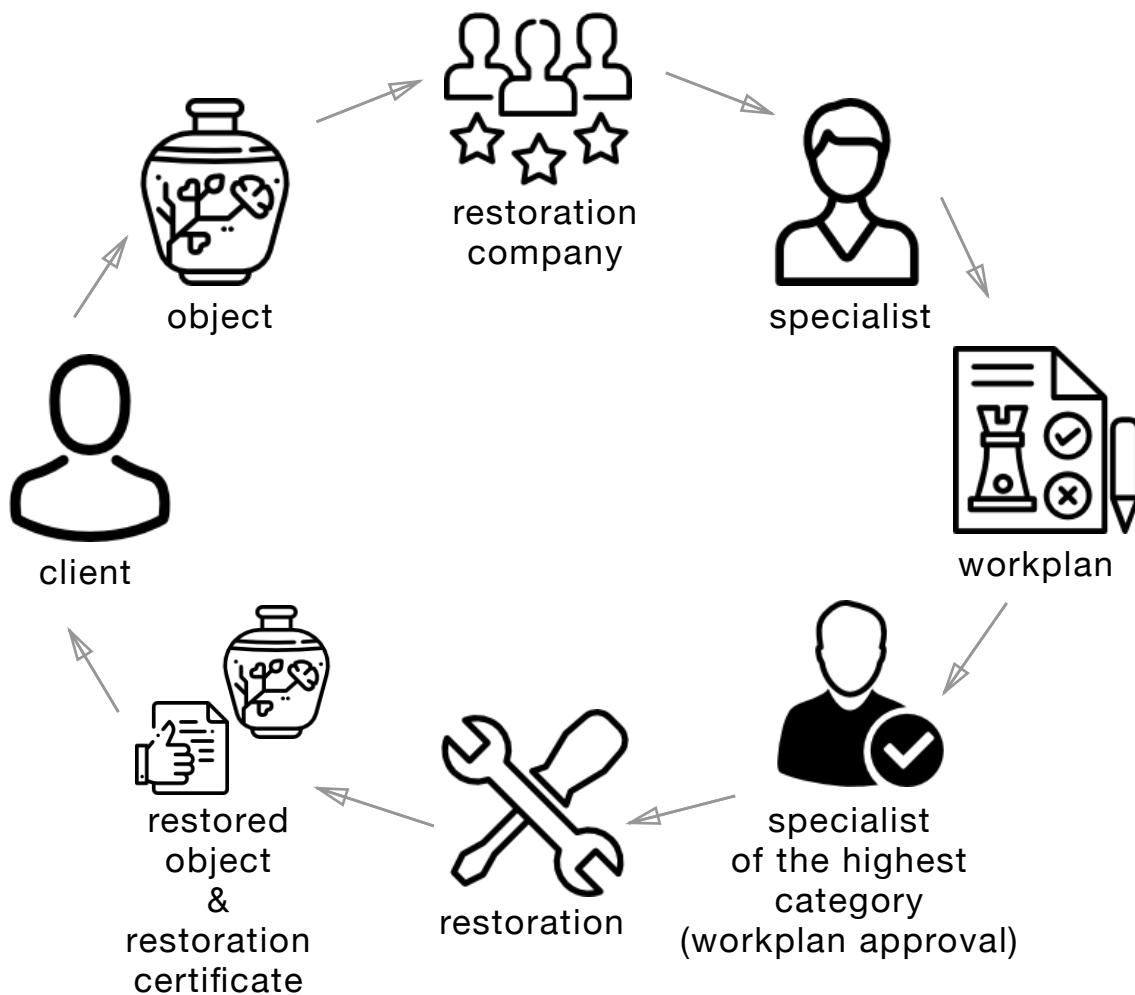
- Pros:** Best for big team project with some amount of people involved.  
**Cons:** Difficult to catch small details.

## First Idea

The initial inspiration of the project came from my close environment — from the discussion with people who work in the field of restoration and my previous background which includes some knowledge in the field of restoration.

Although the issues themselves were never really big, restoration process with daily routines and all mandatory operations is really heavy to control. In addition, restorers need more specific tools for monitoring the restoration process and fixing all stages, so existing applications can help them in their work, but not in full. The main problem is that existing work management systems do not have the ability to connect humidity and temperature sensors and to enter data into the system, the use of which is very important in restoration.

In short, the process of restoration passes the following stages:



1. A client comes to the restoration company and brings the object that needs to be restored.
2. A specialist who will carry out the restoration work is appointed.
3. The specialist evaluates the state of the object — gives a visual assessment and conducts laboratory tests. The specialist also forms an act of reception-transfer, which describes the state of the object before the restoration.
4. After that the specialist prepares the work plan with all necessary steps and tools that are going to be used during the restoration.
5. Then the restoration work plan goes to high level specialist in the team for approval. Usually this person is a team lead / coordinator as well.
6. The next step is restoration process.
7. At the last stage, the specialist prepares the Restoration Certificate of the object, which prescribes each stage of the restoration and lists the conditions in which it was restored, as well as the chemicals and ways of restoration that were used in the recovery process. To this, photos of the Before and After restoration are attached. General conclusion about the condition of the object after restoration is made as well.
8. The specialist gives the object with Restoration Certificate back to the client.

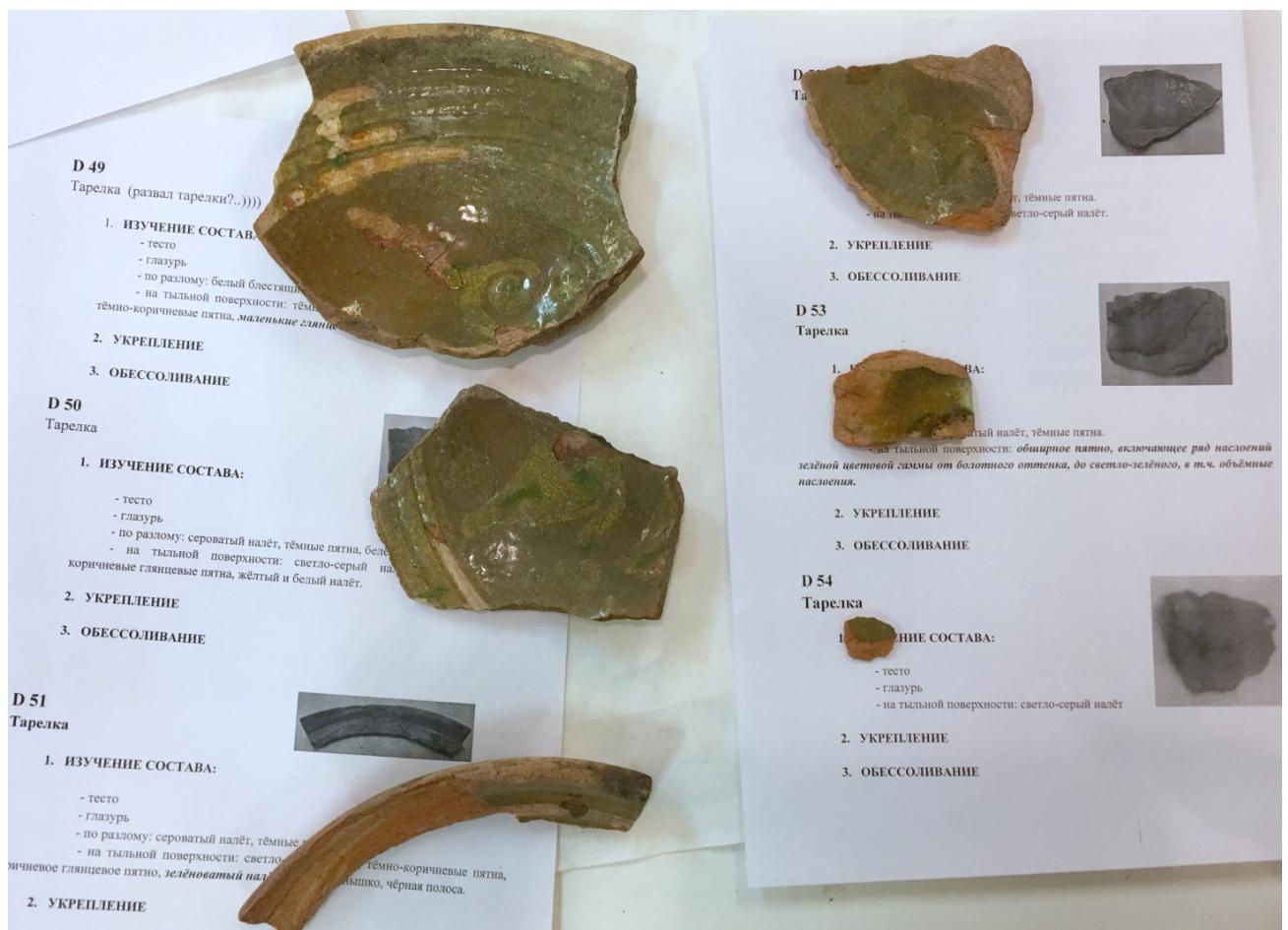
After I looked into the restoration process and what requirements are imposed on the restoration conditions, I outlined the first details of the future project that can make it a unique product that meets the needs of restorers:

**User roles.** The restoration process involves at least two people — the restorer and his coordinator, who must approve the restoration plan. To do this, it is very convenient to work in a system that provides for the distribution of roles — the user and the superuser with the rights to approve or reject plans.

**Project cards.** Description of the state of the object Before and After the restoration, the plan of restoration works, photos and conclusion must form one project. In my opinion, it may work as a board in Kanban apps and include some smart elements of Kanban logic:

- checklists for work plans;
- cards of restored objects with history of their changes;
- different statuses of the restoration plan — approved or for revision.

**Groups.** As it turned out, there should be a function of combining projects into groups. This should be planned, because often the object is restored in parts and each part of it has to be restored in a special way. Or, if the objects for restoration are delivered from the archaeological site, objects not yet identified from one excavation are combined into one group (picture below).



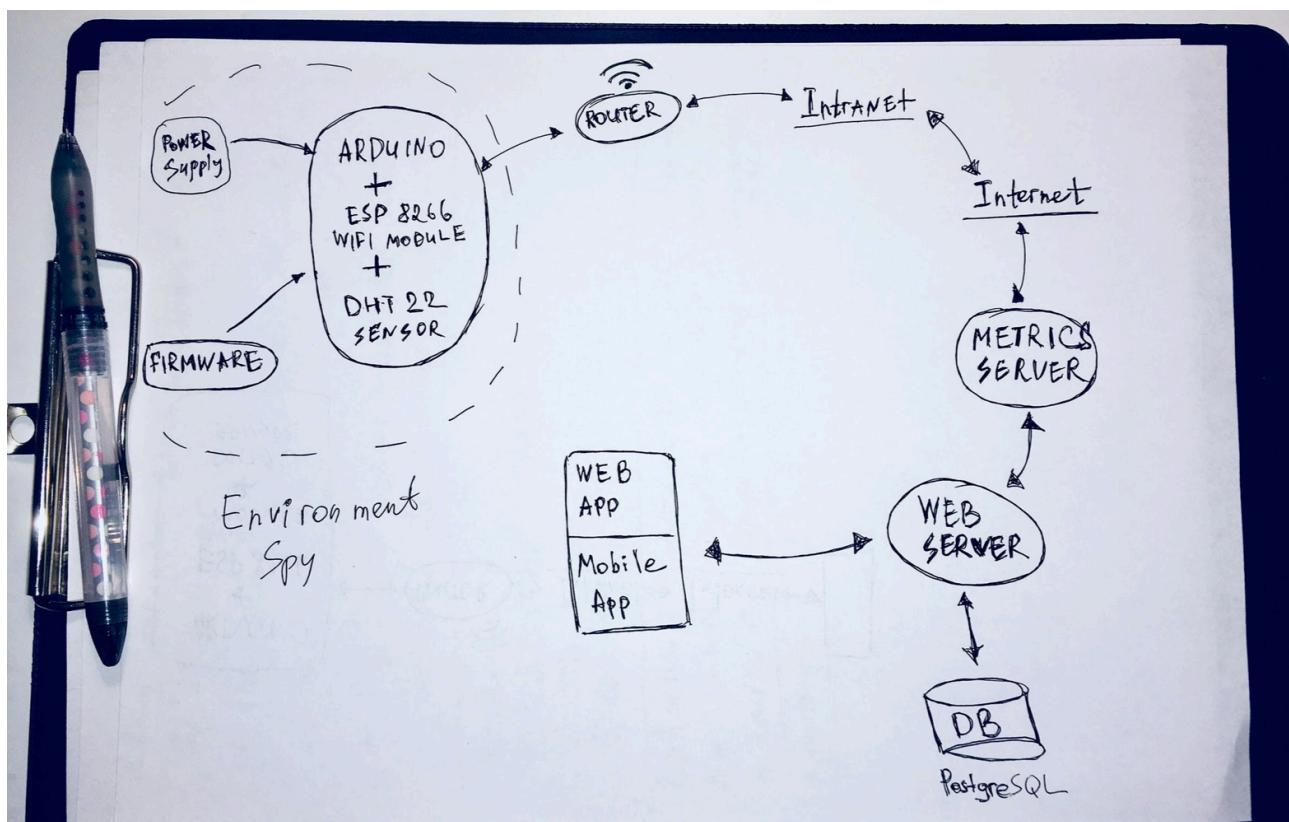
*Photo provided by the staff of the restoration workshop of the Institute of Arts in St. Petersburg during the interview*

**Integration with environment data logging system (Temperature and Humidity sensors).** Since restorers need to know the temperature and humidity of the room in which they carry out the restoration of the object, and provide the data of these measurements to the client in the restoration documentation, there is a need to integrate the system with the sensors. This will make it easier to measure the conditions of the room and it also helps to save the data directly in the description of each stage of the restoration work in the project card.

**Catalog of restored objects.** The system will keep a catalog with the cards of restored objects with history of their changes. User can see all his / her projects, Admin can see all projects of the whole team.

## Project architecture

After first ideas of the project and its main components came to my mind, I began to think over the logic and architecture of the future application. I decided to take the Kaban Method as a basis for the application logic and add some extra functions that might be really helpfull for restorers work.



Project architecture, sketched by hand

It is assumed that the application includes several parts. First is called Environment Spy. It consists of a microcontroller (for example, Arduino Uno plus WiFi module ESP 8266 and sensor DNT 22, which measures temperature and humidity) and unique firmware. By means of Wi-Fi the Environment Spy sends the data to the Intranet and further via the Internet to the servers. Here is the second part — Web App. First, data from the sensors comes to Metric Server. This server collects metric data from the sensors over MQTT protocol, store them and provide HTTP API layer in order to perform complex search queries and apply aggregation functions. The second server works with other information that comes from user and keeps it in the Data base. User works in the system via web or mobile application (web application will be considered in this project).

## Software

**Coding language.** It was discussed with software developers, that Golang (Go) is the best language for networking and workflow organisation applications. Therefore, this is good option to use this language to develop Avro application.

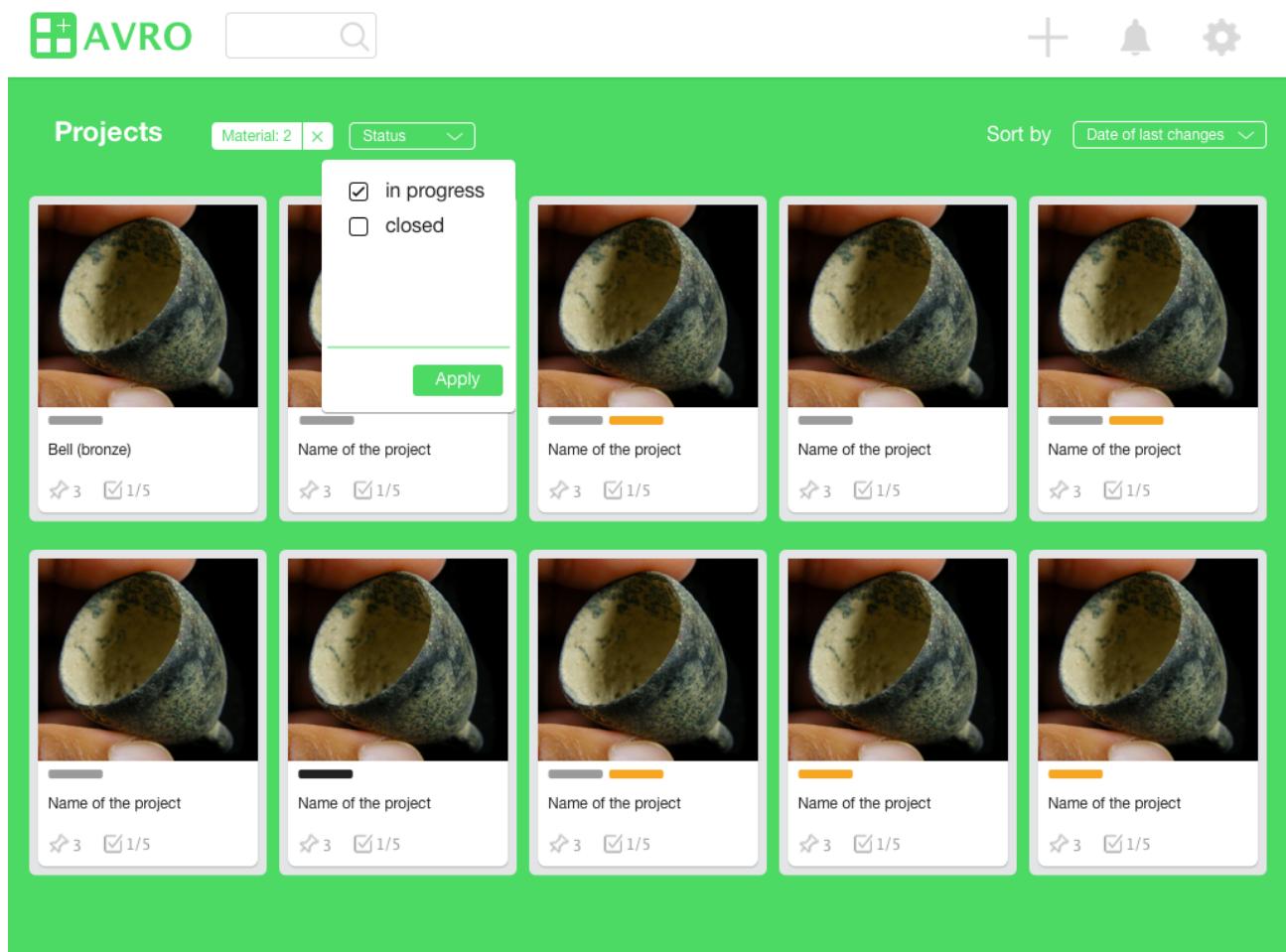
**Database.** From discussion with software developers and research it became known that PostgreSQL is the best Data base solution for this project. «PostgreSQL, often simply Postgres, is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards compliance. As a database server, its primary functions are to store data securely and return that data in response to requests from other software applications. It can handle workloads ranging from small single-machine applications to large Internet-facing applications (or for data warehousing) with many concurrent users; on macOS Server, PostgreSQL is the default database; and it is also available for Microsoft Windows and Linux (supplied in most distributions)» — this is description from Wiki (PostgreSQL, Wikipedia). The one more plus of the PostgreSQL is support from the most well-known cloud providers like AWS, GCE, digital Ocean^ etc.

HTML, CSS, JS, Bootstrap are recommended for frontend developing.

## What is Avro: functionality

Avro is where restorers documentation and work organization happens. It's a digital workplace that powers organization — user accounts with a catalog of all projects of a specialist — so there a specialist can get restoration workplan and documentation done.

### Workspace



*The UI design of a workspace in user account*

This is how a workspace in user account looks like — there is a field with project cards, filtering by material of origin and project status and sorting by the last changes or name (alphabet order).

#### 1. Quick access to catalog with project cards / groups of projects

Easy and instant access to the catalog of restored objects is an essential functionality of app. For that reason, the interface with quick access is placed in the front page of the app. All projects are located on the same working area, which facilitates access to them in just one click. It is easy to find the card of the desired project and start working with it.

## 2. Roles and permissions in Avro

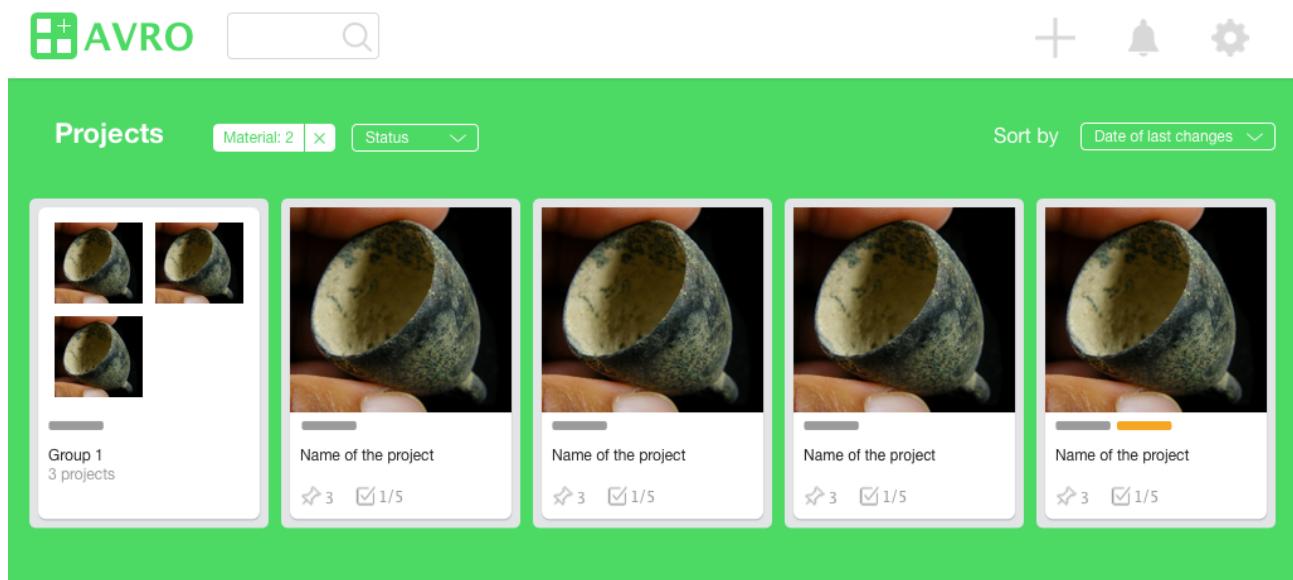
Every member of a Avro workspace has a role, each with its own level of permissions and access.

Types of roles in Avro

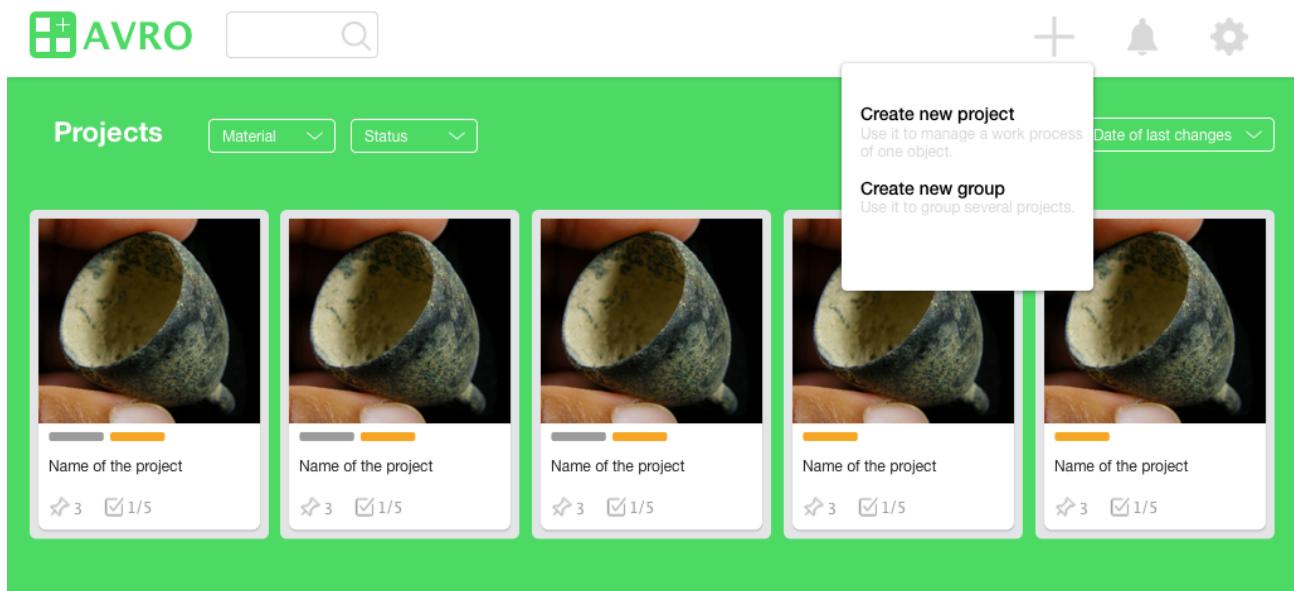
- Owner** controls the highest-level security and administrative settings, has the ability to delete users and accounts.
- Admins** can manage users, users accounts and approve or send restoration work plans back for revision.
- Users** (the default role for everyone) have access only to their own accounts.

## 3. Project cards and projects groups

In order to start the project in Avro a restorer creates a project card, where all the data of the restored object will be stored. If several objects are parts of a single entity, it is possible group them into projects groups. Grouping cards together can make it easier to find connected projects (several parts of a broken vase or unidentified objects from one archaeological excavation, for example) and organize workflow better.



*The UI design of projects grouping*



**NEW GROUP**

Add description of the group

**Projects**

Add a project

- Project 1
- Project 2
- Project 3
- Project 4

Save

The UI design of projects grouping

## 3.1 Project cards example

To illustrate how a project card can look like, I've mocked an example.

It has 3 main parts:

1. BEFORE: object specification before restoration works (pictures, text field for description and laboratory tests data).

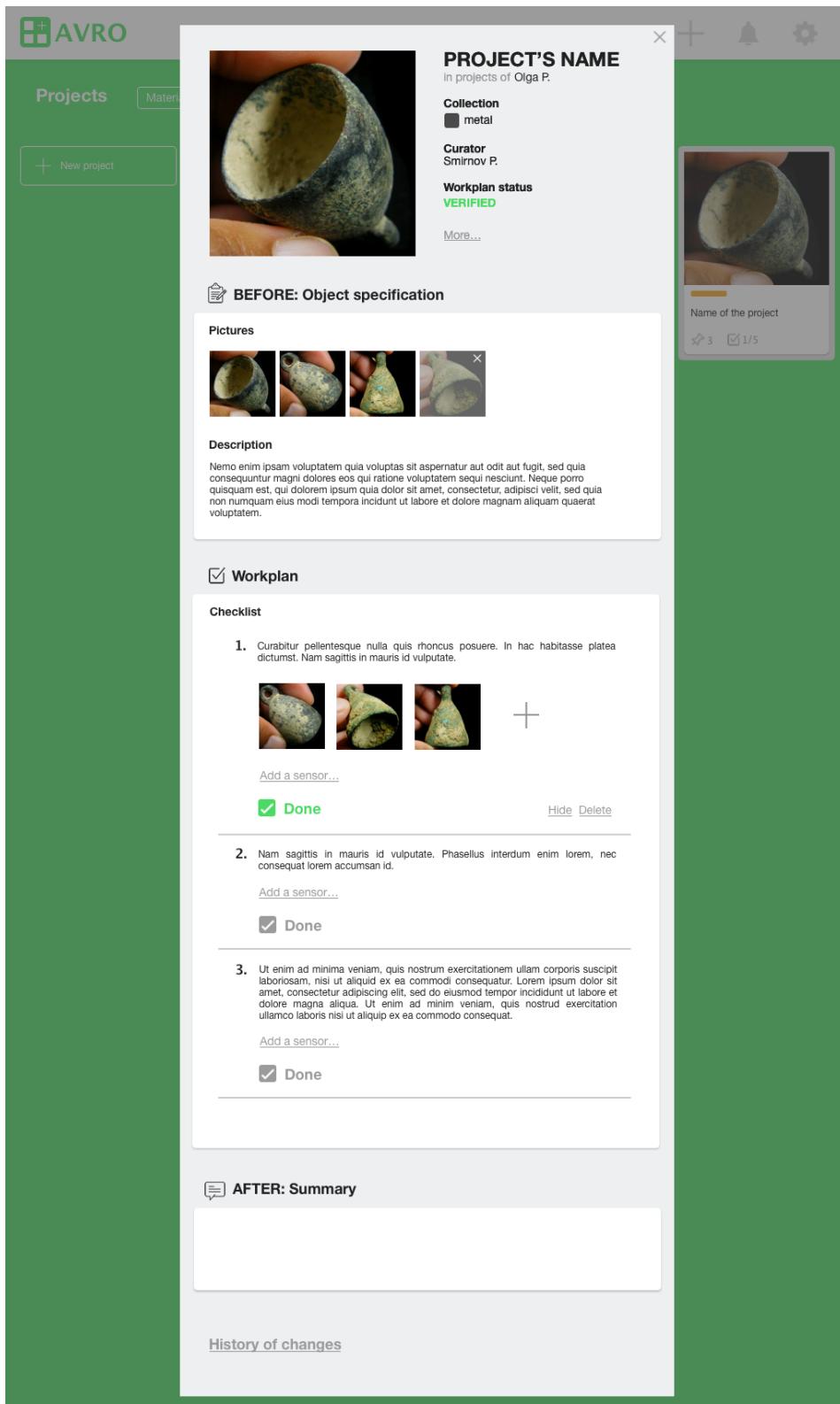
2. WORKPLAN: workplan with a checklist, which includes all the proposed stages of restoration (descriptions of methods, tools, necessary chemicals). At each stage of the work, there is the possibility of uploading photos of the object to see how it changes during the restoration. Also for each stage, it is planned to add Environment Spy (sensors) to a project card and store its metrics. In order to make it easier for a specialist to supervise restoration work processes, the Workplan is made in the form of a check-list with ticking steps that are done. So, the restorer remembers at what stage of the work he is, and his administrator understands how the work on the object is proceeding. In addition, all restoration Workplans are created individually by specialist (User) and approved by the Admin.

3. AFTER: Summary. In conclusion, the restorer gives his assessment of how the restoration of the object was carried out and describes its condition at the time of completion of the work. This part also includes recommendations for the conditions of storage of the restored object and other additional information.

In addition to these basic parts, it is possible to label a project by its material of origin and see the history of all changes.

For project card I choosed the form of **modal window**. Modal window is a graphical control element subordinate to an application's main window. It creates a mode that disables the main window, but keeps it visible with the modal window as a child window in front of it. Users must interact with the modal window before they can return to the parent application. This avoids interrupting the workflow on the main window (Modal wondow, Wikipedia). I use semi-transparent dark background to obscure

information in the main window, because that information could be distracting. The modal window also leaves the user on the main page, that is, he does not need to return to the previous page to get to the main page with the project catalog. The user simply clicks on any space of the darkened background and the modal window closes.



The UI design of a project card

## 4. Integration with Environment Spy

Measurement of humidity and temperature in the room where the restoration is carried out, as I have already mentioned, are necessary for the effective work of the restorer and for entering data into the restoration certificate of the object, which is passed to the client at the end of the work. Users have Environment Spys modules (sensors) that have their unique ID. Avro user (company that uses this application) provides WiFi network in the place where whole team of restorers works. For Environment Spy activation user specifies default WiFi name and a password. Switch on the Environment Spy and add it to a project card.

There are multiple ways to check temperature and humidity in a restoration work shop for simple thermometer to pocket temperature and humidity loggers. Live metrics enables restorers to get and keep accurate data in history of their projects. Moreover, the integration of sensors with the application allows restorers to have all-in-one: they will not need to enter metrics from the sensors at each stage of the restoration manually into the restoration documentation — the data will be saved in the workshop, followed by the ability to print it for the client. I believe that this functionality can be realized and actively used by restorers, because nowadays people are interested in new ways of organizing their work processes, which as a result facilitate their daily work and save time.

**AVRO**

Projects

+ New project

**PROJECT'S NAME**  
in projects of Olga P.

**Collection**  
metal

**Curator**  
Smirnov P.

**Workplan status**  
**VERIFIED**

[More...](#)

**BEFORE: Object specification**

**Pictures**

**Description**

Nemo enim ipsum voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem.

**Workplan**

**Checklist**

- Curabitur pellentesque nulla quis rhoncus posuere. In hac habitasse platea dictumst. Nam sagittis in mauris id vulputate.

Add a sensor...

**Sensors**

Search a sensor

Sensor 1  
Sensor 2  
Sensor 3

[Hide](#) [Delete](#)

**AFTER: Summary**

[History of changes](#)

**Name of the project**

3 1/5

The UI design of a project card

**AVRO**

Projects

+ New project

**PROJECT'S NAME**  
in projects of Olga P.

**Collection**  
metal

**Curator**  
Smirnov P.

**Workplan status**  
**VERIFIED**

[More...](#)

**BEFORE: Object specification**

**Pictures**

**Description**

Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consecetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem.

**Workplan**

**Checklist**

1. Curabitur pellentesque nulla quis rhoncus posuere. In hac habitasse platea dictumst. Nam sagittis in mauris id vulputate.

Sensor 1

Relative Humidity  
25.2

Temperature  
23.1

Done [Hide](#) [Delete](#)

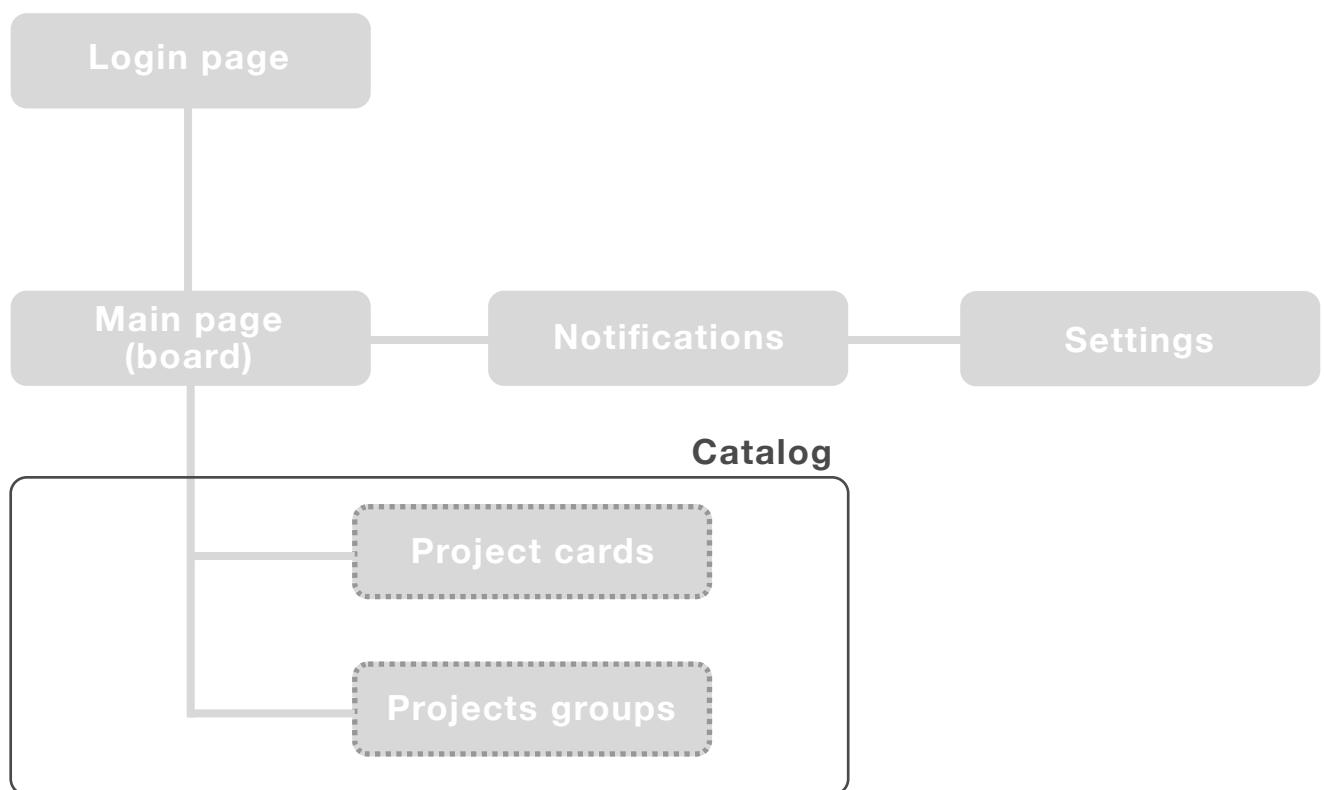
**AFTER: Summary**

[History of changes](#)

The UI design of a project card

## App Structure

The structure of the web app is very compact. It builds upon the board, which enables the user to easily access projects catalog. The starting point is always the main view, it's what user sees after opening the app and logging in. The main view (board) is just the only one page, the remaining sections of the app open in modal windows. This makes it easier to navigate in the application — the user is always on the same page. Within one or two clicks, user can open needed file or create a new one.



## Conclusion

Nowadays more and more sophisticated technologies and digitalization are having increasingly bigger role in our everyday lives, especially in work. More and more people use numerous different apps to make their daily work easier and more efficient. The technical development and new design directions lead towards new types of user interfaces, which need to be developed to be user friendly.

The scope of this project was based on the notion that the highly specialized work of many specialists requires the development of special solutions that could correspond specifically to their needs. After interviewing the specialists working in a field of restoration and reviewing the existing apps for work organization two main directions of project work were created. These directions were: Choosing the most appropriate app logic through existing web-based project management applications as a base for the future project & Creating an app that can combine the workflow organization tool with environment data logging system (Temperature and Humidity sensors).

Thus, there was an idea of creating an application that would integrate a web application (in the future it might be possible to work out the idea of a mobile version of the app) based on the Kanban Method and modified to meet the needs of restorers, integrating sensors that measure humidity and temperature of a room, where the restoration work is carried out. In this part of the project, I focused on the architecture of the system and the functionality of the web application. As the basis for the creation of the Avro web app, I took the Kanban app Trello. It has a user-friendly interface, which is based on the use of boards on the main page, where all the projects of the team are located. In my case, the Avro app has a similar application structure, user roles and the ability for integration with sensors. My task at this stage was to develop the application interface and ideate its functionality, at the next stages I plan to join forces with software developers who will help me develop and run the application, write a firmware for the Environmental Spy and integrate it with the application.

My project has a strong practical focus, so this concept can be used to develop applications for professionals working in the field of restoration, as well as in other industries that require a special approach.

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