**Evolve Limited**

Project Technical Report

Project: **ZPPA Red flags dashboard**

Client: **ZPPA**

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**Executive Summary**

This report starts with a succinct description of public procurement that should help to quickly give a technocrat insights into the public procurement domain, and therefore provide precursor knowledge about the design and considerations made during the system design and development stages. This description is given in the public procurement succinctly section of this report. If you are already familiar with general knowledge about procurement, then skip the section to the next.

In the design and modeling section of this report are the details of how the system is designed in relation to all its stakeholders, actors, entities and requirements. The design is based upon structured analysis techniques, and they are regarded sufficient to complete the design and modeling of the system.

Next is, a closely related section about the structure and the design of the application logic for the system expressed in form of source code, frameworks and associated technologies. This is intended to give any developer a clear understanding of the source code in order to aid maintenance, improvements, and further development.

**Public procurement succinctly**

Unlike private private procurement, public procurement has got its own processes and stages that may differ from country to country, and involves the buying of products and services by different public entities from other entities that may be public or private. The major stages of public procurement are – planning, tender, award, contract, and implementation and the private procurement has a different process that starts with a request for quotes, followed by a quotation, request for goods/services (purchase order), invoicing, payment and payment agreements, payment receipt, and finally a supply of goods.

As seen above, the public and private procurement are very different. Public procurement involves a process known as bidding, where all potential and prospecting suppliers propose to sell or offer or supply goods and services to a public entity. This obviously hints to a very competitive process where a supplier or more with the most desired offers is (are) chosen to supply goods or services to the public entity also known as the buyer. The buyer’s initial desire to purchase good and/or services is as a requirement supposed to published at the start of every fiscal year. This allows prospecting suppliers to make bid preparations. Once the plans are submitted, the buyer can go ahead to announce a desire to purchase goods and/or services from a supplier from a pool of suppliers, and this is what is known as the tender.

All the prospecting suppliers can then compete for the tender and one supplier or more can be selected from the rest of the applicants based on some evaluation criteria. The tender can then be awarded, and this makes up the award stage of public procurement. This is followed by the contract stage where a contract is signed between the procuring entity and the supplying entity.

**Modeling and design**

The system is modelled off a relational approach, Entity Relationship Modelling(ERD modelling) that is further enhanced into a fact based model (FBM). After the modelling has been performed with respect to the different user requirements, the system is made up of 26 entities, and 79 relationships.

It is not a rule of thumb to further enhanced it into a FMB. One can as well immediately start with a FBM.The current approach is preferred for the very many pros it presents, the best being agile development along with the benefits of purely relational approaches.

### 1. The logical schema (FNM to LNF)

This encompasses the modelling rom the first normalized form (FNM) to the last normalized form (LNF). The last normal form is the fact based model(FBM), and is the precursor to the physical schema. Note that entity and referential integrity have been preserved upon the completion of the last normal form(FBM), and the physical schema reflects corresponding changes.

### The entities

The following is a table of entities in the system (table of entities).

|  |
| --- |
| ----------------------------  | E | Entity List |  ----------------------------  | 1 | Country |  | 2 | Fiscal\_year |  | 3 | Configuration |  | 4 | Red\_flag |  | 5 | Illicit\_scheme |  | 6 | Procurement\_stage |  | 7 | Submission |  | 8 | Procurement\_type |  | 9 | Procurement\_method |  | 10 | Bid |  | 11 | Item |  | 12 | Procuring\_entity |  | 13 | Supplying\_entity |  | 14 | Address |  | 15 | Tender |  | 16 | Attachment |  | 17 | Contract |  | 18 | Award |  | 19 | Contact |  | 20 | Fee |  | 21 | Fee\_type |  | 22 | Payment |  | 23 | Alert |  | 24 | Alert\_authority |  | 25 | Alert\_level |  | 26 | Appeal |  ---------------------------- |

The following is a list of individual entities. Every entity is given with the corresponding field(s). For each entity, there can be a field marked (pk) indicating that the field is the entity's primary key. Correspondingly for each entity, there can be a field marked (fk) indicating that the field is a foreign key from some entity. Recall that there can be none of the two marked fields, or there can be one or more of each of such fields in the same entity. At this point in time, when a key field is both a primary key and a foreign key, the label is given in preference for the primary key. Therefore, it is only labeled (pk) neglecting other purposes that it serves in another entity or derived entity in the process of modelling.

In order to transform the Logical schema into a physical schema. The following must be done first as per the concepts applied here.

Create a fact based modal (FBM)

1. Get a relational modal, the entry set of the relational hashmap
2. Normalize the relational modal to the Last Normal Form (LNF)
3. Create a fact based modal (FBM)

First, the Enhanced entity model.The following is the Enhanced Entity Relationship Model (EERM)

#### The following is a Fact Based Model (FBM)

The fact Based Model is obtained from the EERM The Fact Based Model is a direct representation of the phyisical implementation of the data in a Database Management System (DBMS). In this case, a SQL based database technology has been chosen. Any different preferences based on a relational genesis can be adopted to the application at the next stage of the physical model generation. Variant technologies such as PSQL and others can be adopted Other preferences such as graph models have not been used for this application in particular.

### 2. The physical schema, the data definition language (DDL)

#### The Data Manipulation Language (DML)

Finally, create queries for all possible operations (CRUD operations), the Data Manipulation Language (DML) Technology specific CRUD operation files are created in files with synonymous names. The files are named dll, insert, select, update, and delete. These names can be changed for sensitive technologies like Java and others. For all technologies, the corresponding file extension is used to create the above files.

The query files are written in an Object Oriented design style such that an opbject (CRUD operation object named synonymously) can access a given method given the right arity/parameters for the execution of a given query. Parametric methods and non-parametric methods can be accessed with ease. Beyond this, the outputs can be used by the programmer in conjunction with any supplementary technologies, libraries or tools to piece up the application being developed.

**The underlying physical schema tables and corresponding columns**

**Application logic design**

**Dashboard design**

**Conclusion**