eSurvey: a Survey Record based eLearning System for Research Degree Study

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Abstract. In research studies, a student starts with writing a research proposal, followed up by intensive literature and industrial survey in his/her own research area. The student must perform his/her own research with validation under supervisor's guidance. The student's own research work must be differentiated from others work in order to demonstrate the unique originality and significance of the students' contribution. The information explosion on the Internet makes the survey analysis much more difficult. This paper suggests a solution by recording both the students' own research work and others work into a meta data, and compare them for further analysis as part of student's dissertation. The record based eLearning system can track the progress of student's research studies in, problem statement, proposed solution, analysis, findings, publication and feedback, in an eLearning system.

Keywords: research study, research proposal, research method, eLearning

1 Introduction

In research study, a feasibility study is very crucial to the success of the student' work. It determines the direction of the student's research. As a result, the title and the scope of the research study should be wide open in order to provide room for the student to contribute his/her own part of body of knowledge. Otherwise, years of work may be in vain due to no significant result. Very often, a critical analysis is required to evaluate the significance of the findings in the research. In this case, a comparison table on the uniqueness of the students' own work is needed to differentiate it from the others work in the same area.

The process of producing a research proposal is very useful. First of all, the student must define the aims and objectives of the research project, along with the research parameters such as performance analysis, design methodology and derived rules for business operations etc. The student must assess the feasibility of the research parameters to construct a research plan. Basically, a research method must consist of

problem statement, survey, experiment empirical case study, validation by prototype or mathematical induction etc. The deliverables of the research can be a law in science, a new model in design and simulation, a set of stepwise procedure in methodology, improved techniques in engineering, and a validated business rule etc. The research result must be validated by use of prototype, mathematical induction, survey, and/or experiment. The research resources requirement must be prepared with respect to man power, computer hardware and software, and testing data. A schedule states the time table of the research project.

To begin with, a research student must write up a research proposal in a formal document which consists of the following structure:

1. Title of the research project – the main theme and focus of the Research.
2. Introduction to proposal – the scope of the research
3. Background to research – the motivation of the research
4. Aims and objectives – the intended accomplishment of the research
5. Intellectual challenge – the academic merit of the research
6. Ethical basis of project – the originality issue of the research outcome
7. Research method – the process of performing the research
8. Deliverables produced – the outcome and the result of the research
9. Resources needed–required manpower & computer resources of the research
10. References – the referred articles and industrial work of the research

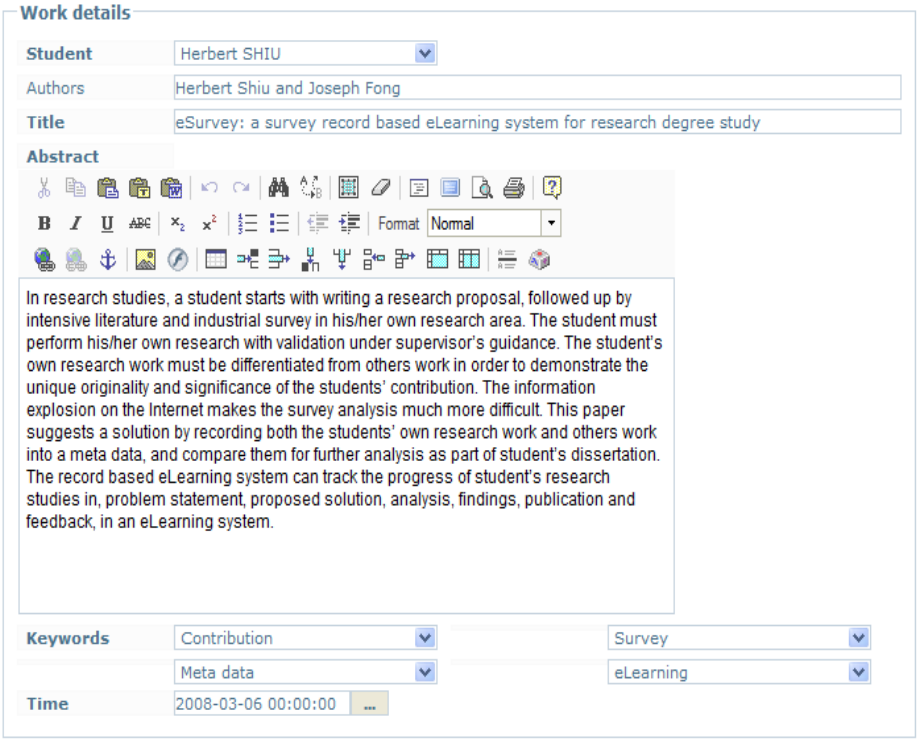

Fig. 1. Data capture of referenced article in the survey

2 Data capture the research proposal survey

To capture users input, we allow users enter his/her article's title, authors' name, time of publication, abstract and keywords as shown in Figure 1.

Figure 2 allows supervisors to enter comment on the student and the others work.

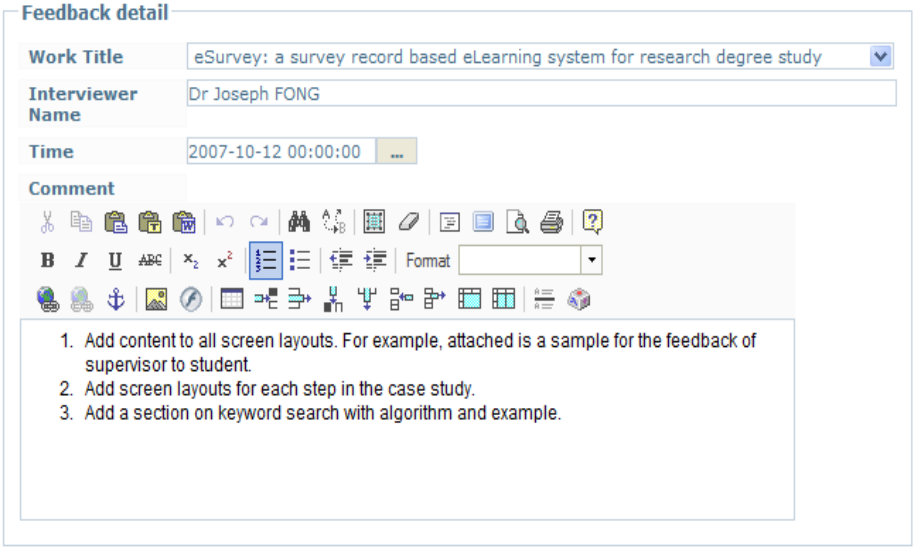

Fig. 2. Supervisor and examiners comment on the student and others work

Figure 3 shows the regular interview record between the student and his/her supervisor. The student reports his/her work after previous interview, and the problem encountered. The supervisor recommends follow up actions for students.

In order to record the student's survey, we need to develop a meta data to store the student's own work and his/her referred articles and their abstracts into the computer records. We can then browse them according to the authors name, time stamps, subject areas, and keywords. The students' supervisors can also provide feedback to the student's work, and which can be stored into the meta data for records. In fact, for each meeting with the research, it will be beneficial for both parties to record the minutes of the interview. For example, the accomplishment of the student's record from the previous interview to the current interview, what kind of the problems that the student is facing, and what are the supervisors recommendation for the student to continue the research work. In order to implement the eSurvey system, we can develop a meta data with its Entity Relationship Model as shown in Figure 4.

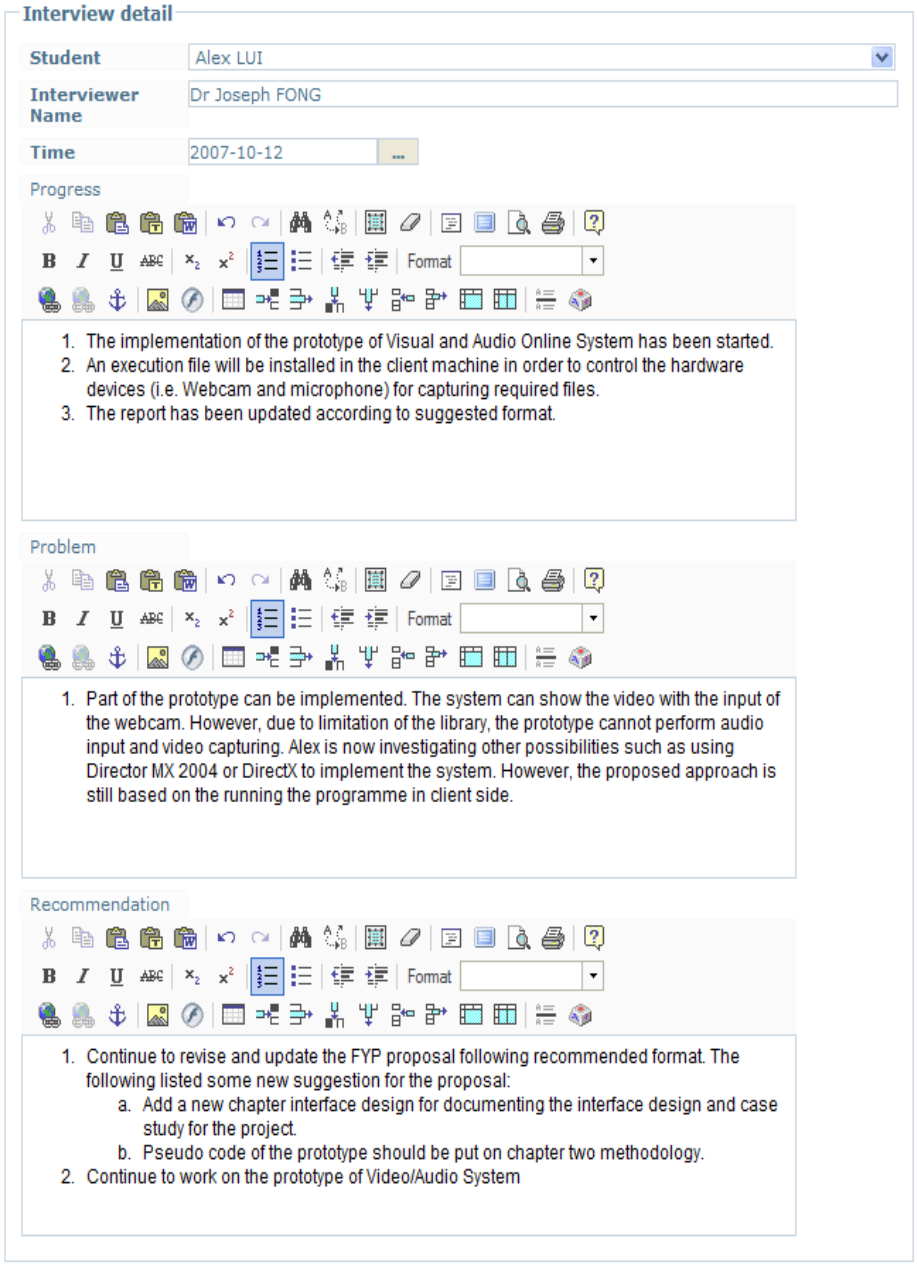

Fig. 3. Interview record between student and supervisor

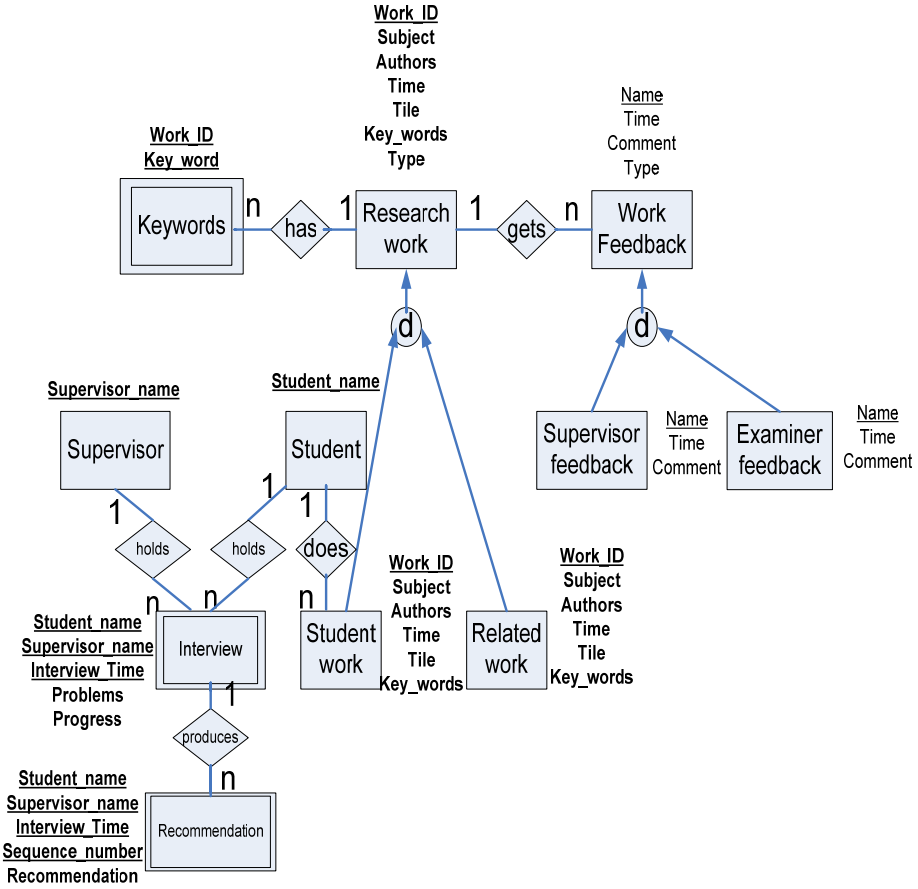

Fig. 4. The Entity Relationship Diagram of the research survey data

In this meta data with entities in parenthesis, the student (student) does many research work (Student work). The student (student) has many-to-many interviews with his/her supervisor (supervisor). In each interview, the supervisor gives many recommendation (recommendation). The student has done much survey (research work), which includes both his/.her own work (student work) and others' work (related work). In each work (research work), there are many keywords (keywords). In each survey article (research work), the student obtains many feedback (work feedback), which consists of supervisors comment (supervisor feedback), and examiners comment (examiner feedback). In each feedback, the supervisors may give many recommendations (Recommendation) for follow up actions for the students to act, ordered by a Sequence number.

The meta data can be implemented in a relational database as follows:
Relation Related_work (*Work_ID, Title, Authors, Time, abstract, title)
Relation Own_work (*Work_ID, Title, Authors, Time, abstract, title)
Relation Others_work (Work_ID, Title, Authors, Time, abstract, type)
Relation Keywords (*Work_ID, Key_word)
Relation Work_Feedback (Name, Time, Comment, Response, *Work_ID, type)
Relation Supervisor_Feedback (*Name, Time, Comment)
Relation Examiner_Feedback (*Name, Time, Comment)
Relation Student (Student_name)
Relation Supervisor (Supervisor_name)
Relation Interview (*Student_name, *Supervisor_name, Time, Progress, Problem)
Relation Recommendation (*Student_name, *Supervisor_name, Time, seq#, Recommendation)

Where underlined are primary keys, prefixed with "*" are foreign key.

ID Related_research_work.Work_ID $\subseteq$ Research_work.Work_ID
ID Own_research_work.Work_ID $\subseteq$ Research_work.Work_ID
ID Supervisor_Feedback.Name $\subseteq$ Feedback.Name
ID Examiner_Feedback.Name $\subseteq$ Feedback.Name
ID Interview.Sueprvisor_name $\subseteq$ Supervisor.Supervisor_name
ID Interview.Student_name $\subseteq$ Student.Student_name
ID Recommendation.Student_name $\subseteq$ Interview.Student_name
ID Recommendation.Supervisor_name $\subseteq$ Interview.Supervisor_name

The value of Type indicate the subclass inheritance. For example, "O" means own work and "T" means others work. "S" means supervisors' comment, and "E" means examiners' comments. ID means inclusion dependence of subclass content is subsumed inside the superclass.

Both the student and the supervisors can use SQL to access the meta data for communication. For example, they can use SQL Insert command to insert values of data fields, SQL Update command to replace the values of data fields, SQL delete command to delete tuples, and SQL select command to browse the inserted tuples as follows:

For example, we can insert the student's publication record into meta data by using insert statement:

```
Insert into others_work (work_id, title, authors, time, abstract, type) values
(1,
'Bin Feng',
'A methodology for XQuery processing in distributed native XML data bases",
'01-October-2007',
'As XML becomes more and more important, it is used not only for data exchange but also for the XML data storage. …….',
'own'
);
```

We can update the time stamp of the surveyed article in update statement:

```
Update Time Set Time = "14-January-2008" Where work_id = 1;
```

We can delete a surveyed reference in a delete statement:

```
Delete others_work where work_id = 1;
```

We can browse the abstract of a surveyed reference in a select statement:

Select * from Others_work where work_id = 1;

We can record an interview between student and supervisor in an insert statement:

Insert into Interview (Student_name, Supervisor_name, Time, Progress, Problem) values
('Herbert Shiu',
'Joseph Fong',
'16-1-2008',
'Research Proposal on distributed heterogeneous XML database. Finished the initial feasibility study on survey in this area. Start to design a methodology on designing an XML database',
'Can two phase commit be done in an XML database?. What is the XML database management system to be used in the research project?'
);

3 Application of eSurvey with cases study

We can apply eSurvey as a cross reference between research contribution and the examiners and supervisors' comment to them. It can also be used as a communication record between student and supervisors, and between student's dissertation and examiners feedback as follows:

I. Cross references on the subject

In a research topic, many outstanding issues may come up in the research. Each one of them may involve others' work against student's own contribution. We need to analyze their differences, and evaluation the significance of the student's contribution on each subject as a result.

II. Minutes on research progress meeting

In general, student will meet with his/her supervisors on the progress of the research project. In each interview, the student must show their incremental work and seek for the feedback and approval of the supervisors. Very often, supervisors will analyze student's research work, identify the problem in the unresolved issues, and recommend actions to resolve them. It is important for student to record his/her supervisors' comment in a minutes, and which can be reviewed in the next interview meeting.

III. Record the issues between student's dissertation and examiners' unresolved concern

After reviewing student's dissertation, both the internal and the external examiners usually come up with many questions for the student's written and/or oral

examination. It is important for the student to answer each question correctly in good detail. A record tracking system is helpful for student to revise his/her dissertation to satisfy the examiners' demand.

4 Searching features

Searching is an important feature of the application for locating the works and hence their progresses, comments and feedbacks. Based on the proposed entity-relationship behind the application, the Keywords table plays an important role in locating the Research Works and hence the corresponding interviews and feedbacks.

Another significantly useful searching feature is to search the Research Works based on their contents. For instance, the proposed database schema only maintains the abstracts. A possible enhancement is to maintain the contents of the entire research work documents by uploading the works to the application in their native file formats, such as Microsoft Word document, Portable Document Format (PDF), Latex and so on. Once a research work file is uploaded to the application, it is stored centrally at the server and its contents are extracted by an appropriate module to be maintained by the back-end relational database. As a result, it is possible to perform textual search in the research work contents other than the abstracts.

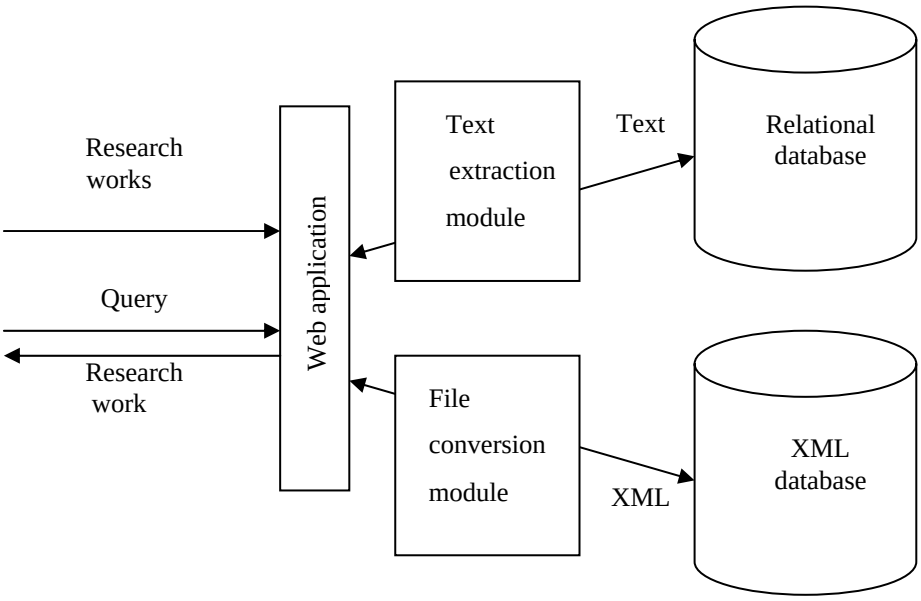

Fig. 5. Data flow of research works stored in relational/XML databases for search

Another possible enhancement of the application is to make use of an XML database to maintain the related works, such as Tamino [7], that can convert popular document formats into XML format and subsequently maintained by the XML

database. As such, it enables the user to search the XML database with the more feature rich X-Query language that involves single or multiple research works, compared with the pattern or sub-string searching by relational databases.

Figure 5 shows the data flow for key word text search among research articles which are stored into relational database and/or XML database. The related works in the form of articles can be scanned and stored into a PDF file. The text of the PDF file can be extracted and stored into either relational database or XML database in memo data type, and then retrieved by using SQL for relational database, or XQuery for XML database.

While relational database can store research work contents in pure textual format and sub-string or pattern searches are possible, native XML database mostly stores XML documents with indexing on entire textual data. As such, the performance of keyword and text searches is more efficient. Besides, the flexibility and capability of the native query language for XML database, X-Query, provides user more possible ways to query and manipulate the research work contents.

For example, Figure 6 demonstrates the keyword search box for searching works by keyword. By clicking the drop-down list box, the list of existing keywords will be shown for selection. Click the Search button to start searching.

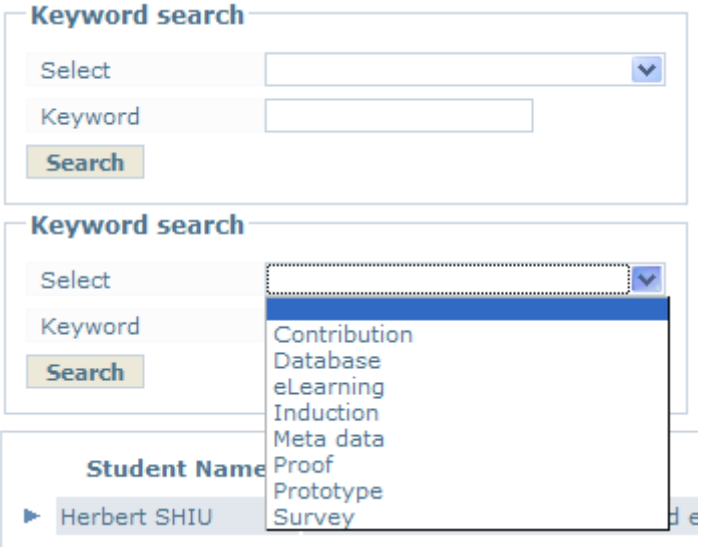

Fig. 6. Screen layouts for keyword search

Besides, it is possible to enter a keyword to the keyword field for searching as shown in Figure 7.

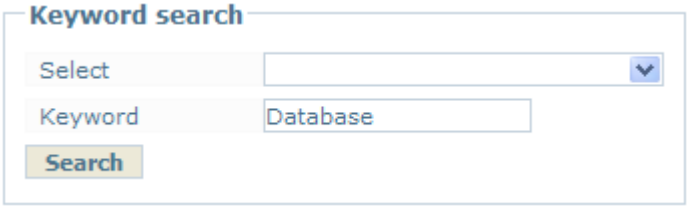

Fig. 7. Screen layouts of data entry for keyword search

5 Conclusion

This paper helps a research student keep track of his/her research studies work in an eLearning system. The student can log the research literature and industrial survey into a database, store his/her own published and/or un-published working papers into system, and put the interview minutes between the students and the supervisors into tables, and insert the supervisors' comments and recommendations into records. Then, the students can cross reference his/her own work against others work in an online report. The significance of the system is a powerful search agent for students research effort. In case of implementing this eLearning system by use of XML document, the student can search for the keywords and/or key phrases of the whole article, not limited to an abstract of the referenced paper. In this case, the practical application of the system is enormous to the student because it can save much time in his/her research studies.

The future research of this paper is for the authors to use this system, and report its users friendliness, performance analysis, and most of all, the productivities of the student's learning activities as a result of the eLearning system.

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