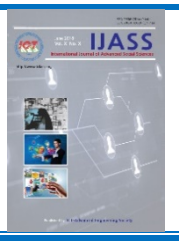
ISSN: 2586-761x (Print) Vol. 02, No. 02, December 2019
ISSN: 2635-5817 (Online)
International Journal of Advanced Social Sciences
Source: http://ictaes.org
Manuscript received: August 6, 2019; Revised: September 9, 2019 ; Accepted : September 20, 2019



Highly Flexible Document Workflow using NoSQL

Mark Quevedo [1], Ken Gorro [2], Kim Gorro [3], Brenette Abrenica [4],Rogelio Bag-ao [5],Kay Conales [6], John Rafael Arañas [7]

University of San Carlos, Philippines
kdgorro[1],misquevedo[2],kidgorro[3],blabrenica[4],rnbag-ao[5],ksconales[6],jrraranas[7]{@usc.edu.ph}

Abstract

Documents are very important for all of us especially to business organizations and Universities. This study creates a document workflow system for Community Extension Service office using document-based NoSQL. This study compares a relational database architecture for the document workflow over NoSQL architecture by introducing change point requirements. The result shows that out of 4 change points only 0.41% increase in the source code is noted while 25.92% increase for the relational database architecture. The overall User acceptance testing score is 4.37 which is very acceptable for users.

Keywords: *Document, Community Extension Service, Document Workflow, NoSQL, Relational Database*

1. Introduction

Automation is simply converting manual process to automated process using technology. Document approval is very common to every organization and manually doing it requires effort and time. Document workflow automation is highly needed for every organization especially for multi-site organization. The common way to built an application with information handling is to use relational database. Relational database is structured to recognize relations among stored items of information. This study explores NoSQL for document workflow that may be in advantageous in terms of flexibility. This study uses Community Extension Service office processes in Project Proposal Application to built the document workflow using NoSQL. The previous version of the document workflow of CES office is built in relational database which was kept to compare with the new version using NoSQL.

Corresponding Author: Mark Quevedo
Author's affiliation : University of San Carlos, Philippines
Email: misquevedo@usc.edu.ph

2. Related Literature

In today's technology, data is important and all of us is contributing to big data. One of the disadvantages of relational database is expansion and this is also a problem with the evolution of internet [1][2][3]. A NoSQL database must have consistency and partition, consistency and availability and availability and partition [4]. Document database is focus on query performance and the capability to store big data [3].

3. Methodology

1) The workflow is designed by the process flow in Figure 1.

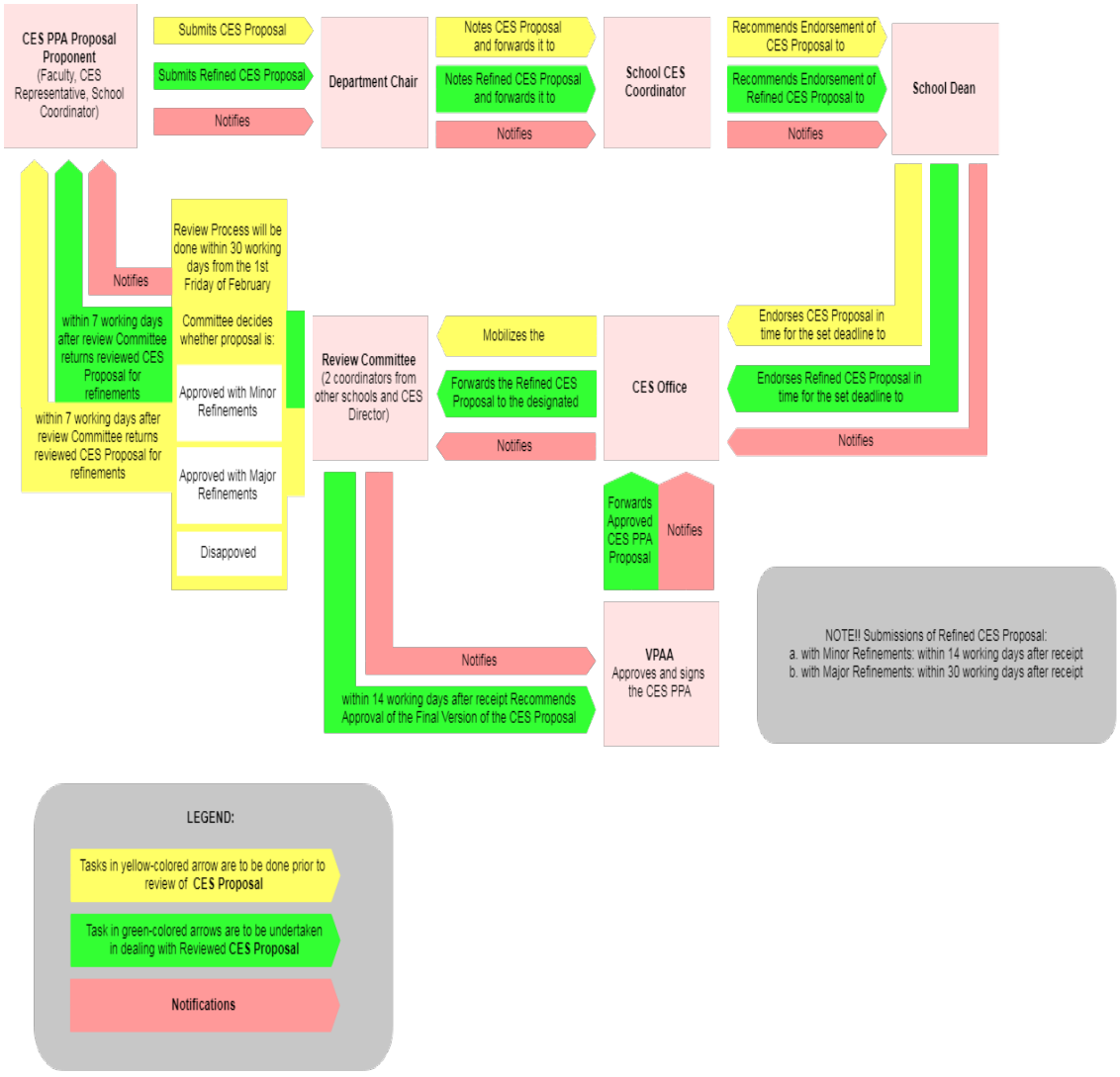


Figure 1. Process Flow

2) Form serialization was performed to treat it as it is and stored as one document instance.
3) Table 1 shows the different numbers to denote a status of the document.

Table 1. Status

Status	**Process**
1	Chair: To be Noted by chair
100	Coordinator: To be endorse to the
200	Dean: Endorse to director
300	Director: For committee review
400	Pass the committee review
500	Approve by VPAA
600	Completed

4) This study performs source code map analysis, table 2 shows the number of lines per code level.

Table 2. Source code map analysis

Code level	**Number of lines**
Database logic	2,084
Javascript	1,430
Business Logic	783
UI	5,030

Database logic is everything that deals with the database such as models. Business logic is the routing such as controllers. Javascript code only includes written by the developers and it does not include the source for the plugin being used. User Interface such as html and CSS are also counted. A total of 9,037 number of code lines.

5) A series of experiments were performed by adding change point requirements and each changes in the source is recorded accordingly. Table 3 shows the change point requirements the impact to the source code.

Table 3. Change Point Impact NoSQL(no. of code change)

	Change Description	**DBL**	**UI**	**Javascript**	**BL**	**Total**	**%**
A	New field in the form	3	3	4	0	10	0.11
B	Change field data type	2	1	0	0	3	0.03
C	New form type	3	10	0	0	13	0.14
D	New personnel in the workflow	2	3	2	5	12	0.13

4. Results and Analysis

Based from the result of the change points, A total of 0.41% is modified to the existing source code. Table 4 shows the impact of the change point requirements in the previous of the CES-DMS which is in the relational database.

Table 4. Change Point Impact Relational Database(no. of code change)

	Change Description	**DBL**	**UI**	**Javascript**	**BL**	**Total**	**%**
A	New field in the form	332	3	150	90	575	4.70%
B	Change field data type	100	10	231	0	341	2.72%
C	New form type	932	10	0	0	942	7.70%
D	New personnel in the workflow	1020	49	32	221	1322	10.80%

It is noted that the previous version has 12,230 total number of lines of source code. A total of 25.92% of the number of source code was changed to cater all the change point requirements for the relational database architecture.

It is noticeable that a new data or change in the data field will cause big impact to the database logic which is not ideal for a stable release software.

This study also evaluates the acceptability of the document workflow application by performing user acceptance testing. Table 5 shows the overall user acceptance testing result.

Table 5. User Acceptance Testing

Criteria	Total Score
Functionality	4.48
Reliability	4.46
Usability	4.45
Efficiency	4.40
Maintainability	4.23
Support and Manuals	4.23
Average	**4.37**
Interpretation	**Very Acceptable**

The UAT result shows that the document workflow software is very acceptable.

5. Conclusion

This study evaluates the effectiveness of NoSQL for document workflow systems. The result shows that NoSQL can be advantageous to make your document workflow flexible for changes that might occur in the future. Relational database is not advantageous for changes that might affect database logic. This study does not consider the experience of the developers developing the 1st version of the document workflow for CES office. This study only focuses on document workflow systems in evaluating the effectiveness of NoSQL.

Acknowledgement

This work was supported by Community Extension Services office & Department of Computer and Information Sciences, University of San Carlos in 2017.

References

[1] Kai Fan, "Suvey on Nosql", Programmer, 2010(6): pp.76-78

[2] Jing Han, Meina Song, and Junde Song. "A Novel Solution of Distributed Memory NoSQL Database for Cloud Computing", In ICIS 2011, 10th IEEE/ACIS International Conference on Computer and Information Science, 2011.

[3] Han, J., Haihong, E., Le, G., & Du, J. (2011, October). Survey on NoSQL database. In 2011 6th international conference on pervasive computing and applications (pp. 363-366). IEEE.

[4] Nathan Hurst, "Visual Guide to NoSQL Systems.", http://blog.nahurst.comlvisual-guide-to-N oSQL-systems/