

Database Design for Human Resource Planning

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# Introduction

Human resource planning is a process of “*analysing current workforce, determining future workforce needs*”([CIPD, 2018](https://www.cipd.co.uk/knowledge/strategy/organisational-development/workforce-planning-practice)). In other words, to ensure company have the right people at the right time.

In this report designs a database management system support HR planning of a certain SME company. The relationship database that captures existing employee, role or a firm is looking for and candidate information, which delivered using SQLite. Due to inflexibility of SQL, MongoDB, a document database was introduced to enhance the database design.

# Relationship Database

## Conceptual Design

For relationship-based database management system (RBDMs) supports following functions:

**HR planning** : Potential employees intrigued by job advertise enters a list which is subdivided by different roles. For each role, number of registrations paired with job vacancy can inform which roles are in demand and which are not. HR are able to prioritise talent planning based on this information.

**Recruitment**: A candidate can take online test which automatically filtering out illegible candidates and reduce recruiter’s workloads.

**Diversity management**: Information recorded on employee’s gender can automatically form *gender pay gap reporting* as required by Equality Act 2010. Further employee’s ethical background can be used to alert HR if a certain minority is underrepresented.

Human resource planning is a process of “*analysing current workforce, determining future workforce needs*”([CIPD, 2018](https://www.cipd.co.uk/knowledge/strategy/organisational-development/workforce-planning-practice)) to ensure company have the right people at the right time.

The essence of HR planning is to match “supply” with “demand”. In HR literature, two type of HR planning are distinguished – a *soft guidance* from a strategic point of view, or detailed *planning* from day-to-day operation. As far as the concern this report, the RBDMs is mainly designed for to support day-to-day operation.

Labour supply can be simplified and measured by how many eligible applicants registered for the test. HR usually estimate the percentage of people leaving organisation based on multiple factors. These factors include natural attrition due to age, or work pressure triggered voluntary turnover.

Employee turnover can vary in different roles or at different levels. Because of current movement to urge organisations adopting flat structure, the design of this database assumes all role have equal rank and salary are determined competitively. For the role part this report list five example roles that likely to be in a business intelligence specialist firm: *marketing*, *finance and accounting*, *consultant analysts*, *visualisation artist*, *database architect*, which are respectively based on process of business analytics ().

Following above descriptions, four entities and attributes are identified:

|  |  |  |  |
| --- | --- | --- | --- |
| *Entities* | | *Description* | *Candidate Key & Attributes* |
| Candidates | | basic candidate information | *Employee ID (prim key)*, name, gender, role, background |
| Role | | A record of role currently existing in the organisation; should cover information about estimated job demand of that role and test used to assess candidate who applied for that role | *Role ID, Role Name*, *attrition;* |
| Employees | | a record of existing employee and their performance review | *Candidate ID (prim key, foreign key)*  name, gender, role, turnover intention. |
| Test | **Psychometrics** | Covers the five personality dimensions | *Candidate ID (prim key), Openness, Neuroticism, Conscientiousness, Agreeableness, Extraversion.* |
| **Numerical Rationing** | a numerical score | *Candidate ID* (*prim key, foreign key), score.* |
| **Interview** | a text summary of from interviewer | *Candidate ID* (*prim key, foreign key), summary.* |
| **Composite Test** | used to recommend which candidate is which should return a recommended role for candidate. | *Candidate ID* (*prim key, foreign key), recommendation.* |

### ER diagrams and Normalized Table

Diagram

Description automatically generated

Table

Description automatically generatedGraphical user interface, application, table

Description automatically generatedTable

Description automatically generated

Table

Description automatically generatedTable

Description automatically generated

### Fan Traps Consideration

Candidate to role is many to one relationship (\*:1), role to test is many to many (\*:\*) relationships. This constitute fan trap as links between candidate and each test is not clear. The solution for this is to add link one to one (1:1) between candidate and test, hence the reference link between

## Logical Design (330)

All tables have been normalised to the third form (see)

**Representing Many to Many Relationships**:

Table “TESTS”, representation of many to many relationships (\*:\*) between two entities test and role reflects the second normalised form(). Two attribute function as a composite key.

**Referencing Candidate’s Test**:

In referencing candidates and test tables, primary key “application ID” were used instead of candidate name. This is standard design to protect database integrity should a change to “CANDIDATES” record been made. Such protection relies on the premise that primary key application ID is not easily changed.

**Optimize Storage Efficiency by Using** :

The database was designed to use data storage more efficiently by letting both CANDIDATES table and EMPLOYEES table has referenced to attribute “Role\_ID”.

Attribute “Role ID”, a one-character integer, comparing to what it represents, the actual name of the role, is dozen times lighter and hence saves more storage when more records are added.

## Physical Design

Two functions have been written to process query relating to employee and candidate. `get\_cand(job\_title )` and `get\_empl( job\_title)` let user see employee or candidate of a certain role. One feature of these functions is it displays name of role by merging with role table, which make table more readable. Users call those function by typing keywords of the role, instead of having to reconciliation what number stands for what roles.

Furthermore, those function has built in auto-correct functions in case of when user don’t kwon weather to capitalise data or not, although this relays on always input job title in capitalisation when stored in database.

Similar function has been featured in registering a candidate. Such features avoid distinguish between “m” or “M” when input gender; or selecting a role id out of existing list.

implement remaining integrity constraints in physical design.

In supporting transactions from overload system, user have only 30 seconds to finish input. Input beyond 30 seconds will be script. If a role number is incorrectly entered beyond three times, candidate will be automatically assigned to role ‘unknown’.

A query transforms a set of data from SQL into Python Data frame object.

# Non-RBDMS

## Problem with RDBMS in matching candidate with match

For RDBMS, three traditional assessment methods-- psychometrics, numerical rationing test, interview – are used for demonstration. For each role, the assessment is a redefined

This creates two problems. Firstly, not all candidates are required to take all test depending on what role they are applying for. Secondly, HR may wish to change assessment method for each role in the future. If so, query would be very retrieving as it constantly requires merging of the database. These problems call for more flexible database system.

## Document Database

To solve problems with RDBMs in associating candidate with tests, this database design uses Document Database. Document Database may suits retrieving candidate assessment method because of the hierarchy structure between test and its subtest. Such hierarchy is also reflected in the ER diagram.

For *polyglot persistence* document data are imported straight from RBDMS and adapt the save *“\_id value*” as “*primary keys*” in relational database. So, candidate data will be automatically “synchronized” into document database every time the code is run. User will be able to use the save exactly the same id values and keywords to retrieve data they want.

Because document database has no schema, so recruiters view role to a certain employee and their test results without having to bear sight of void values in some test using joint method. In addition, it gave HR the flexibility to design other assessment matrixes and allows them to add more detail inside a candidate record.

For querying a candidate profile, function `cand\_profile()` is defined. This is more advanced because it allows users to find a candidate both by their applicant number or by their role.

# Limitations and Future Directions

The database design comes with several limitations including a set of assumptions listed in next sections. Firstly, many query methods retrieve all data from one table and a went through a sequence of data transformation process. This could slow down processing time if number of records builds up over time. Hence this design is suited for SME firms.

Updating document database to include more attributes could have been a problematic. The document database relays on relational database to import data from. This is yet a “one-way system”. If new attribute were added in *MongoDB*, import data from *SQL* would overwritten new updates to the system. It would make no sense to “backwards-synchronise” *SQL* with new *MonogoDB* data because relational database has fixed structures. However, a solution for this is to serves MongoDB as a temporary database. User can clear up data from “CANDIDATES” table every time per recruitment and achieves everything into *MongoDM.* In future, developers can update database to automatically merge old record with new records.

Finally, as for which candidate should take which assessment method there was no integrity constraints implemented. This database by itself does not restrict a candidate from taking tests, that is, not required for their role nor remove a candidate when they absence from a test. Hopes are on UI and Application designs, user interface that only shows candidate what test they should take, and a notification reminds HR administrators to remove a candidate after certain time period.

## List of Assumptions

* Each candidate is restricted to select one role only.
* if a candidate is not sure want what role to apply for, they can take a test called “composite test” to find out what role to apply for
* each role has a different set of tests, but a candidate only takes each test once:
  + Marketing candidates requires to take psychometric test and interview.
  + Finance candidate requires to take numerical rationing and psychometric test.
  + Consultant analysts requires to takes all three tests.
  + Visualisation analysts and Database architect are required to be interviewed only.
* ID and are easily changed.
* Attribute “Role\_Name” in table “ROLE” should always be written in capitalisation.
* Attribute “Gender” in table “CANDIDATES” and “EMPLOYEES” should all in capitalisation and have no space.
* Whether candidate is able to take a correct test or not depends on UI design which notify them take a test.

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