Middle-East Journal of Scientific Research 23 (7): 1512-1520, 2015
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2015.23.07.22381

# An Efficient Human Resource Management Through Web Based Analytics

[1]*Veeramalai Sankaradass,* [2]*K. Vijayabhaskar and* [1]*A. Merry Ida and* [1]*W. Ancy Breen*

[1]Department of Computer Science and Engineering,
Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Avadi, Chennai, India
[2]Department of Computer Science and Engineering,
Misrimal Navajee Munoth Jain Engg College, Thorapakkam, Chennai, India

**Abstract:** Human Resource forms major part of any organization. Efficient Human Resource Management is required for any organization and it is even more essential in the case of a large organization which has to optimally and effectively manage its resources. A dynamic analytics tool is required which can provide accurate and reliable information in the most efficient way to help in optimal utilization of its manpower. Modern organization or firms maintain large and heterogeneous data. These real-world databases contain hundreds or even thousands of relations and attributes. Traditional predefined query forms are not able to satisfy various ad-hoc queries from users on those databases. This paper proposes HR portal that will generate dynamic report using Dynamic Analytics tool, a novel database query form interface, which is able to dynamically generate query forms. The essence of DQF is to capture a user's preference and assisting him/her in making decisions. The generation of a query form is an iterative process and is guided by the user. A user can also fill the query form and submit queries to view the query result at each iteration. In this way, a query form could be dynamically refined until the user is satisfied with the query results.

**Key words:** Enterprise Resource Planning · Human Resource Management · Query form · User Interface

## INTRODUCTION

Company's workforce represents one of its most potent and valuable resources. Consequently, the extent to which a workforce is managed effectively is a critical element in improving and sustaining organizational performance. The techniques for the application of Human Resource Management (HRM) will include many familiar functions [1, 2] of personnel managers, such as man-power planning, selection, performance appraisal, salary administration, training and management development and to improve communication systems, involvement, commitment and productivity.

**ERP and HR:** In today's world of Globalization, it's knowledge, commitment, skills and training that provides the competitive advantage for world class companies like Microsoft, IBM etc. And it's HR's job to build that competitive advantage. That means an upgrading of HR's traditional role. In early 1900's HRM functions used to entail hiring and firing of employees, payment of salaries and administering the benefit plans [3, 4]. The function consisted largely of ensuring that procedures were followed. Today HRM function is shifting from protector and screener to strategic partner and change agent. Enterprise resource planning (ERP) integrates internal and external management information across an entire organization, embracing finance/accounting, manufacturing, sales and service, customer relationship management, etc [5].

**Customized Query Form:** Existing database clients and tools make great efforts to help developers design and generate the query forms, such as Easy Query Cold Fusion, SAP and Microsoft Access and so on. They provide visual interfaces for developers to create or customize query forms [6, 7]. The problem of those tools is that, they are provided for the professional developers who are familiar with their databases, not for end-users proposed a system which allows end-users to customize the existing query form at run time. However, an end-user may not be familiar with the database [8, 9, 10, 11]. If the database schema is very

**Corresponding Author:** Veeramalai Sankaradass, Department of Computer Science and Engineering, Vel. Tech. High Tech. Dr. Rangarajan Dr. Sakunthala Engineering College, Avadi, Chennai, India.

large, it is difficult for them to find appropriate database entities and attributes and to create desired query forms [12].

**Automatic Static Query Form:** Recently proposed automatic approaches to generate the database query forms without user participation presented a data driven method [13]. It first finds a set of data attributes, which are most likely queried based on the database schema and data instances [1, 11]. Then, the query forms are generated based on the selected attributes. It applies clustering algorithm on historical queries to find the representative queries. The query forms are then generated based on those representative queries [14, 15]. One problem of the aforementioned approaches is that, if the database schema is large and complex, user queries could be quite diverse.

The primary objective of any ERP is to collate and integrate all organizational data from across the functional spectrum into a "single central data repository" by using software that has been specifically designed for this purpose [16]. The HR portal enables role based access to all HR related information Suitable analytics that can help in efficient deployment of manpower and also facilitate planning the of manpower requirement is the need of the hour. The Main aim of the project is to identify and analyse the requirements related to HR including deployment, recruitment etc.s

**Literature Review:** In the world of technologies ERP systems play an important role. Among the many definitions available in the literature, Al-Mashari defines an ERP system as a package business software system that enables a (government) to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization‘s information processing needs [1]. The origins of ERP can be found in the 70s when companies started to find a solution to the problem of large inventories whose cost became not manageable any longer. These inputs brought to Material Requirement Planning (MRP) systems whose main goal was to reduce the inventory by coordinating the procurement process activities with the production process. Using accurate inventory record files, the available quantity of on-hand or scheduled-to-arrive materials could then be used to determine net material requirements [17]. In the 1980‘s MRP faced an evolution towards MRP II, which were capable to couple the inventory with the financial dimensions.

Basically, with MRP II financial accounting and management systems created a system with the manufacturing and materials management systems [18, 17]. This evolution was an important step towards a more integrated view of business activities. The next step was taken in the 1990‘s when MRP II scope enlarged to consider all the resource planning for the entire organization, including human resources, giving rise to the Enterprise Resource Planning Systems. Kalling points out that the literature on ERP systems may be divided into three groups: research about how ERP systems add value; research about implementation issues; and research about combination of ERP with other IT resources [9]. Interestingly, he also highlights that research have neglected two important issues, the relationship between ERP and competitive advantage, the relationship between managerial processes and ERP-based competitive advantage [9, 19, 12].

Holland *et al*. highlighted that ERP implementation processes may follow two paths, i.e. the choice of a standard, almost ready-to-use package (with little setting required) and the customization of an ERP system to tailor it to the organization‘s needs [8]. However, the first option appears to be more probable than the second one [10, 20]. Therefore, this obliged standardization may not fit with the organization‘s characteristics and, in turn, bring to the ERP implementation‘s failure. In fact, the ERP systems require organizations to comply with the standard business processes which were used to design the ERP software packages. He considers organizational resistance to change as a critical success factor for ERP implementation. Perceived risk and habit are the two most probable causes of resistance in ERP implementation [21, 22, 23].

Existing database clients and tools make great efforts to help developers design and generate the query forms, such as Easy Query, ColdFusion, SAP, Microsoft Access and so on. They provide visual interfaces for developers to create or customize query forms [12, 24]. The problem of those tools is that, they are provided for the professional developers who are familiar with their databases, not for end-users proposed a system which allows end-users to customize the existing query form at run time. However, an end-user may not be familiar with the database. If the database schema is very large, it is difficult for them to find appropriate database entities and attributes and to create desired query forms.

Even though the authors cautioned that success is a multidimensional and interdependent construct and that it is therefore necessary to study the interrelationships among, or to control for, those dimensions, in this paper we tried to shed some light on two of the cited dimension,

i.e. individual impact and organizational impact or ERP systems. In fact, among the vast literature on ERP systems, relatively little attention has been given to the impact of ERP systems on both the organizational and the individual level. In this paper we will focus on understanding ERP impact on HRM functions and the increased effectiveness as an outcome.

**Proposed System Architecture:** Enterprise resource planning systems (ERP) are powerful software packages that enable the integration of a variety of business activities. Enterprise resource planning (ERP) integrates internal and external management information across an entire organization, embracing finance/accounting, manufacturing, sales and service, customer relationship management, etc. The ERP application has 6 major portals classified as follows:

- HR portal
- R&D portal
- Stores, purchases & procurement portal
- Works & facility management
- Policy & planning
- E-learning portal

Human Resource database distinctively provide the main functionalities for each of two individuals: Prospect Applicant interacts and communicates with HR personnel via the frontend portal to reach project information and application process. HR Personnel manages applicant and project information through the back-end system and manage the content of the front-end portal to connect with prospect applicants.

**Employee Portal:** In the traditional HR systems a considerable amount of HR job used to involve employee services like filling up their leave forms, taking their income tax declarations, sending them payslip, taking their loan requests, claims and reimbursements processing, travel forms etc. In ERP systems with employee service portals employees can take all these information through a web based interface. They can login in the portal and can apply for various benefits, loans, leave etc. They can also generate their payslip. Managers and HR Service Managers can give approvals over the portal. This saves lot of time and effort both for employee and HR. Also employee satisfaction increases with faster and quick service.

**Salary and Compensation Management:** The salary administration and payroll system in ERP helps payroll officers and compensation specialists in Administration of salaries which is an ongoing process of human resource department. On the contrary, in the traditional system the Salary administration used to be a very time taking process and Payroll officers used to take a lot of time and effort in manual calculations, postings, Tax calculations etc. Organization wide payroll can be processed centrally at one location making the process more efficient and effective.

**Training and Development:** This entire online process in ERP saves lot of time and effort in comparison to the manual process. Also it brings more transparency. Through it‘s integration with the employee master data the qualification is updated in the master record of an employee once the course is completed this ensures real time reporting and complete synchronization. The ERP provides for various reports required as part of learning solution analysis.

**Project Management System:** The calibration notes can be downloaded for normalization committee and ratings can be uploaded and which can then be used for all the purposes. Also the performance improvement process is triggered wherever required and is linked to the corresponding improvement mechanism. In this module, the project details such as vendor allowance, old project that has been done, current project ongoing, etc., can be easily analysed by having dynamic query form approach.

Two perspectives are provided by the web portal in which includes:

- *Front-End System* provides a web portal mainly for applicants with comprehensive project information such as employee details, salary and compensation, training and development, etc..
- *Back-End System* fully supports HR personnel with applicant management by showing application information and status in systematic view.

In this paper, we proposed a Dynamic Analytics Tool: DAT, a query interface which is capable of dynamically generating query forms for users. Different from traditional document retrieval, users in database retrieval are often willing to perform many rounds of actions (i.e., refining query conditions) before identifying the final candidates. The essence of DQF is to capture user interests during user interactions and to adapt the query form iteratively. Each iteration consists of two types of user interactions: Query Form Enrichment and Query Execution (Table 1). Fig. 1 shows the work-flow of DAT.

Table 1: Interaction between Users and DQF

| | |
|---|---|
| Query form Enrichment | DQF recommends a ranked list of query form components to the user. |
| Query Execution | The user selects the desired form components into current query form<br>The user fills out the current query form and submit a query<br>DQF executes the query and shows the results.<br>The user provides the feedback about the query results. |

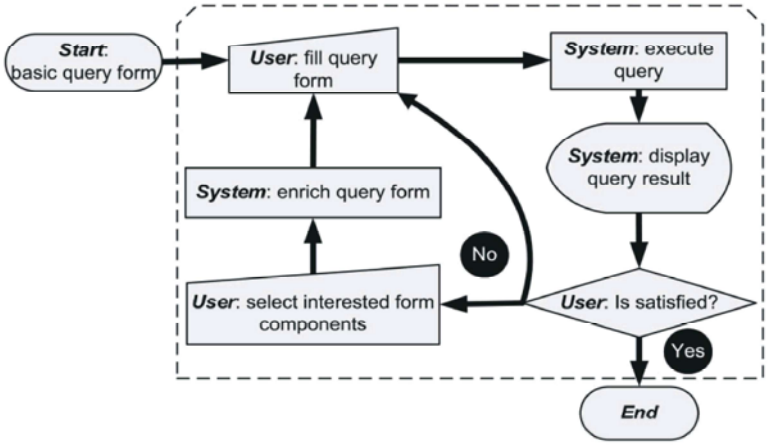


Fig. 1: Flow diagram of Dynamic Analytics Tool

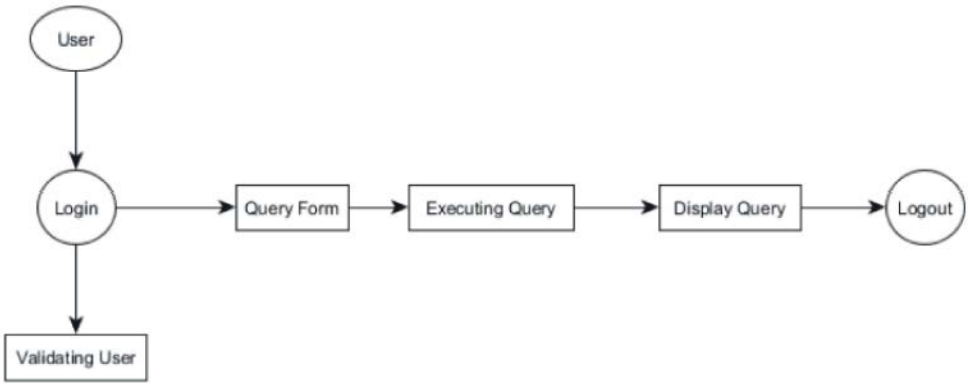


Fig. 2: General query process flow diagram

It starts with a basic query form which contains very few primary attributes of the database. The basic query form is then enriched iteratively via the interactions between the user and our system until the user is satisfied with the query results.

**Form Interface**

**Query Form:** In this section we formally define the query form. Each query form corresponds to an SQL query template.

**Definition 1:** A query form F is defined as a tuple (AF, RF, σF, (RF)), which represents a database query template as follows:

F = (SELECT A1,A2, . . . , Ak FROM (RF) WHERE σF),

where AF = {A1,A2, . . . ,Ak} are k attributes for projection, k >0. RF = {R1,R2, . . . ,Rn} is the set of n relations (or entities) involved in this query, n >0. Each attribute in AF belongs to one relation in RF. σF is a conjunction of expressions for selections (or conditions) on relations in RF. (RF) is a join function to generate a conjunction of expressions for joining relations of RF.

In the user interface of a query form *F*, *AF* is the set of columns of the result table. *σF* is the set of input components for users to fill. Query forms allow users to fill parameters to generate different queries. *RF* and *(RF)* are not visible in the user interface, which are usually generated by the system according to the database schema. For a query form *F*, *(RF)* is automatically constructed according to the foreign keys

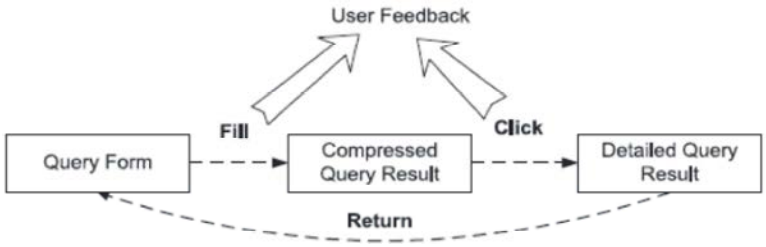


Fig. 3: Diagramatic representation of user action

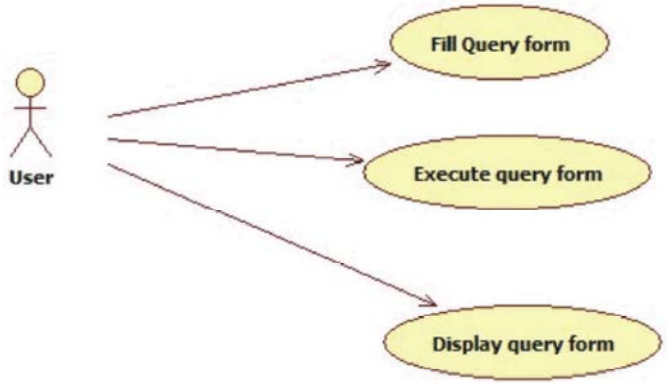


Fig. 4: Use Case Diagram

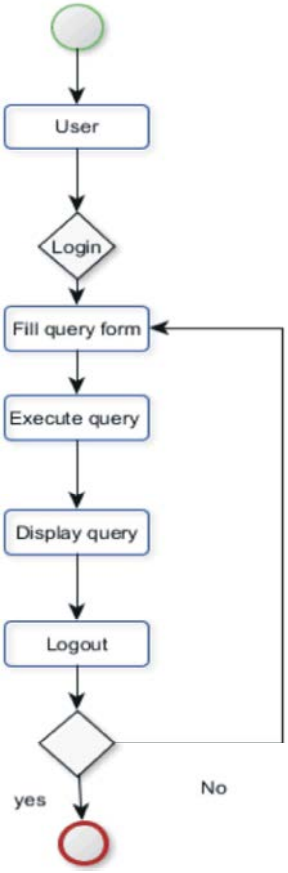


Fig. 5: Activity Diagram

among relations in *RF*. Meanwhile, *RF* is determined by *AF* and *σF*. *RF* is the union set of relations which contains at least one attribute of *AF* or *σF*. Hence, the components of query form *F* are actually determined by *AF* and *σF*. As we mentioned, only *AF* and *σF* are visible to the user in the user interface. In this paper, we focus on the projection and selection components of a query form. Ad-hoc join is not handled by our dynamic query form because join is not a part of the query form and is invisible for users. As for "Aggregation" and "Order by" in SQL, there are limited options for users. For example, "Aggregation" can only be MAX, MIN, AVG and so on; and "Order by" can only be "increasing order" and "decreasing order". Our dynamic query form can be easily extended to include those options by implementing them as dropdown boxes in the user interface of the query form.

UML is simply anther graphical representation of a common semantic model. UML provides a comprehensive notation for the full lifecycle of object-oriented development.

Use case diagrams overview the usage requirement for system. They are useful for presentations to management and/or project stakeholders, but for actual development you will find that use cases provide significantly more value because they describe “the meant” of the actual requirements. A use case describes a sequence of action that provides something of measurable value to an action and is drawn as a horizontal ellipse.

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

## RESULTS AND DISCUSSION

To decide whether a query form is desired or not, a user does not have time to go over every data instance in the query results. In addition, many database queries output a huge amount of data instances. In order to avoid this "Many-Answer" problem [10], we only output a compressed result table to show a high-level view of the query results first. Each instance in the compressed table represents a cluster of actual data instances. Then, the user can click through interested clusters to view the detailed data instances. Fig. 3 shows the flow of user actions. There are many one-pass clustering algorithms for generating the compressed view efficiently.

In our work, we choose the incremental data clustering framework because of the efficiency issue. Certainly, different data clustering methods would have different compressed views for the users. Also, different clustering methods are preferable to different data types. In this paper, clustering is just to provide a better view of the query results for the user. It is defined as a specified set of activities designed to put into practice an activity or a program of known dimensions. The efficient human resource which we implement provides secured management of information.

**Proposed Methodology**

**Pseudo Code for Query Construction:**

*Input:* Select the fields and condition specified

- Q:=set of pages
- for each page p in Q do
- p.con=1 //p.con is the condition of the page p
- p.val=1 // p.val is the value of the page p
- function ConditionExtractor(G)
- for step from 1 to k do // run the algorithm for Ksteps
- condition=0
- for each page p in G do // update the values
- p.con=0
- for each page q in p.incoming condition do // p.incoming condition is the set of pages that link to p
- p.con+=q.val
- con+=square(p.con) //Calculate the values
- con=square(con)
- for each page p in G do
- p.con=p.con/condition
- condition=0
- for each page p in G do
- p.val=0
- for each page r in p.outgoing condition do // p.outcoming condition is the set of pages that link to r
- p.val+=r.con
- condition+=square(p.val)
- con=square(con)
- for each page p in G do // update the values
- p.val= p.val/ condition

*Output*: Display the report according to the condition specified.

The above methodology will help us to understand that how the query is constructed and evaluated. The same algorithm is clearly described as algorithm in this section as proposed algorithms. The below algorithm is defined, described and estimated based on cost of execution.

**Proposed Algorithm 1:**

Data: $Q = \{Q1, Q2, \ldots, \}$ is the set of previous queries executed on *Fi*.
Result: *Qone*is the query of One-Query
begin
*σone*□- 0
for*Q* □*Q* do
*σone*□- *σone*□*σQ*
*Aone*□- *AFi*
□*Ar(Fi)*
*Qone*□- GenerateQuery(*Aone*,*σone*)

**Static vs. Dynamic Query:** If a query task is covered by one historical query in history, then SQF built on those historical queries can satisfy that query task. But the costs of using SQF and DAT to accomplish that task are different. *Form-Complexity* was proposed in [2] to evaluate the cost of using a query form. It is the sum of the number of selection components, projection components and relations, as shown below:

$$Form\text{ - }Complexity(F) = |AF| + |\sigma F| + |RF|.$$


Fig. 6: Employee Survey

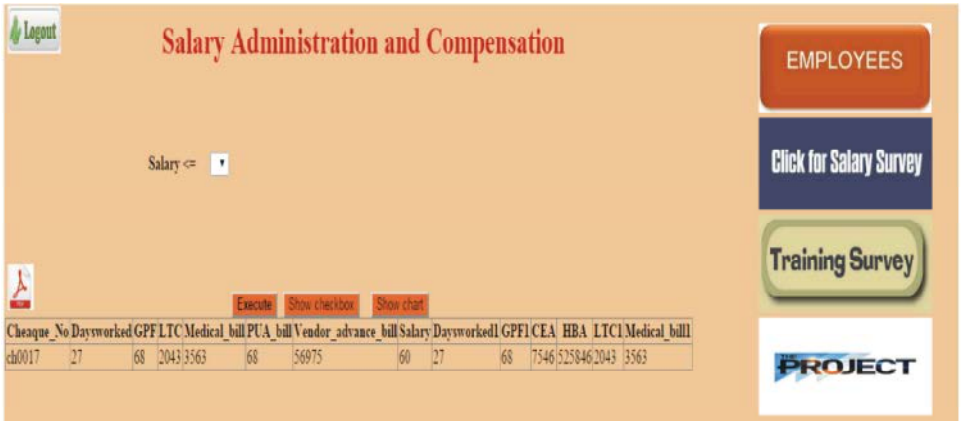


Fig. 7: Salary Administration and Compensation


Fig. 8: Relationship between employee and supplier

On the premise of satisfying all users' queries, the complexities of query forms should be as small as possible. DAT generates one customized query form for each query.

## CONCLUSION AND FUTURE WORK

This work deals the design and implementation process of the Human Resource Management Portal and objective to enhance the user experiences and support of useful features for Human Resource Department throughout the application process. Human resources being a strategic partner in the overall growth and success of Organization need to consistently outperform on all aspects. ERP system helps in better driving the Human resource management processes thereby contributing to the overall success of the organization. The key idea is to use a probabilistic model to generate report form components based on user preferences.

As for the future work, the work can be extended to capture the user's interest based on their queries besides the click feedback. For instance, we can add a text-box for users to input some keywords queries. It is therefore possible to add some business models for charging of access to applicant information for commercial purposes as future work. The relevance score between the keywords and the query form [12] can be incorporated into the ranking of form components at each step.

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