Lessons learnt from the Operational System initial prototyping

"A prototype is worth a 1000 meetings"

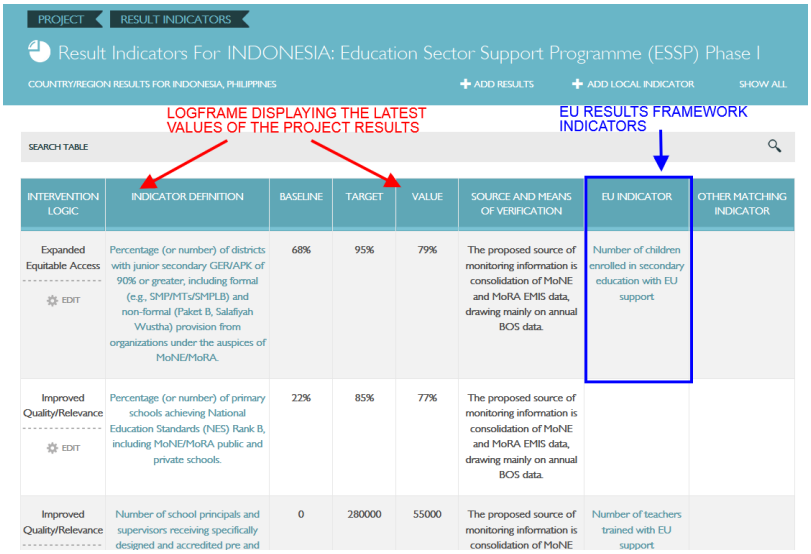
Summary:

Prototyping and working in an agile way are two methodologies derived from good practices for building large systems in the framework of the implementation of digital transformation programmes.

The goal of the "initial prototyping" was to support the reflection work and the feedback capture from users at the early stage of defining the platform.

About 9 areas were explored, analysed, developed and tested[1]: the major domains covered were data structure (MIP, sectors of concentration, action, contracts), results monitoring and aggregating, online document, "project" entity..

The experience proved very useful in results management, which is a complex area without prior experience of the Commission in collecting aggregatable results. The challenge is to make the process simple for the user, while keeping a level of flexibility to cope with a variety of real-life situations. In that case, prototyping supported the business process design and vice-versa, as they were done together. The solution designed included includes baselines, targets, intermediary targets, indicators of the EU results framework, other matching indicators for situations or DGs whose needs are not covered by the EU indicators.. The following figure shows an example of an online logframe, connected to the EU result framework:

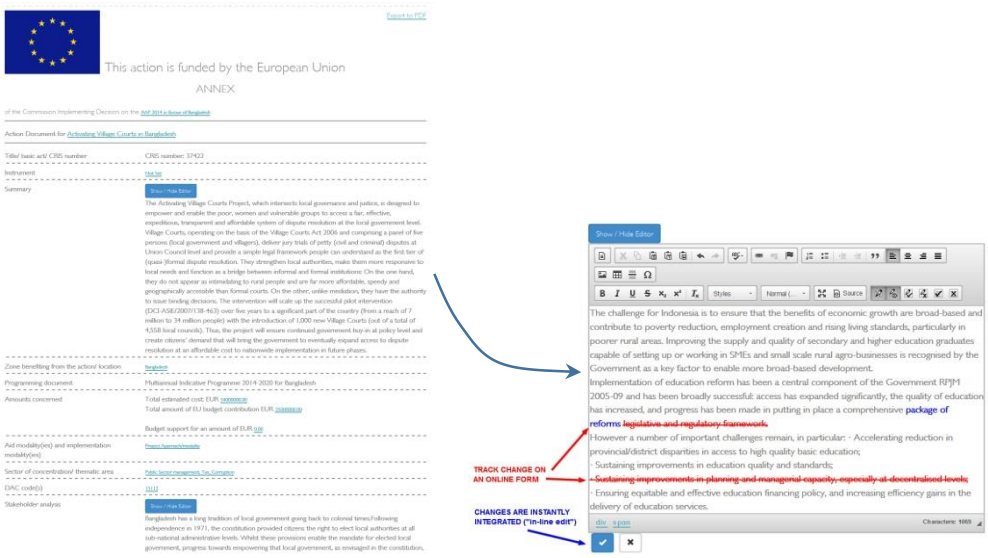


Another use case presented by the prototype was a user-friendly 'online form' offering track changes possibilities. The advantages of such a form are important for simplifying our work:

- Based on contextual information, the right template is chosen by the system

[1] See annex on "lessons learned from initial prototyping"

- this template can be prepopulated with data, which already exists in the system
- business rules can be applied on the form (which e.g. prevents encoding a wrong figure)
- new data entered in the form can be reused in another step or process



The main findings of this experience are the following:

- The development of functionalities happened at a quick pace. The key factors having contributed to that are:
    - the agile methodology;
    - direct and daily interaction between the business (the task force) and the developers.
    - worth noting that a light structure without interference also helped a lot. Therefore scaling up this approach would pose some challenges and reduce the efficiency.

- The user feed-backs were useful to improve the prototyped functionalities.

- The way of working (including the technology[2]) used for the initial prototyping proved flexible to build and adapt the development of functionalities (e.g. a number of user's requests have been implemented with a light effort).

From the previous observations, we draw the following lessons:

1. An agile methodology is one the best practices to be recommended in our environment, including tests on real work with users.
2. The structure in charge of implementing the programme should include experienced operational colleagues to be involved in the work of development teams.
3. According to the recommended "building block" scenario, the use of open source technology and open-source building blocks as Drupal could directly contribute to the architecture of the global OpSys solution.

[2] Drupal: An open source software, used by the Commission as Web Content Management. For the initial prototyping the use of Drupal is supported by Javascript/ Node.js/ angular/ bootstrap.

I. Introduction

The objective of this report is to present the current status reached by the initial prototyping at the end of the OpSys definition and scenario phase (30/3/2015).

Prototyping and working in an agile way corresponds to current good practices. DIGIT is promoting the agile methodology for specific projects, while UK government (Government Digital Services/GDS) has adopted prototyping as the main methodology (https://www.gov.uk/service-manual).

The initial prototyping work with OPSYS is not a prototype stricto sensu; it is a tool aiming to support the reflection work and the feedback from users at the early stage of defining the scope of the platform. In particular, the prototype has been instrumental in helping to put together the concepts and the business requirements for results management. It has also demonstrated the feasibility of using structured online forms instead of word documents which has the potential of simplifying important processes such as Identification-Formulation and drafting tender documents. With regard to user interaction, the prototype has allowed to obtain 60 valid feed-backs, some of which are a useful basis for the user requirements.

However lessons learnt go beyond the reflection tool and show the real potential added value in engaging in a prototyping approach for the development of the new system.

The initial prototyping has been developed on Drupal[3] which is the framework used for Capacity4Dev. The functionalities developed can be easily re-used with any other IT application according to the final choice to be made for developing the new system.

In a few months, the initial prototyping has shown the high potential of this method of working, as key functionalities of the future system have been developed, such as:

- developing most functionalities linked to the results cycle management
- embedding part of data structure of the future OpSys
- migrating a significant part of the existing data (basic data related to 400 MIP, 3.000 Actions, 10.000 contracts, 800 users,..)[4].
- building a proof of concept of a structured document (action document)

Although a lot of functionalities have already been developed, it is much too early to see the present prototype as a prefiguration of the final system. As a deliverable, it should be seen as a concept application.

However, given the level of maturity of certain functionalities, the prototype demonstrates that an approach of rapid development starting from high level requirement is possible.

II. Basic facts:

Cost: 120.000 EUR (This figure only represents the development costs incurred by the Task Force, and cannot be compared to a "Total Cost of Ownership").

Time: 5 months

[3] Technical information is available in the "Approach and methodology" appendix.

[4] Including CRIS numbers, sectors of concentration, amounts committed and consumed, benefitting zones, DAC sector tagging for sectors of concentration, Actions, Contracts, user in charge. For users, it includes delegations and units, job titles.

Conditions: the rapid prototyping was made possible thanks to the capability acquired by DEVCO with the development of capacity4dev (5 years' experience from 2009). In 2014, the capacity4dev team also successfully supported the development of the EYD 2015 website (8 months mission for definition, design, development and housing by DIGIT). The OpSys Task Force benefited from the availability of competence and work by capacity4dev.

Contractor: ADE

Approach: times & means, agile

DEVCO effort: 0,3 FTE over 5 months

III. List of the areas/functionalities which have been developed and tested

1. User first: Linking a user to its portfolio

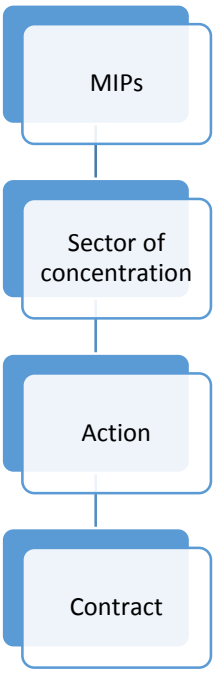
Although at its early stage, the system has been built so that it takes account of the identity of the users and their portfolio.

The prototype is linked to CRIS through database extractions.

A link to a SYSPER database extraction is almost completed, and would allow to cross-navigate through staff, organigrammes and their related portfolio.

2. Embedding the operational entities / constructing a data structure: Programming (MIPs, sectors of concentration)

For the time being, the backbone structure (main branch) displayed below has been implemented. It is based on the main entities present in CRIS. The Project entity is constructed on that backbone (see below on III.7).



The relationship between entities is either:

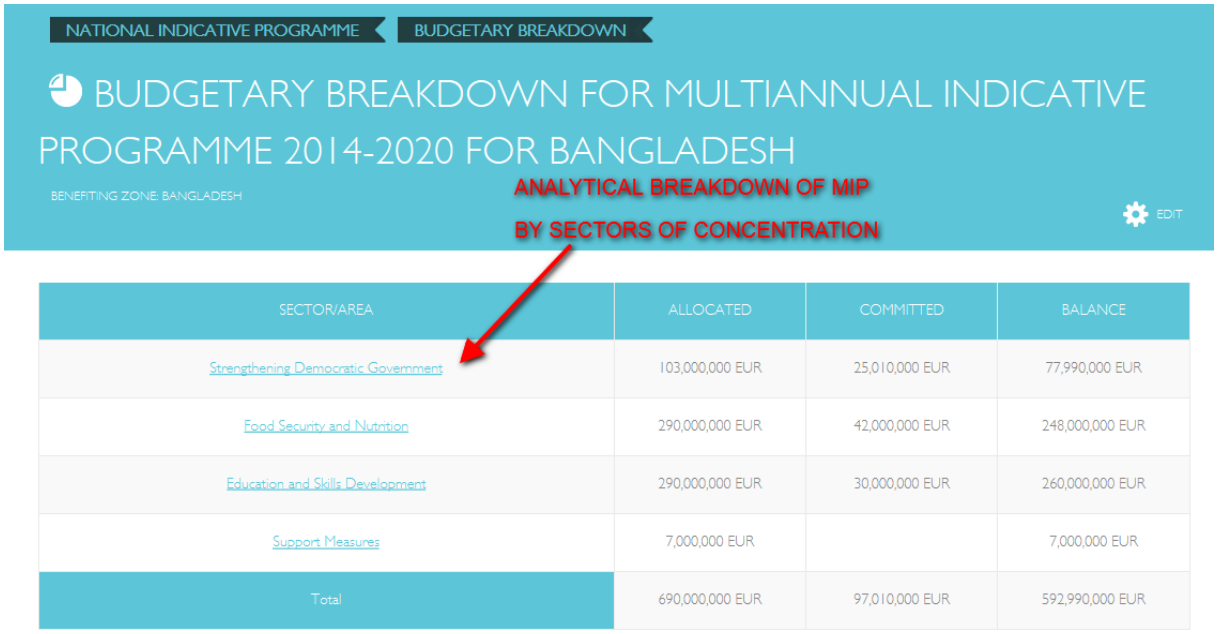
- one to one: A sector of concentration is a budgetary breakdown of a MIP[5], and therefore there is a perfect matching

- one to many: An Action can be spread over several sectors of concentration *(example of regional Actions in the African Portuguese speaking countries: PALOP, which are financed from several MIPs/sectors of concentration)*

At this stage, there is full correspondence with CRIS (Action corresponds with CRIS Decision).

In the future system, - to be more in line with reality - it is expected that "Action" will allow to display several "CRIS Decisions".

The following page illustrates the "MIP to sector of concentration" relation:

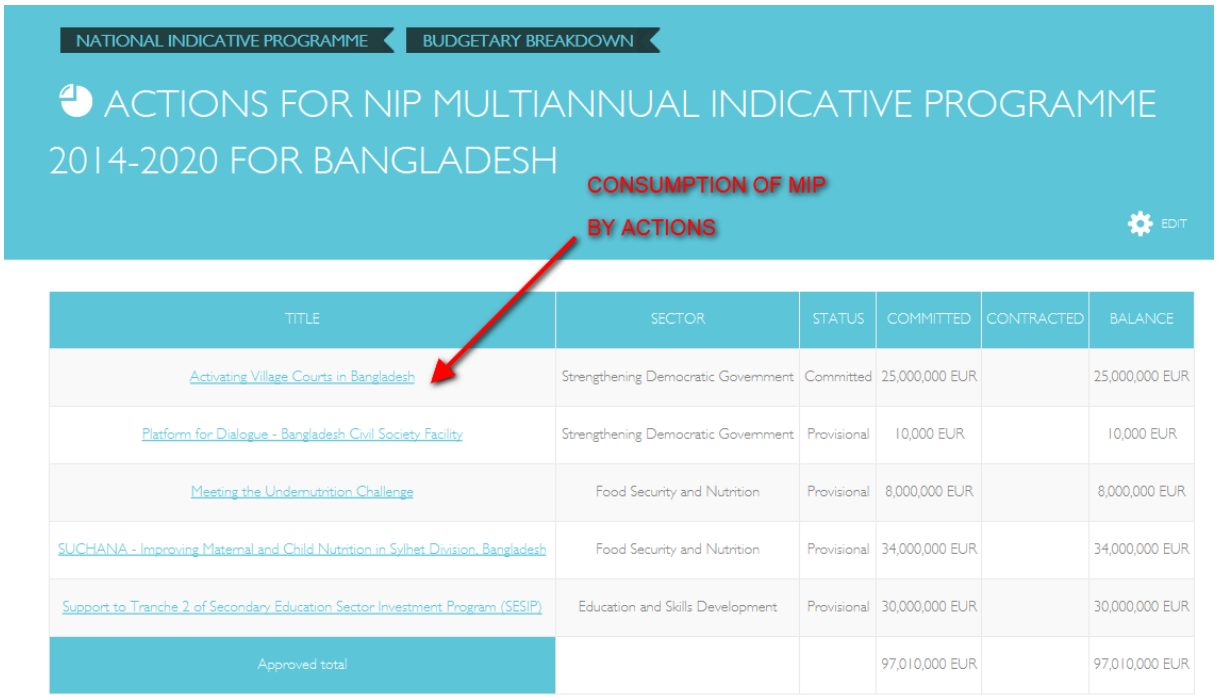


The system calculates the total amount committed and the balance according to the information in its database.

The analytical breakdown function for a MIP could be replicated for an Action/Decision, a contract or the related payment

The following page illustrates the "MIP to Actions" relation:

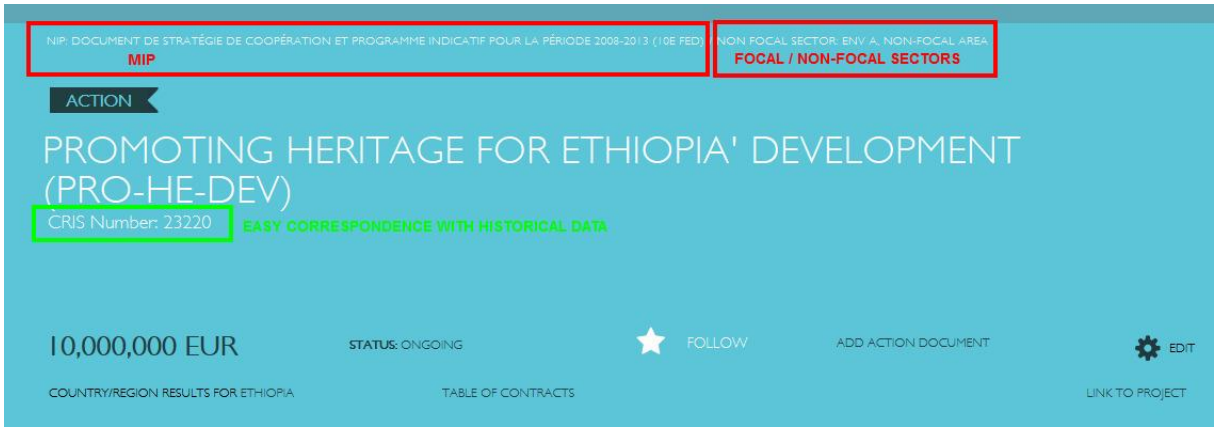
[5] MIP: Multi-Annual Indicative Programme, used as Programming Document in DG DEVCO (equivalent of "Indicative Strategy Paper" in DG NEAR)



3. **<u>Embedding the operational entities / constructing a data structure: Actions, Contracts</u>**

The breadcrumb displays the parent and "grand-parent" entities, and allows easy navigation.

Here the "promoting heritage" in Ethiopia is related to the "non-focal sector env.A", which is related to the National Indicative programme 2008-2013:



The system calculates the consumption of contracts in an Action.

If this information becomes readable from ABAC, then the system would import it from ABAC and the calculation would be replaced by an automatic test.

ACTION | TABLE OF CONTRACTS

CONTRACTS FOR APPUI À LA PROMOTION DE L'ÉQUITÉ ET DE L'ÉGALITÉ ENTRE LES FEMMES ET LES HOMMES

CONSUMPTION OF ACTION BY CONTRACTS

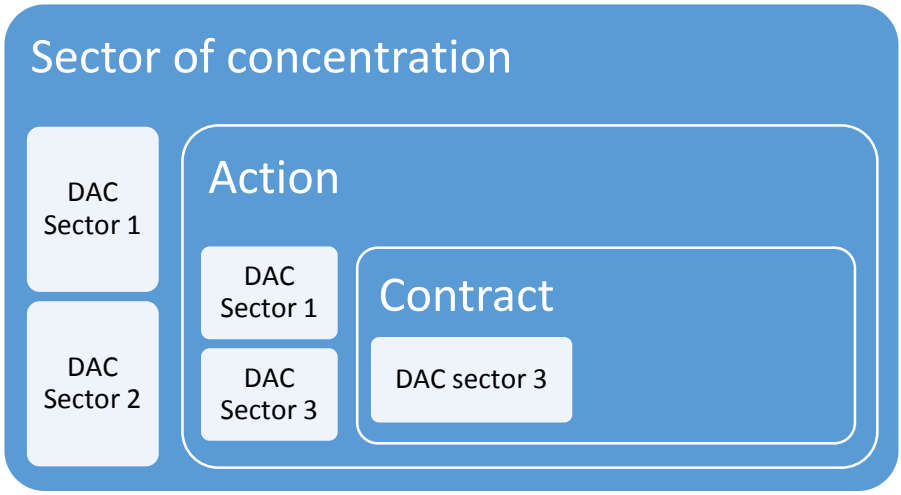
+ ADD

TITLE	TAG	STATUS	CONTRACTED	PAID	BALANCE
Contrat pour le versement des tranches d'appui budgétaire du programme d'appui à la promotion de l'équité et de l'égalité entre les femmes et les hommes au Maroc	Budget Support	Ongoing	27,500,000 EUR	8,000,000 EUR	19,500,000 EUR
suivi du programme "Appui à la promotion de l'équité et de l'égalité entre les femmes et les hommes - mise en oeuvre du Plan Gouvernemental pour l'Egalité" Maroc	Services	Ongoing	294,300 EUR	169,762 EUR	124,538 EUR
Devis programme composante subventions ANE	Programme Estimate	Ongoing	1,400,000 EUR	910,292 EUR	489,708 EUR
Elaboration et traduction du rapport de l'évaluation à mi-parcours de la mise en uvre du PGE	Services	Ongoing	7,600 EUR		7,600 EUR
APPROVED TOTAL			29,201,900 EUR	9,080,054 EUR	20,121,846 EUR

4. **Embedding the operational entities / constructing a data structure: Statistical breakdown (sector tagging):**

Each of the following entities: Sector of concentration, Action, Contract are tagged according to DAC sectors.

Actions and Sectors of concentration (at this stage) can be tagged with several DAC sectors according to a one to one split (one EUR to one sector):

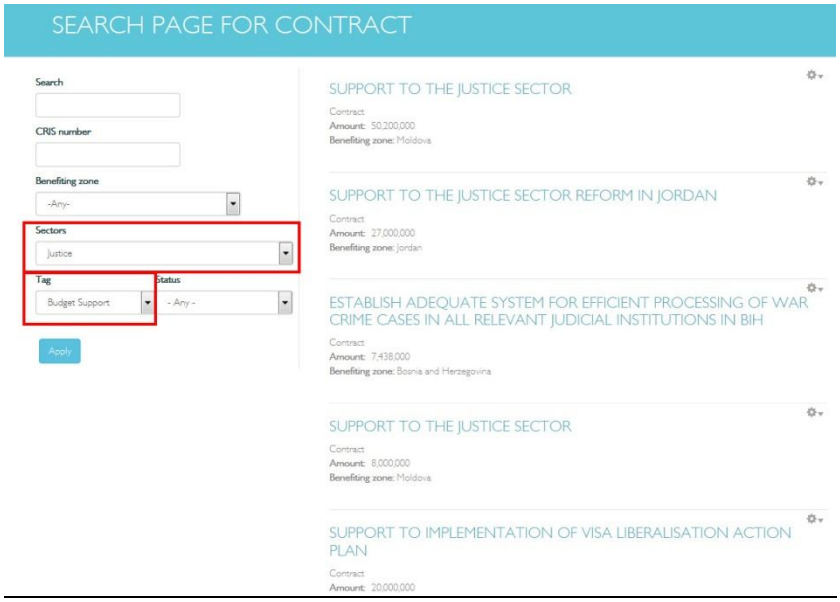


5. **Better access to knowledge: Improving the user-friendliness of DAC sectors**

Considering that the DAC sectors do not correspond to our professional sectors and are impacting negatively our data quality, a new sector structure has been implemented based on Agenda for change sectors of concentration and capacity4dev main sectors used by the thematic units.

It is therefore possible to search through the database by using sectors of the agenda for change or other DEVCO sectors.

See for example the following multicriteria search: All Actions in the Justice sector for budget support operations:



6. **From Paperless to document-less / document management through structured form:**

Actions Document

The system offers structured form with a Microsoft word touch.

The form includes text areas as well as fields with specific rules (e.g.: the action amounts cannot be over the maximum budget included in the MIP).

Export to PDF

This action is funded by the European Union

ANNEX

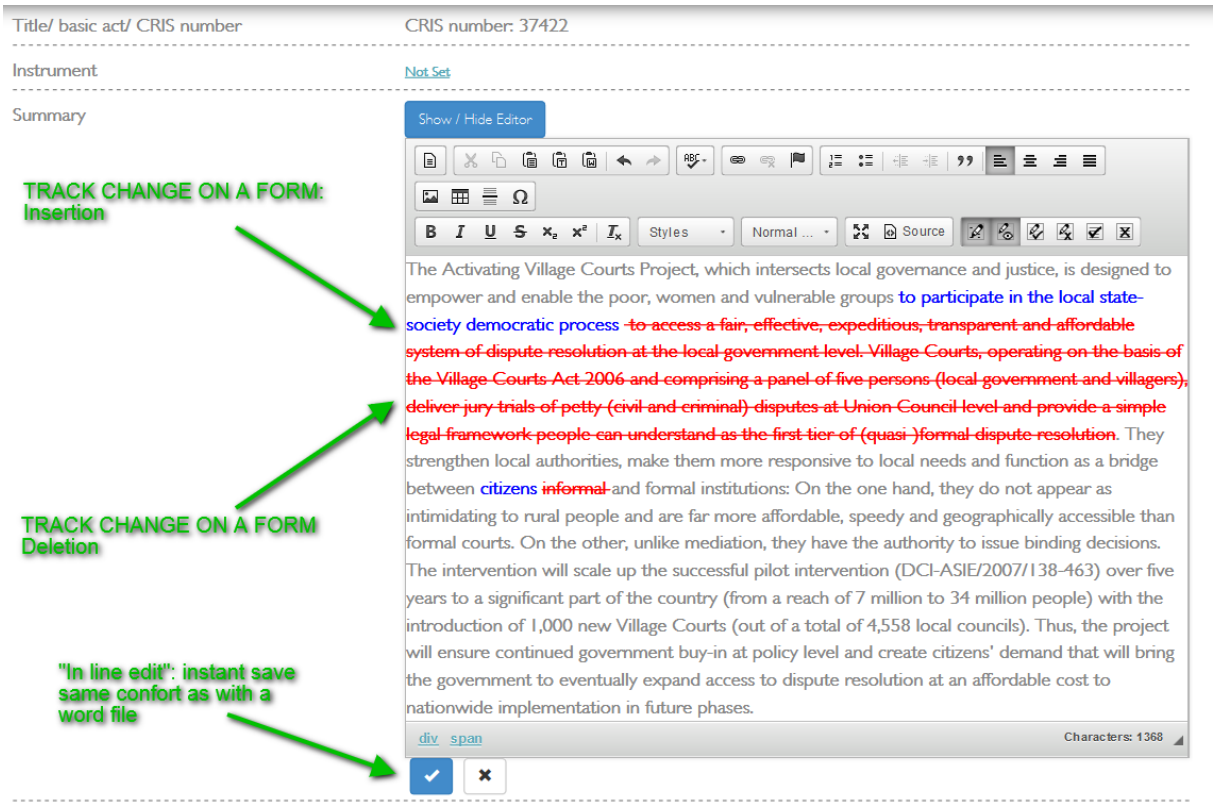
of the Commission Implementing Decision on the AAP 2014 in favour of Bangladesh

Action Document for Activating Village Courts in Bangladesh

Title/ basic act/ CRIS number	CRIS number: 37422
Instrument	Not Set
Summary	Show / Hide Editor The Activating Village Courts Project, which intersects local governance and justice, is designed to empower and enable the poor, women and vulnerable groups to access a fair, effective, expeditious, transparent and affordable system of dispute resolution at the local government level. Village Courts, operating on the basis of the Village Courts Act 2006 and comprising a panel of five persons (local government and villagers), deliver jury trials of petty (civil and criminal) disputes at Union Council level and provide a simple legal framework people can understand as the first tier of (quasi-)formal dispute resolution. They strengthen local authorities, make them more responsive to local needs and function as a bridge between informal and formal institutions: On the one hand, they do not appear as intimidating to rural people and are far more affordable, speedy and geographically accessible than formal courts. On the other, unlike mediation, they have the authority to issue binding decisions. The intervention will scale up the successful pilot intervention (DCI-ASIE/2007/138-463) over five years to a significant part of the country (from a reach of 7 million to 34 million people) with the introduction of 1,000 new Village Courts (out of a total of 4,558 local councils). Thus, the project will ensure continued government buy-in at policy level and create citizens' demand that will bring the government to eventually expand access to dispute resolution at an affordable cost to nationwide implementation in future phases.
Zone benefiting from the action/ location	Bangladesh
Programming document	Multiannual Indicative Programme 2014-2020 for Bangladesh
Amounts concerned	Total estimated cost: EUR 34000000.00 Total amount of EU budget contribution EUR 25000000.00 Budget support for an amount of EUR 0.00
Aid modality(ies) and implementation modality(ies)	Project Approach/modality
Sector of concentration/ thematic area	Public Sector management, Tax, Corruption
DAC code(s)	15112
Stakeholder analysis	Show / Hide Editor Bangladesh has a long tradition of local government going back to colonial times.Following independence in 1971, the constitution provided citizens the right to elect local authorities at all sub-national administrative levels. Whilst these provisions enable the mandate for elected local government, progress towards empowering that local government, as envisaged in the constitution,

The form allows the users to enter track change in the forms.

The ability to accept or refuse track changes is with the process manager.



The benefits are numerous:

- opens a wide range of possibilities in terms of collaboration (example: an Action Document can be simultaneously edited by a Delegation and a thematic unit).
- possibility to prepopulate the template with information already in the system
- possibility to re-use information which will be entered in the form
- instant verifications by the system which improve data quality
- up to date templates are always used and do not have to be searched for

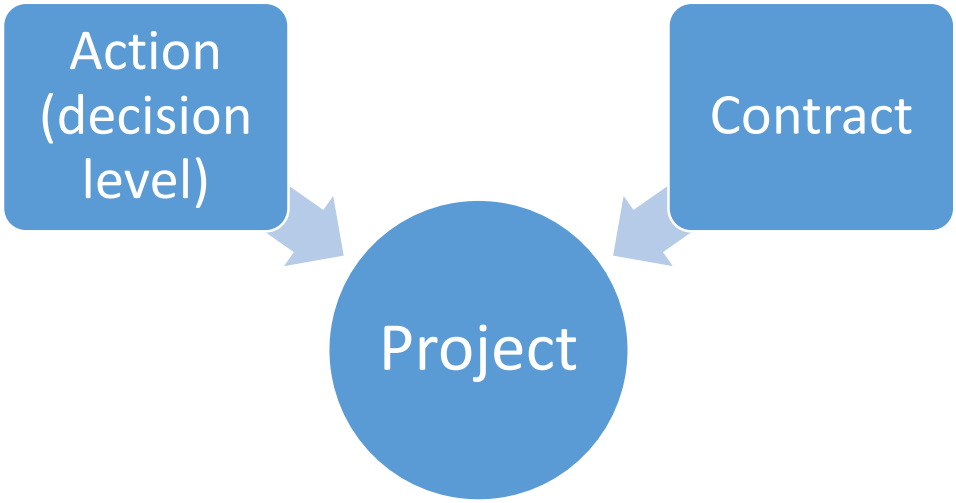
The potential of this approach is quite important: It can be replicated to any structured template, which is widely used, and embedded in a work process.

7. Embedding the operational entities / constructing a data structure: Project/Programme

"Project" will be the main operational entity of the operational system during the implementation phase.

At this stage, "Project" can be set at action level (corresponding to decision in CRIS) or contract level.

In the future system, it is envisaged that Project can also be tagged below the contract level in order to give account of projects included in major envelopes like CBC, Infrastructure Trust Fund..



Step by step: How to tag an existing action (or a contract) as a project?

1) Look for the CRIS entity.

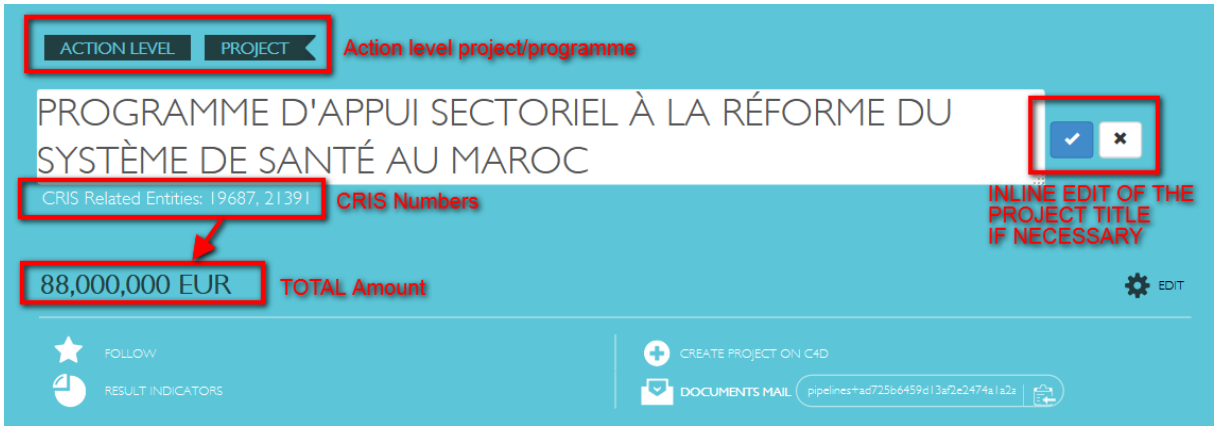
Can also be searched through the CRIS number: Decision or contract can be indifferently entered in the general search field:

2) Tag the action as a project (here: "One single new project")

3) Join any other relevant action into this project (here: "One single existing project")

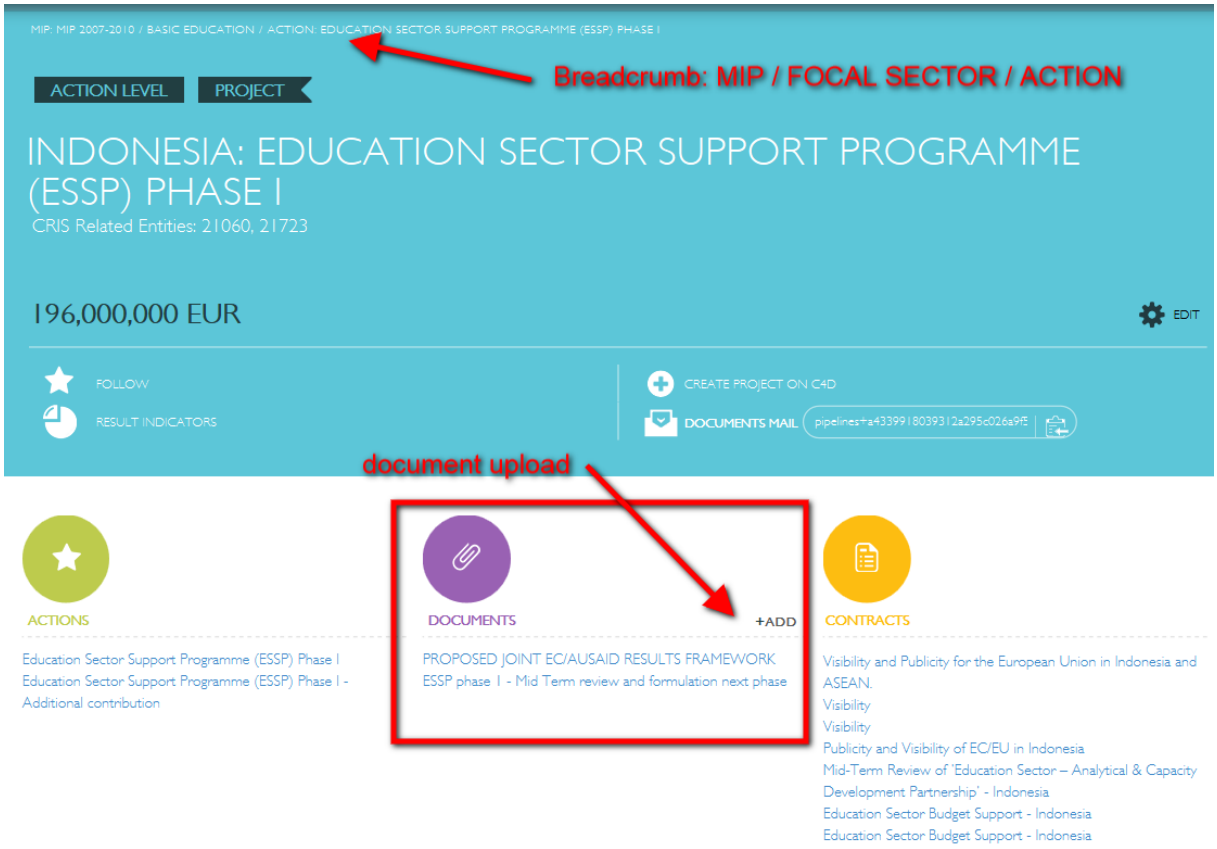
4) The "Action level project" is created

It consolidates 2 Actions (equivalent to 2 CRIS decisions)



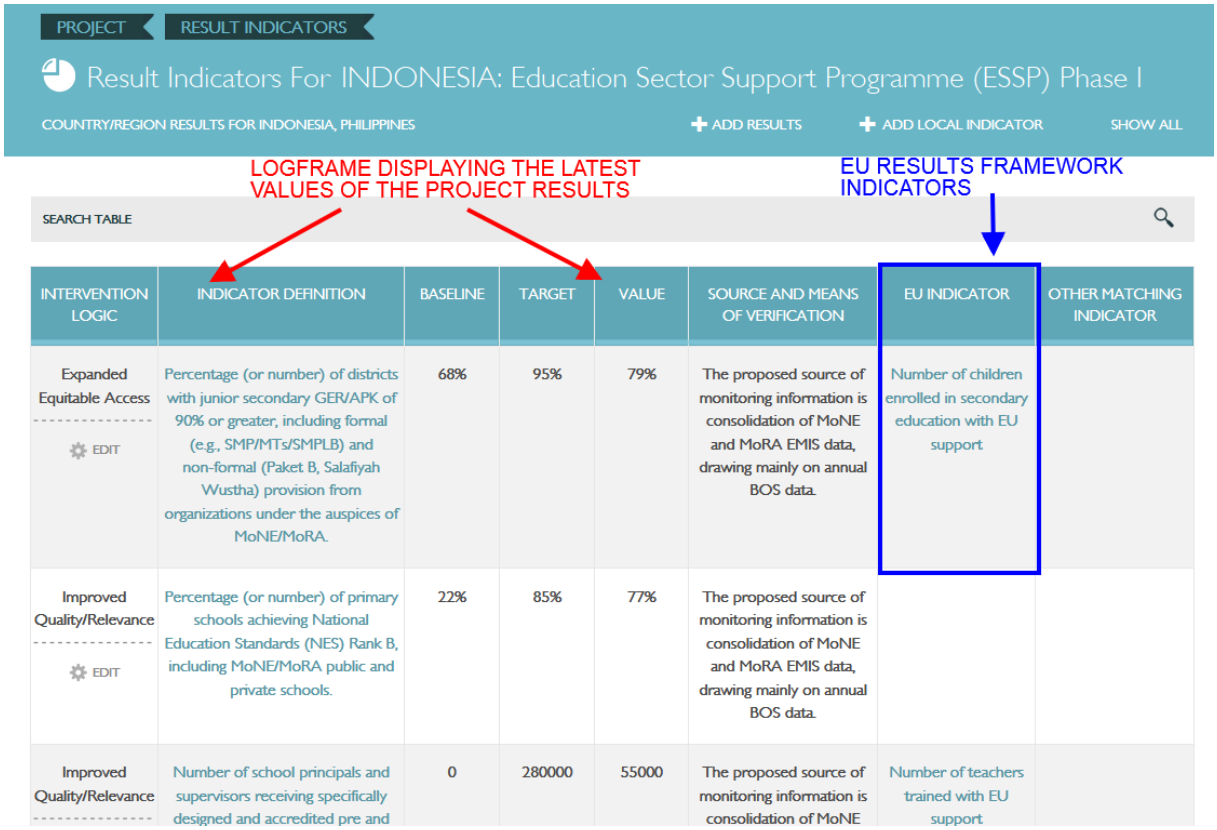
5) The position of a given project is shown in the breadcrumb

- Breadcrumb is applied to all entities in the system
- Documents can be attached and managed (see further below)



8. **Result management**

1. **Online logframe for every project**
2. **Linked to the EU results framework**
3. **Values of indicators are being actualised by the implementing partner as the project is being implemented**
4. **Project monitoring dashboard**



At this stage, the coherence of the result cycle is insured by:

- use of the indicators validated at the programming phase
- use of the Action Document logframe
- correspondence of local indicators with EU or other matching indicators, which allows to aggregate the results at different levels.

The project entity is the foundation for managing the results at implementation stage.

Result management is currently the most advanced functionality in the platform.

Results are managed through 4 data bases:

- 1. results
- 2. local indicators (possibly more than one per result)
- 3. result indicator values (yearly values of baseline, targets and achieved values)
- 4.a. EU indicators (matching with local indicators)
- 4.b. Other Matching Indicators (same db as the EU indicators: matching with local indicators)

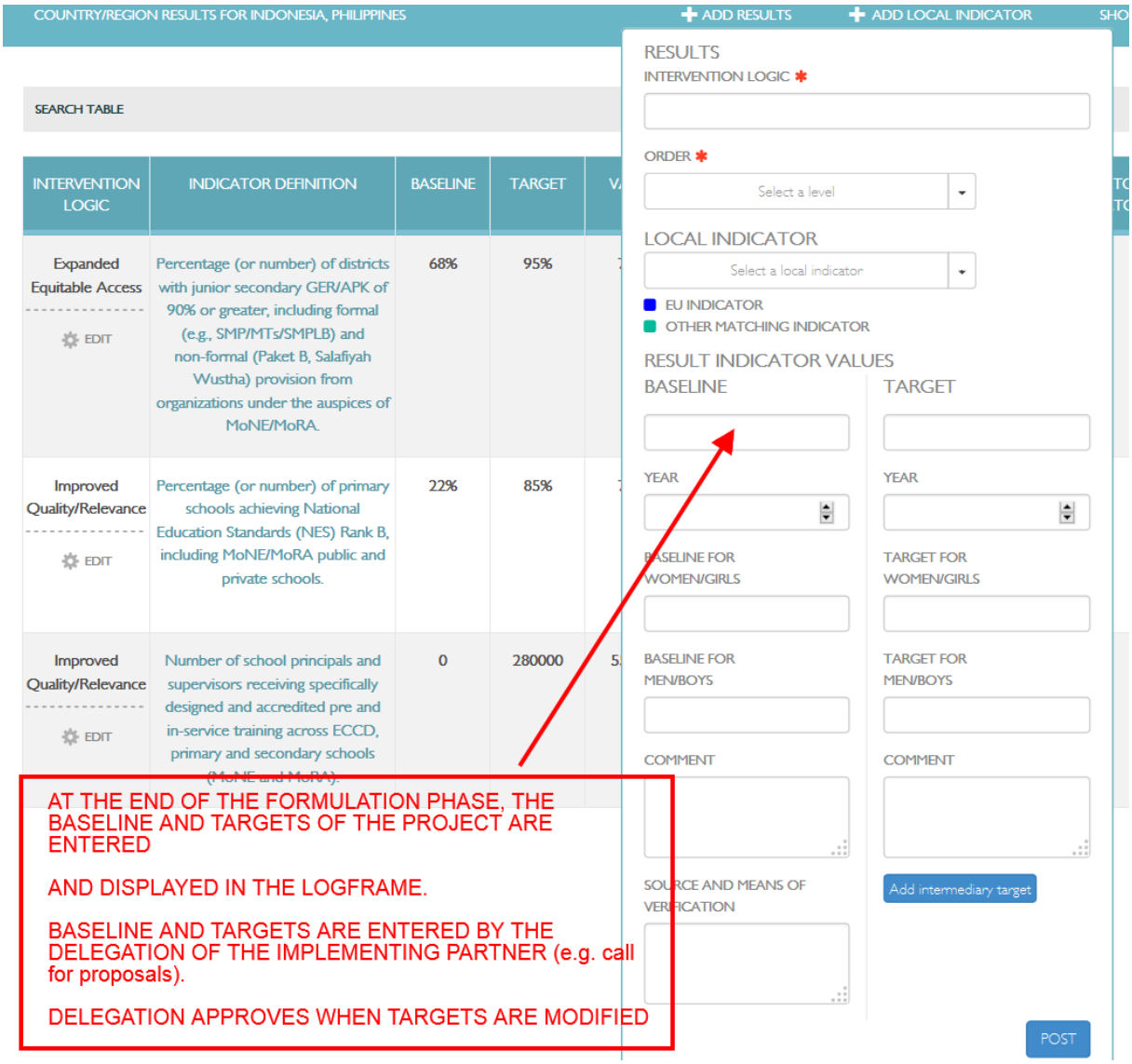
Step by step guide for implementing the results cycle in the system:

1) During the formulation phase, the user enters the logframe including the baselines and targets

The system keeps track of the link between local indicator and EU results indicator (or other matching indicators).

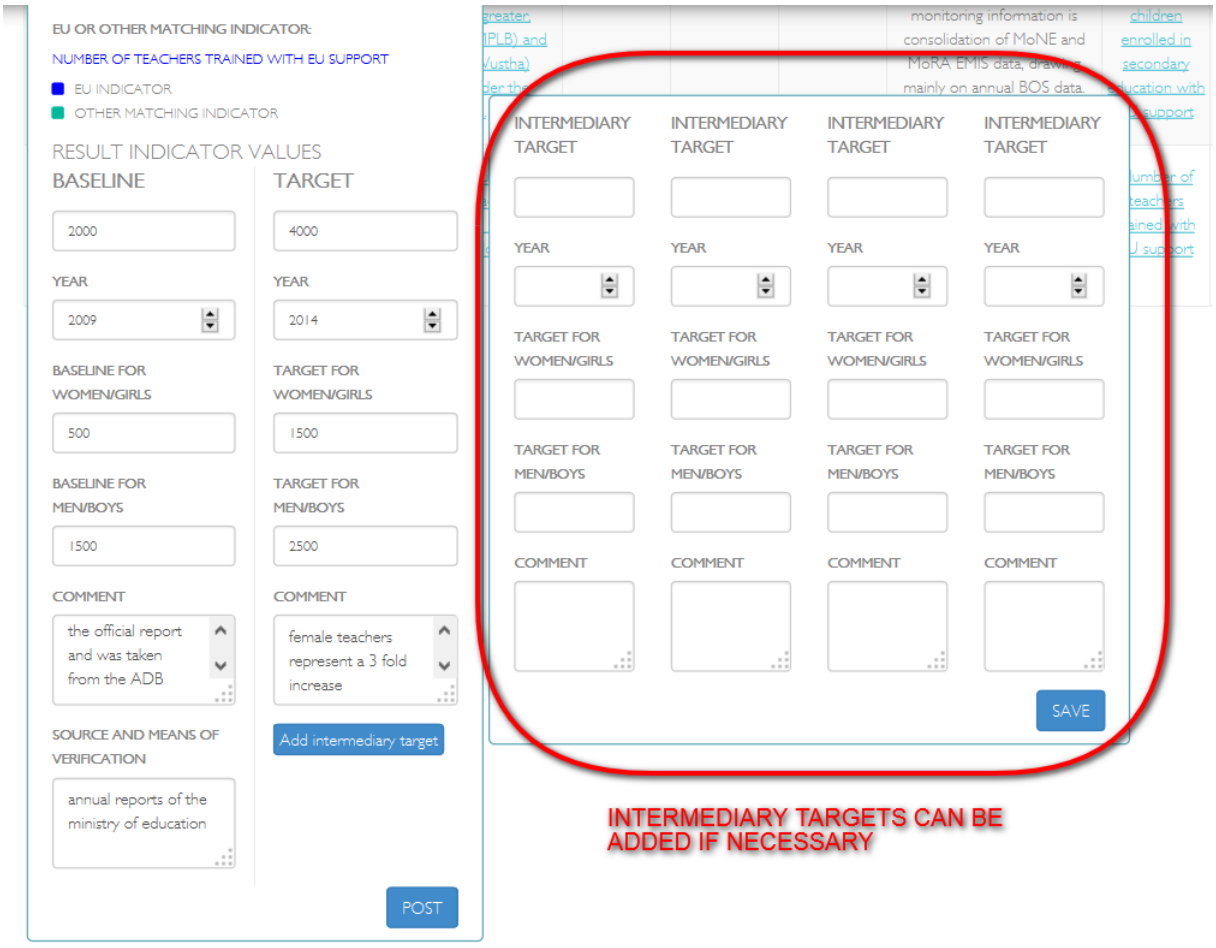
Therefore the system proposes the user to apply local indicators which have already been linked to EU result indicators.

Alternatively the user may create its own local indicator.



A form allows the user to enter values in the 4 different databases of the system in one go.

2) If necessary, intermediary targets can be added



The baseline and targets can also be edited.

3) During the implementation phase, **the implementing entity** enters the achieved values

YEAR	TYPE	TARGET	TARGET FOR ♀	TARGET FOR ♂	COMMENT	VALUE	VALUE FOR ♀	VALUE FOR ♂	COMMENT	SOURCE OF RESULTS	NET VALUE	NET VALUE FOR ♀	NET VALUE FOR ♂	COMMENT
2009 EDIT	baseline					2000	500	1500	figure for women was not part of the ADB study.	annual reports of the ministry of education				
2011 EDIT	intermediary	2500	750	1750	new programme to be established in 2010	2500	600	1900	the awareness campaign was delayed and explains the low results for women	report from the ministry completed with project information	500	100	400	
2012 EDIT	intermediary	3000	1000	2000	linear progress in 2012	2800	800	2000	The overall yearly results are mixed, but the rate of increase for women is very satisfactory	report from the ministry now comprises sex-disagregated figures	800	200	100	net value shows a sharp increase in the number of women trained for 2012
2013 EDIT	intermediary	3500	1250	2250	linear progress in 2013									
2014 EDIT	final	4000	1500	2500	the target for female teachers represent a 3 fold increase									

THE ACHIEVED VALUES DURING THE IMPLEMENTATION ARE ENTERED BY THE IMPLEMENTING PARTNER - (not the Delegation staff)

The latest achieved values are actualised in the online logframe

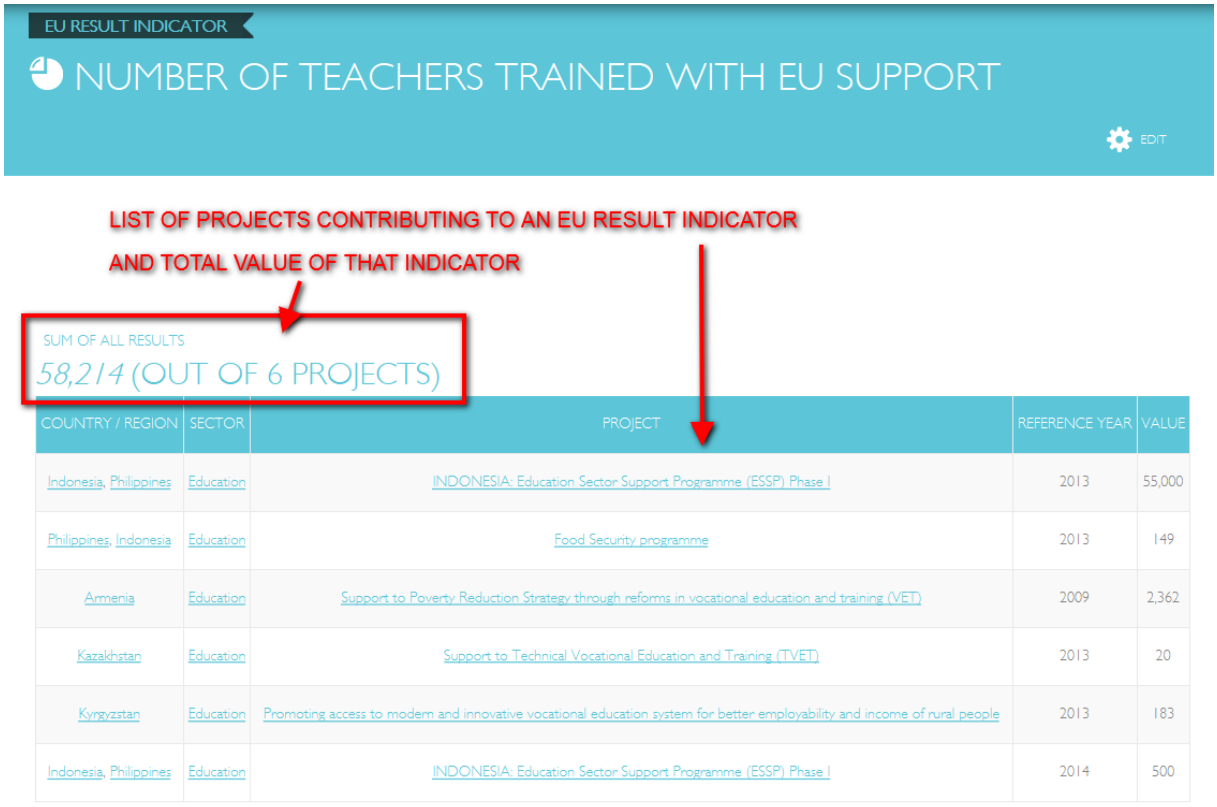
The targets can be edited by the Operational managers

A differentiated access could be easily implemented, for restricting the "write access" of implementing contractors/entities to the red square of the table.

4) Aggregation and display of results:

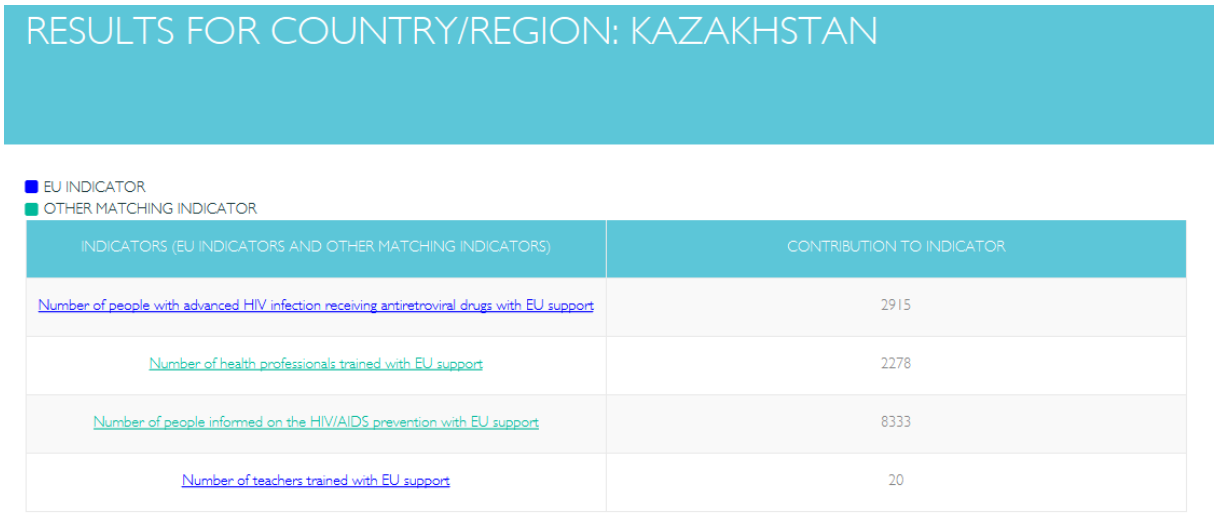
Given the sophistication of the data structure, a high number of aggregation is possible. For the time being, the system allows only the main types of aggregation: By EU indicators, or By country/region.

- display by EU indicator:



COUNTRY / REGION	SECTOR	PROJECT	REFERENCE YEAR	VALUE
Indonesia, Philippines	Education	INDONESIA: Education Sector Support Programme (ESSP) Phase I	2013	55,000
Philippines, Indonesia	Education	Food Security programme	2013	149
Armenia	Education	Support to Poverty Reduction Strategy through reforms in vocational education and training (VET)	2009	2,362
Kazakhstan	Education	Support to Technical Vocational Education and Training (TVET)	2013	20
Kyrgyzstan	Education	Promoting access to modern and innovative vocational education system for better employability and income of rural people	2013	183
Indonesia, Philippines	Education	INDONESIA: Education Sector Support Programme (ESSP) Phase I	2014	500

- display by country/region:



INDICATORS (EU INDICATORS AND OTHER MATCHING INDICATORS)	CONTRIBUTION TO INDICATOR
Number of people with advanced HIV infection receiving antiretroviral drugs with EU support	2915
Number of health professionals trained with EU support	2278
Number of people informed on the HIV/AIDS prevention with EU support	8333
Number of teachers trained with EU support	20

Given the fact that the EU result framework indicators cannot cover the full extent of our cooperation, it is necessary to offer the user the possibility to aggregate other important results for example at country level.

Such possibility has been implemented in the system as "Other Matching Indicator". It will allow to manage a "key country result" on which a Delegation would like to report at country level, but which does not belong to the list of EU RF indicators.

Similarly, the "Other Matching Indicator" could be used by other DGs which would like to implement specific Non-DEVCO results indicators.

5) Early version of a project/programme monitoring dashboard:

A result dashboard indicates the progress to target, while the cell is filled with a traffic light colour (green, red, orange), depending whether the progress achieved is reasonable with respect to the time elapsed. That functionality was developed in February 2015. Although it is technically working, it is still indicative with respect to design.

MAIN RESULTS

INDICATOR	VALUE	PROGRESS TO TARGET
Number of children enrolled in secondary education with EU support	120000	41%
Percentage (or number) of primary schools achieving National Education Standards (NES) Rank B, including MoNE/MoRA public and private schools.	77%	87%
Number of teachers trained with EU support	55000	20%

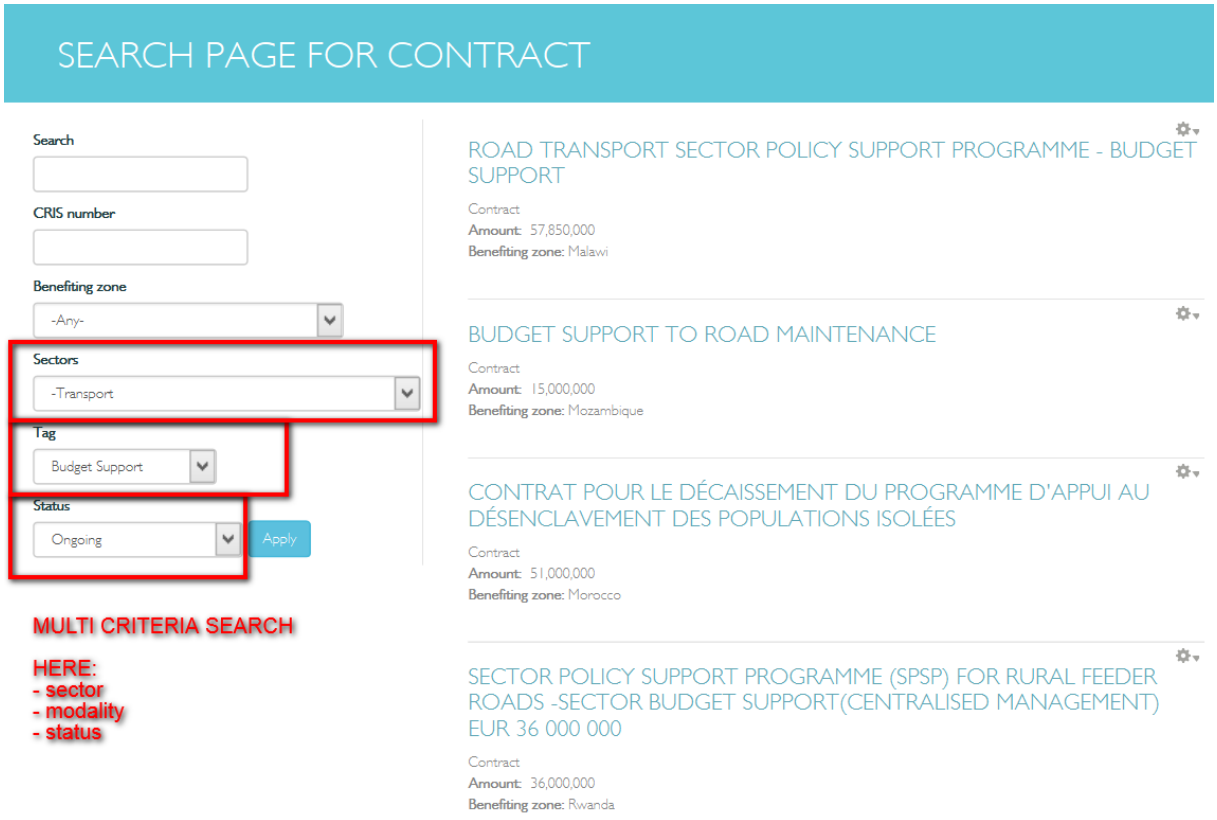
FINANCIAL STATUS

CRIS NB.	TITLE	AMOUNT	CONTRACTED	BALANCE
21060	Education Sector Support Programme (ESSP) Phase I	145,000,000.00 EUR	144,774,000.00 EUR	225,657.00 EUR
21723	Education Sector Support Programme (ESSP) Phase I	51,000,000.00 EUR	51,000,000.00 EUR	
Total		196,000,000.00 EUR	195,774,000.00 EUR	225,657.00 EUR

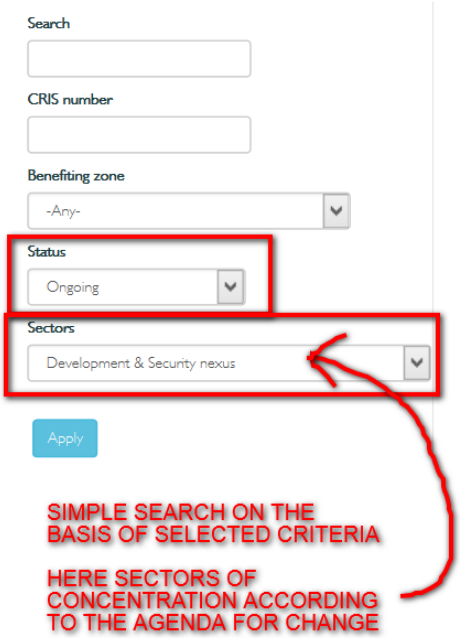
9. Search functionalities according to operational concepts

The search functionality is very flexible, the main search field can indifferently accept a title (or a word in a title), or a CRIS number (decision, contract numbers are recognised as such).

The below search pages are dedicated to filtered search with one or several criteria, e.g. as below: all budget support contracts in the transport sector:



SEARCH PAGE FOR ACTION



CONFLICT PREVENTION IN PERU

Action
Amount: 405,000
Benefiting zone: Peru

SUPPORT TO STABILITY AND PEACE BUILDING

Action
Amount: 21,442,694
Benefiting zone: Nepal

MINE ACTION IN THE TIGRAY, AFAR AND SOMALI REGIONS OF ETHIOPIA IN SUPPORT OF PEACEBUILDING INITIATIVES

Action
Amount: 9,895,488
Benefiting zone: Ethiopia

STRONGER EVIDENCE FOR AN IMPROVED ACCESS TO CRIMINAL JUSTICE

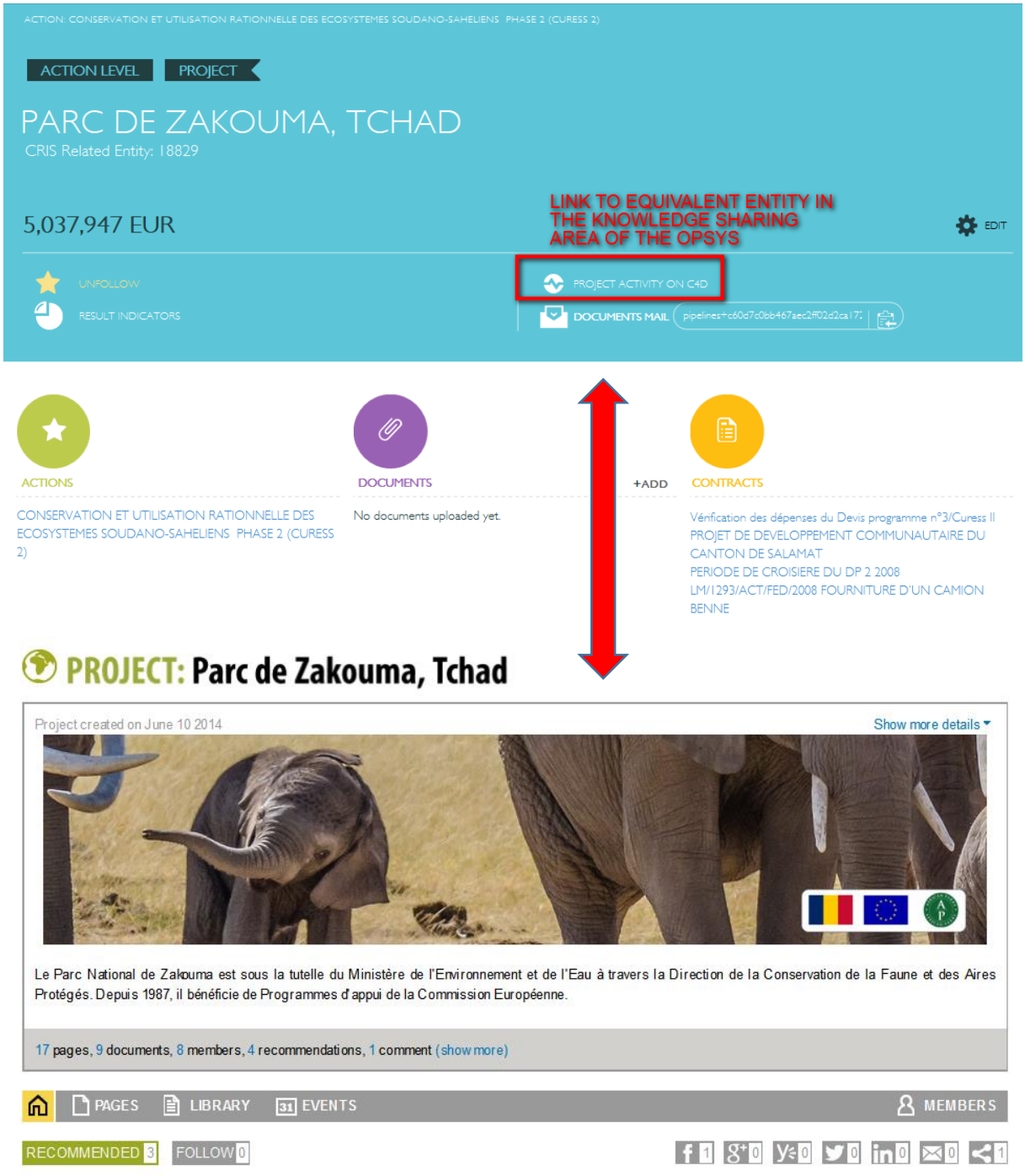
Action
Amount: 5,350,000
Benefiting zone: Nicaragua

10. Other tested functionalities, including administration functionalities:

a. Linking operational information with knowledge sharing

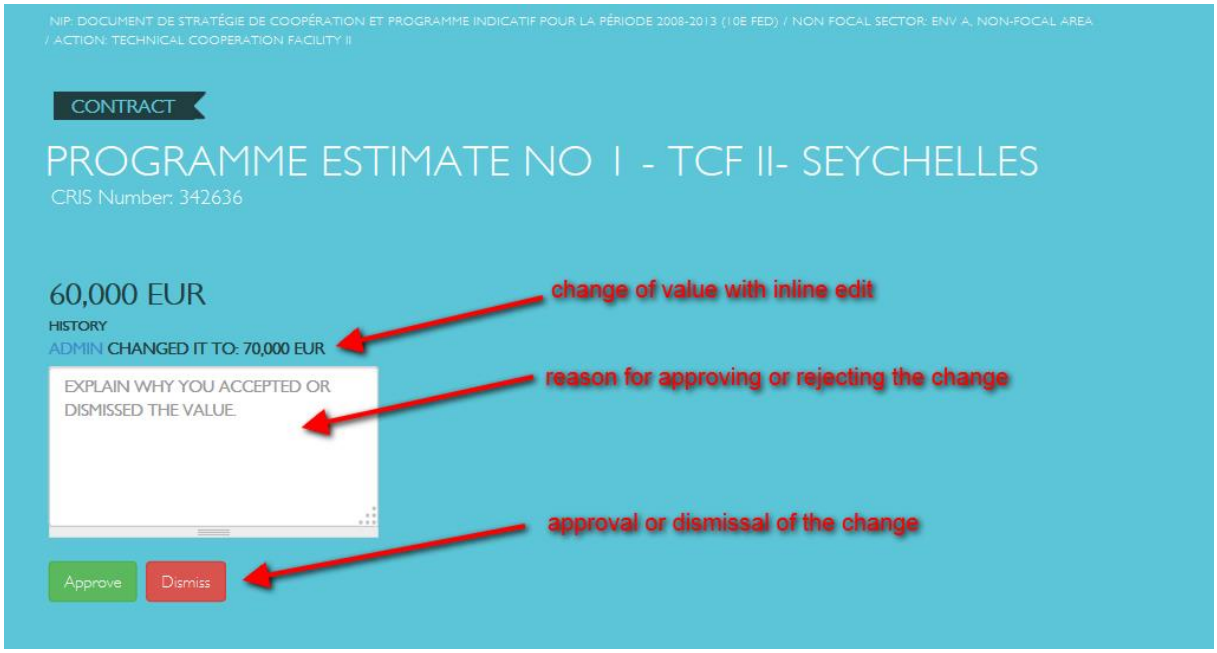
"Project" is the pivotal entity to exchange data between communication/knowledge, geographical information system and operational information. For the time being, only a link has been implemented.

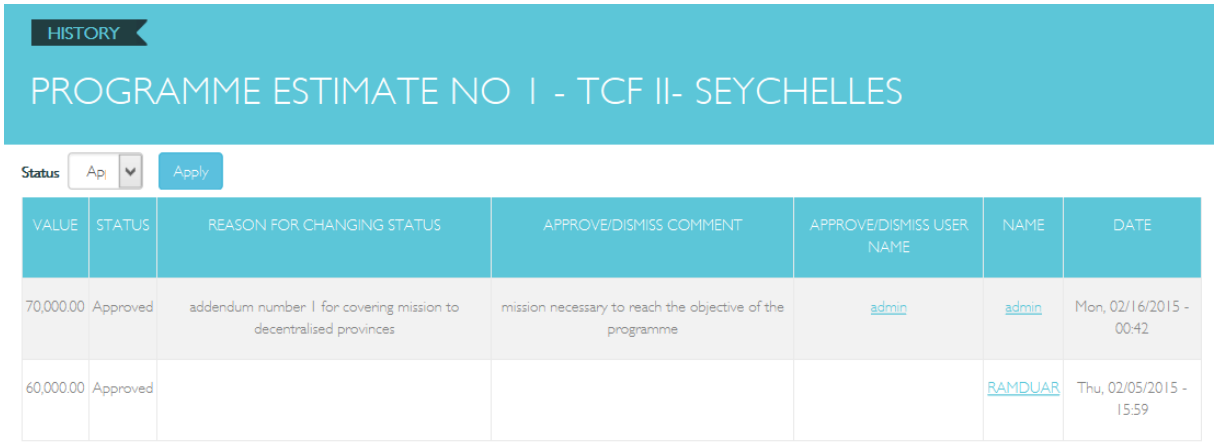
In the future system, it is planned that information would be exchanged between OpSys, GIS, capacity4dev and the internet website.



b. Basic workflows:

The system is able to manage operational workflows (The following example is very basic, but can be expanded).





c. Document management

Apart from the structured document form, the system offers the classical versioning functionalities (i.e. keeping track of previous revisions of documents), something which, for internal users, would be managed in ARES/Hermes).

d. Notifications

The system has embedded notification capabilities (not in use for the moment).

e. Link with outlook

The system allows linking a meeting with the outlook calendar of a user. To complement that function, an add-on should be implemented in order to automatically update the user outlook calendar, when the meeting is changed centrally on the system (example a CTM or QSG meeting).

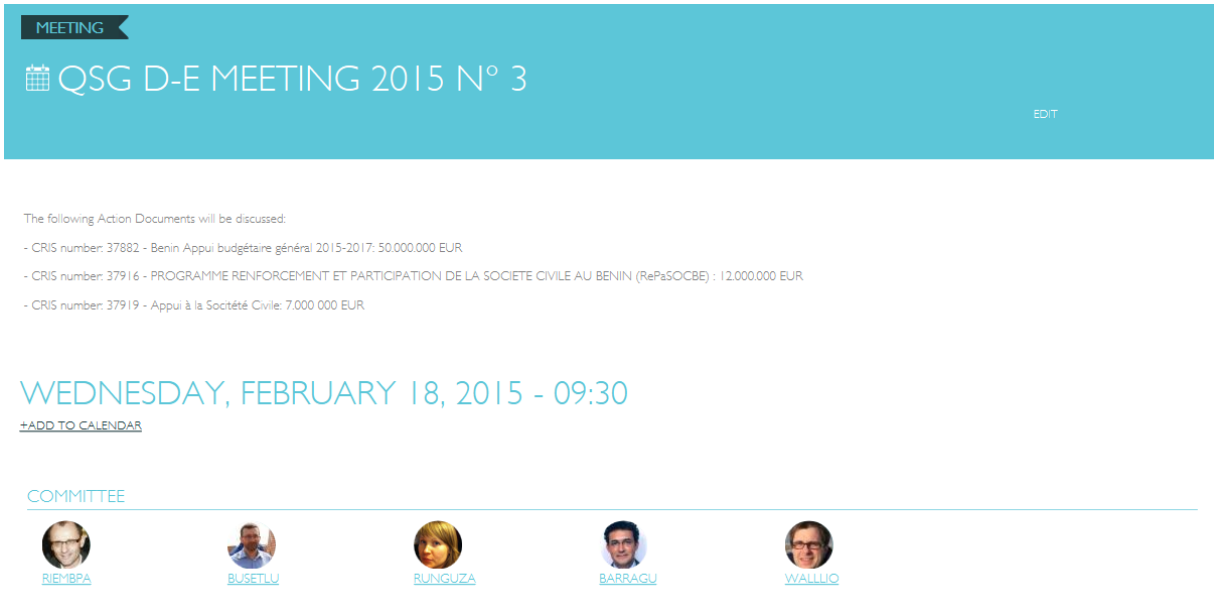
f. Inline edit

Allows editing certain fields "inline" (on the screen): greatly improves usability.

g. Meeting management (Work in Progress)

The system allows the central management of meetings, while linking the meetings to one or several Actions.

This functionality is a work in progress.



Lessons learnt from the initial prototyping:

Appendix on Approach & Methodology

1. Technology used for the prototype

The prototype has been developed on Drupal 7, a Content Management Framework built on PHP.

It has been possible to build a solid, secure and scalable platform/prototype very fast, in so far that:

- Drupal relies on Modules (functional building blocks)
- Inhouse expertise was available (5 years of capacity4dev, EYD successfully developed in 4 months).
- PHP is very widespread and robust language, easy to customise and flexible.

In the end it's not the programming language that counts most, but rather the **capability of the IT experts team** that uses it, and the ability of both teams: Development and Client to **understand each other**. It is also important that the Client's project manager has a very good understanding of the business processes, including how **external stakeholders** intervene in these processes**.** Finally the Client team should also be aware of the possible **evolutions** of the organisation's way of working, in order to incorporate **flexibility** where appropriate.

2. Integration

Integrating this prototype into an enterprise architecture should be simple due to its restful design. That means that, if need be, some of the components (such as workflows, rules) can be transferred to a java engine for example, if relevant with respect to the IT architecture.

Also the modularity of PHP/Drupal gives the tools for "continuous integration" (i.e. constantly being able to push even important changes, without the fear of taking the platform down).

The current approach to the prototype, which is very in line with direction the web is heading is building different components that can interact with each other through web-services.

The prototype isn't "just" a site. It's a fully **RESTful server**, that allows authorized clients to consume it's API.

In case the IT architecture requires it, complex tasks that require heavy calculations or workflows would be distributed to other backend components written in Java. Each component should be built on the most fitting language, where there is a team of experts that can get the best out of that language.

3. Capability to handle entities, data, workflow and interaction with external users

It's important to note that PHP/ Drupal can deal with complex workflows when the use case requires. For example, “Drupal Commerce” is the core component in the centre of the Royal Mail's complex legacy architecture, **transacting up to 50,000 orders per day against 200,000 order lines, integrated with several supply chain systems including SAP**.

As a CMF - Content Management Framework, Drupal makes it suited for modelling the different prototype entities (e.g. MIPs, actions, contracts, projects) as-well as providing robust mechanisms for authentication, permissions, roles, admin interface, automatic testing and so on.

Closer to DEVCO, capacity4dev is already an implementation doing more than simple content management. It is handling different permissions and rules based (1) on mail domains and REST services linking to LDAP and (2) on memberships in different groups and projects, triggering workflows to enable access to specific resources.

Having said that, it does not mean that a Content Management Framework is the perfect 'one-size-fit-all' tool, only that each component should be built on the most fitting language.

4. A modern approach

*| The most dangerous phrase in the language is, "We've always done it this way." (*Grace Hopper)

The prototype isn't just a more modern technological approach, allowing interaction with external users, and flexible design. It's also a modern methodological approach, relying on agility and Open Source components.

Through agile approach, transparent development (code and activities of the developers accessible in real time by the business) and regular conversations between the Experts and the Task Force, not only we are able to tackle important challenges quickly, but also build solutions in such a manner

that can be later re-used in other platforms, notably C4D, or other platforms of the EU and elsewhere.

Another good practice is to have built a realistic prototype: No dummy data – no theoretical functions: working functionalities and use of real data that users are familiar with.

5. Project Management

A high emphasis has been placed on transparency and communication between the stakeholders of the project.

Approach Used

- The code is stored in a Git repository accessible online via GitHub to privileged users.
- Code commits, comments, pull requests etc are all accessible to all users via the GitHub repository.
- Task management is done via GitHub Issues, ensuring all tasks and communications between developers, project manager (Task Force) and other stakeholders is archived and accessible to all.
- Each new task is handled in a separate Git branch. Once the task is complete, the Lead Developer performs a code review with the developer in charge. Once all feedback was implemented, the code is merged to the master branch via pull request.
- A DEV site is updated weekly or daily with the most recent code changes and new data

6. Migration

In order to allow for exporting and importing in parallel, this task is divided into two operations independent of each other:

- Export existing data to normalized tables which will allow easier migration
- Import data from normalized tables into Drupal 7

Approach Used

- Migrate module: Custom migrate handlers are developed to migrate from the normalized tables to Drupal's entities (e.g. node, user, taxonomy term, etc)
- **csv2sql**: A drush plugin developed by Gizra for converting CSV files into SQL. This allows migrated content to be prepared and edited using Excel/OpenOffice tools prior to the final migration. Ultimately the actual migration uses SQL.

- Online sheets: Private online Excel sheets are shared between the stakeholders. Each sheet represents an entity in the system, thus exposing the developer's implementation to the Task Force, so that the business can better understand the interaction between the entities, and validate them prior to any development

7. Theme and mockups

Following the initial graphic design, the PSD deliverables were converted to HTML pages using Jekyll, a static site generator, which allowed stakeholders to view the resulting site with the actual fonts, layout etc and validate it on various browsers and devices (mobile responsive design).

Once validated, the HTML/ CSS of the Jekyll mockup was integrated into the Drupal theme.

Approach Used

- Jekyll: A static site generator that allows quickly building an HTML mockup, that can be later injected into Drupal
- SASS & Compass: In order to avoid having to write plain CSS, SASS mixins are used by the developer to reduce the amount of duplication and browser compatibility
- Bootstrap: This is the most popular base theme, which provides a robust starting kit with grid functionality, along with different UI elements such as menus, select lists, tables, typography, etc - adhering to UI design best practices. Worth noting that Kendo is the standard promoted by DIGIT for UI (User Interface). Using bootstrap as an alternative would necessitate further investigation and discussion with DEVCO IT unit and DIGIT.

8. Front End Implementation

In order to provide an engaging experience and a responsive user experience the front end code used **AngularJS library,** where reasonable.

For example, "adding result (targets)", "editing (achieved) results", inline editing in the "Action Document" and quick filtering in the home page are using AngularJS component instead of the bulky looking Form API.

The idea was not to convert the prototype into a fully Headless Drupal (I.e., use Drupal in backend only), but rather to find a good balance of Drupal along with front end AngularJS components communicating with the backend via REST/JSON.

AngularJS components improve the way HTML5 is managed by adding functionalities to HTML5 and an application specific structure (MVC model, routing, and bilateral binding of data,…). AngularJS is not improving the way an application will look. CSS templates will.

Approach Used

- RESTful module: Developed by Gizra, RESTful module is becoming the leading module for Drupal 7 for REST servers, thanks to its high performance and fine grained control implementors have over each RESTful resource. The RESTful module comes with authentication providers, caching, rate limits, multiple data provider (e.g. query entities, or the DB table directly), auto-discovery and many other features, which could be taken advantage of in order to provide a slick and stream-lined user experience
- AngularJs: The Open Source Js library which is backed up by Google, is nowadays considered as the popular framework for developing engaging client side application or web components

9. QA

A proper QA cycle is vital for the success of the project. QA is done by a combination of QA-dedicated personnel (with a strong development background, allowing them to understand and test the whole system) and automated tests written by developers and executed automatically whenever a new piece of code is added.

Used Approach

- Automated testing was implemented using Behat. The developer indicates that his testing benchmark is to have a **15% test coverage for all features** and translations and **100% coverage for access related features**.
- PhantomCSS is a tool that allows taking screenshots of the existing, validated, state of the UI. On every Git commit PhantomCSS compares validated images with the new state of the site and notifies on any change in the UI appearance.
- TravisCI is be used for continuous integration so that each commit triggers the automatic test suite in order to catch any problems caused by the new code.

10. Monitoring the prototype

A key element to maintaining a live system is being aware of issues in real time, if possible before users are affected.

This was accomplished through a logging module, such as Gizra-developed Logs HTTP, which allows sending Drupal logs into a centralized logging service (e.g. a Logstash or a 3rd party commercial tool such as Loggly). When an error occurs, the system alerts the relevant staff via email/SMS and keeps a execution backtrace in order to help developers determine the cause of the error and significantly reduce debugging time.

Proposed Approach

- Logs HTTP: The module takes extra care in not blocking the request (thus not slowing down the response), by sending the logs via HTTP only when the request has finished.
- Piwik: This is a good alternative to Google analytics, and it could be used to get insight on the user's behaviour (currently being tested by DIGIT).
- New Relic: In case it would be allowed to integrate New relic with the server, the developer indicated that it gives a lot of information about the application (e.g. time spent in database, slowest query, etc).
- User Snap: A widget that allows taking a screenshots and providing comments on every page was successfully used for users to provide their feedback.