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PRIMARY RESEARCH

A configurable data management solution For Small-Medium Enterprises (SMEs)

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Abstract
Small and medium enterprises (SMEs) are fast becoming a driver of innovation in technology, and they play an important role in the economic development of a growing country. Businesses that acquire modernization cannot fully function without the help of information technology, which is essential for the survival and growth of economies in general. Adapting a data management system for a business firm is a big factor that can be used for fast and easy business transactions and processing results but considering its current price in the market, it may not be affordable for startup businesses. The study focused on a data management system configurable web-based application that can handle data based on the required set of procedures. This study integrated the concepts of distributed system algorithms in the developed data management system to define and find a solution for handling data responsibilities and techniques that can be used to solve the challenges encountered in this algorithm.

I. BACKGROUND OF THE STUDY

In people's daily lives, technology is being developed and enhance every day. This has changed society extremely; because of these technological improvements, we have given people various information. Technology products, such as a computer, mobile devices, and even a calculator, make lives easier. One of the advantages of technologies in society is in communication. Technological progress has saved our lives and has benefited our society. It brings every distant place closer and has made the world a smaller place to live because of the ease of communication [1, 2, 3].

Technology has changed the way people understand how things work and the way they interact with one another. Every day, a new device is being released or introduced to people. When they think of technology, people think of computers and electronic devices. The truth is, technology can be almost anything. Nowadays, the computer is used globally and is being continuously enhanced. Computers have been developed and improved into a tiny working machine, and it helped people to have access to information. Organizations acquire these types of technologies for the purpose of having a more efficient and better service.

Technology in the business field has transformed the way companies conduct business. Small to medium organizations can implement technology in their business and can adapt to the playing ground with larger organizations. Examples of these are system or mobile applications, websites, and other customized digital products to promote competitive advantages in the marketplace. Business owners/stakeholders should consider implementing or developing technology in their business plan process [4, 5].

SMEs are becoming popular trailblazers in technology due to continuous or frequently active connectivity. It plays an important role in the economic development of a growing country. A few theories were proposed to discuss the connection between information technology, economic development and social change. Most of them agree on the significance and benefit of information and communication technology adoption in SMEs. Through this, the presence of information technology in SME is accepted and accredited worldwide. The Internet, as part of information technology, is having a huge impact on the operations and performance

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of SME. Since information technology is changing, the economy and traditional business firms become more reliant on the current trend of technologies. Usage of these technologies is transforming the existing rules of every business, resulting in restructuring of the enterprises. Businesses who acquire modernization cannot fully function without the help of information technology, which it is asserted to be essential for the survival and growth of economies in general [6, 7, 8, 9].

The study focused on the data management system which is a configurable web-based application that can handle data based on the required set of procedures [10, 11, 12]. The system uses the concepts of distributed system algorithms to define the find a solution for handling data responsibilities and techniques that can be used to solve the challenges encountered in this algorithm. The developed system was named "ProjDJ.x", which is based on the word "Project", the initials of the developers, and the "x" for the version of the system. The researcher assumed that the developed system has the potential to grow and can be one of the top enterprise data management systems [13].

A. Problem Statement

The purpose of this study is to develop a web-based Data Management System, using the concepts of distributed system algorithms which can be used in data transactions and processing for business-related purposes that can handle data management responsibilities. This specifically aimed to answer the following problems.

1. What is the level of awareness of the respondents in terms of the existence of a data management system?
2. What is the level of importance of having a data management system in the organization?
3. How do the respondents rate their level of satisfaction on the developed configurable data management solution in terms of?
   3.1 Functionality
   3.2 Reliability
   3.3 Efficiency
   3.4 Usability
4. What are the recommendations for the possible improvements in the developed web-based configurable data management system?

B. Significance of The Study

The study focused on the development of a web-based data management system using the concepts of distributed system algorithms that can be used for fast and easy business transactions and processing results with today's technology integration, such as cloud technology. Moreover, the results of the study are intended to be beneficial to the following:

1) Respondents: The respondents who are working on small to medium enterprises will be aware of the importance of having a data management system, especially if their organization's expertise is more on data gathering and data manipulation in relation to a business firm.

2) Organization: The result of the study will help the organization to assess the level of importance of web-based data management system in their specified field and to compare the proposed system to the current system available in the market in terms of its functionality and cost-efficiency.

3) Future researchers: The findings of the study will serve as reference material and a guide for future researchers who wish to conduct the same experimental study or explore the development of the data management system further using a distributed system algorithm integrated with today's technology.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

A. Theoretical Framework

The theoretical framework (see Figure 1) is the systems approach to the Information System Research. As can be observed from the figure, the inputs are the requirements of the system, the process is the system development, and the output is the product of testing and evaluation, which is the evaluated system.

Cloud computing is ideal to use in the case of Company X since the researcher's proposed system would be hosted by the cloud service provider server. Cloud computing provides a way for the business to manage computing resources online. The term has evolved over recent years and can be used to describe the use of a third party for storage and computing needs. Cloud computing allows businesses to access their information over the internet, allow to create a flexible way of accessing data anytime, anywhere [14, 15]. Through this document, data can be processed, approved and transact anytime and anywhere.

In developing the Web Application, the researcher adopted the Laravel PHP Framework. The Laravel is an Application Framework that enables to develop a project in a simple and elegant open-source toolkit; that is much faster than writing code from scratch because it provides a set of libraries for commonly needed tasks. Laravel uses the Model-View-Controller (MVC) design, which allows the separation between presentation and logical approach. This approach is good for projects that have designers working with template files and others. The researcher also adopted today's top Javascript Framework, the Vue.js, for front-end func-

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tionalities. This will serve as the middleware for back-end and user interface functionalities, and Bulma CSS framework for the responsive graphical user interface so that it can be even in a mobile browser.

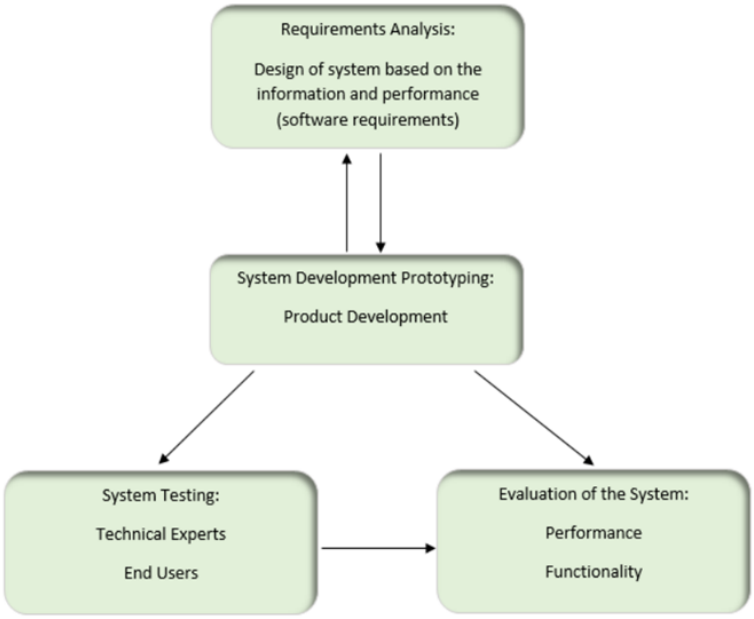

Fig. 1. Theoretical framework

The proposed system covered the data transaction, processing, approval of the uploaded document, and storing these records in the database. 1.) First, the creation of forms will be the basis of every document data where the administrator or authorized user can add or set fields and variables into forms that they needed. After the creation of forms users can now add data into forms. The third is the processing and approval of the filed form data through the document module. Finally, creating customized report content based on the expected outcome for business requirements.

B. Conceptual Framework

The input box contains information on the existing business process or the flow of organization; the survey on the level of awareness and level of importance of the existence of data management and the information on the software developed. The process includes the formation of a process system and design prototype, and the presentation, analysis, and interpretation of data gathered. Finally, the output is the developed data management system and the result of the survey on the levels of awareness, importance, and satisfaction of the respondents.

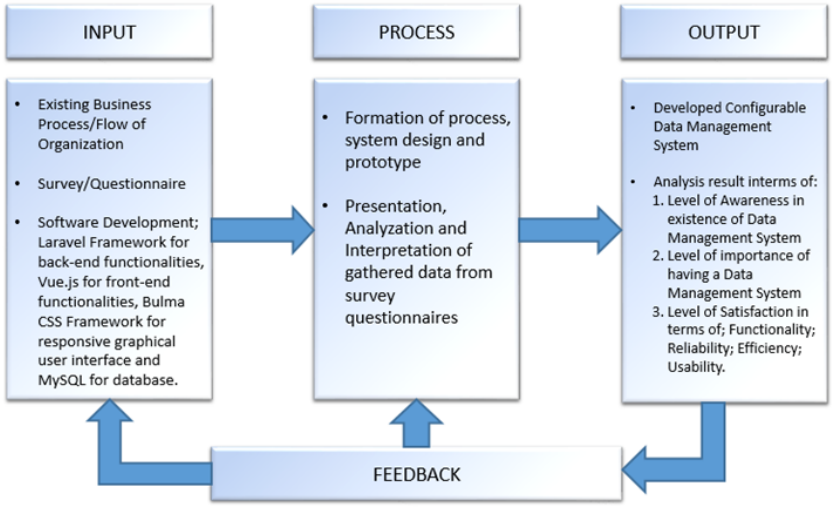

Fig. 2. Conceptual framework

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C. Scope and Limitations

This study aimed to develop a web-based Data Management Solution using the distributed system algorithm that is configurable and versatile, which can be used in data transactions and processing based on the organization's business process. The study also sought to create an economical and simplified version of the data management system compared to the current application available in the market that can help SMEs. Data Management requirements should be driven by the operational requirements of the organization for data streams for current and retrospective use. The study used the distributed system algorithm to define the data treatment in the back-end functionality of the proposed system. The proposed system would be basically starting as a raw and plain application where the organization can add templates based on their business rules; these templates can be used to process and transact data based on the inputted or uploaded raw data. Processed data can now be used for reporting view. The system would allow the organization's desired output for reports module; to add approval routing upon creation of the template and this will be reflected once the user tried to upload data on that template, and to define the capability of their users to access the application through user management.

However, the study was limited in terms of its versatility, especially of its reporting feature. Since the target users of the study belong to a small-medium business firm, the researcher assumed that the reports they needed to generate are not so complex and also the researcher had a limited time to have a big data sample to test the versatility of the report module. Also, this study aimed to build an economical data management system for small-medium enterprises firm only to help the organization in their day-to-day transactions with less financial costing for their data management.

III. METHODS

The researcher used the developmental and descriptive type of research design to describe the nature and procedures used and problems that exist in the subject company (tagged as Company X in the study) with regard to its data management system. It allows the researcher to collect necessary data that corresponds to the objectives of the study through the use of observation, case study, or survey. The researcher administered the survey questionnaire to 25 employees of Company X. These individuals are assigned to the Accounting Department, Finance Department, Sales Department and Information Technology Department. Employees from a said department like Department Head, Area Manager, Finance Staff, Sales Staff, Accounting Staff, Branch Officer, IT system administrator and among others [16, 17]. The researcher used the Convenient Sampling Method due to the need to follow the availability of the respondents during the software presentation. The employees of the required department were able to participate in the survey and served as technical experts. The combination of information technology personnel and employees from the accounting, sales and finance departments served as End-Users who were selected due to their experience and familiarization with the nature of the proposed system [18].

Respondent's responses were used for further analysis and interpretation. The following formula was used to evaluate the user responses further.

Mean, or weighted average can be calculated as follows:

$$M = \frac{S1 + S2 + S3 + Sn}{ave}$$

Where *M* refers to the mean average of the total respondents rating each criterion, S1 refers to first respondent average rating, Sn for last respondent average rating, and ave for the total number of respondents average rating.

Frequency and Percent can be computed using the formula below:

$$P = (f/n) * 100$$

Where *P* refers to the percentage, *f* for frequency value, and *n* for the number of respondents.

TABLE 1
LIKERT SCALE

Numerical Rating	Rating	Descriptive Equivalent	Descriptive Equivalent	Descriptive Equivalent
5	4.51-5.00	Very Aware	Very Important	Very Satisfied
4	3.51-4.50	Moderately Aware	Moderately Important	Moderately Satisfied
3	2.51-3.50	Aware	Aware Important	Aware Satisfied
2	1.51-2.50	Slightly Aware	Slightly Important	Not Satisfied
1	1.0-1.50	Not Important	Not Important	Not Satisfied

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To properly interpret the results, the researcher employed the Likert Scale to identify the respondents' answers according to its level easily. The respondents were given five response options. These options were used to quantify their acceptability on the developed application.

IV. THE SYSTEM

Currently, there are other data management systems readily available over the internet, either as paid software. The researcher proposed in this study the development of a cost-effective web-based data management system using the concepts of distributed system algorithms that will help a small-medium business firm who needed this kind of application.

A. System Architecture

Since the developed data management system is a web-based application, the researcher used cloud computing technology as the service provider server. Cloud computing provides a way for a certain business to manage your computing resources online. Cloud computing allows businesses to access their information virtually and create a flexible and global way of accessing data at any place, and any time. Through this concept, the requested data can be efficiently processed, approved, and transacted anytime and anywhere.

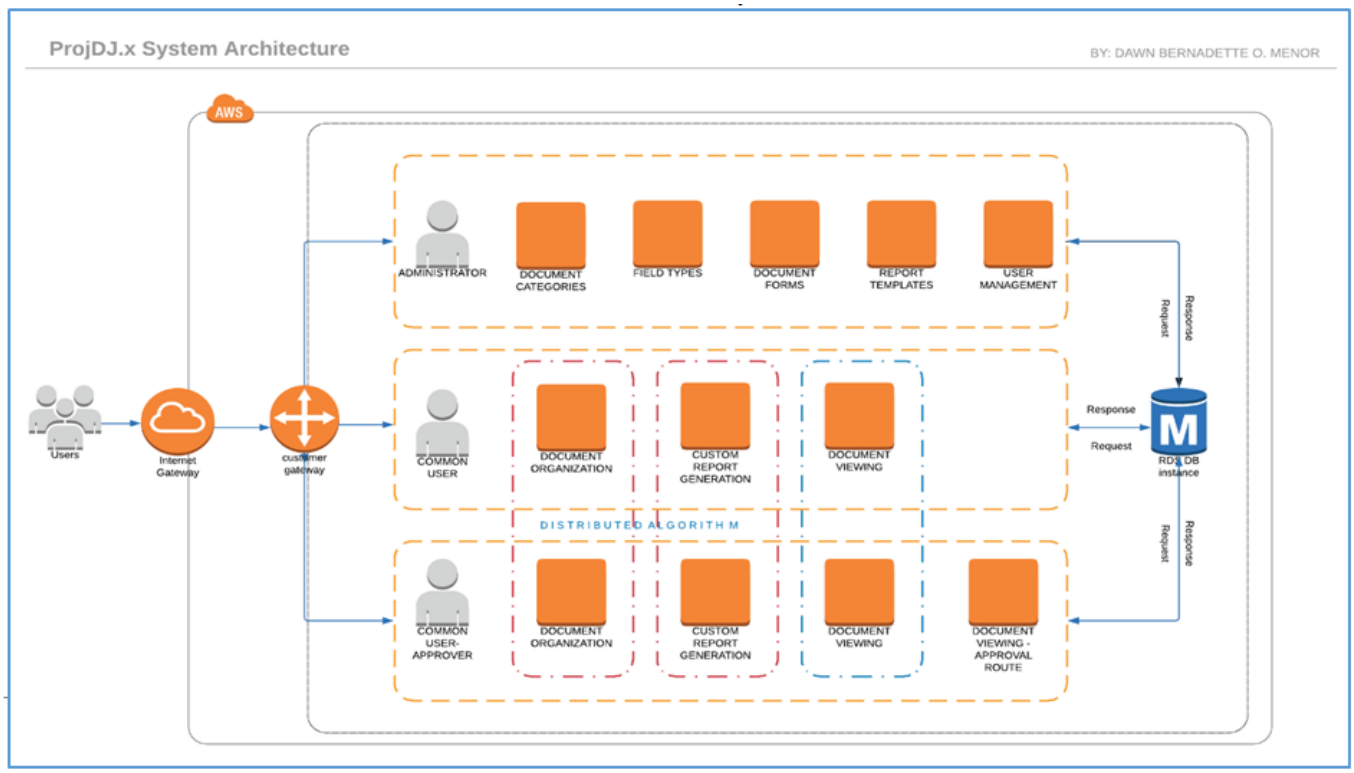

Fig. 3. The system architecture of configurable data management system

The researcher came up with this system architecture to define the system requirements and functionalities. In the proceeding page, the architecture of the proposed system is shown as well as its features which it apart from other systems already on the market.

From the illustrated figure (in the previous page), the user will be able to access the system through Cloud Services Application (example, the AWS). They will connect to the system using the Cloud Services Application Program Interface (API) to send a request that will validate its account and permission of the user. This API will serve as the intermediary program between the cloud service, database and user requests. The user will send the data request over the internet/cloud in Java Script Object Notation (JSON) format and execute the request functions, store it to the database and return its corresponding response. Based on the figure, there are three (3) types of users that the system has. First is the administrator who has access to all modules, including the Setting (modules namely Document Categories, Field Types, Document Forms, Reports Templates and User managements). The others are common user and common user–approver that have the same modules to access but the only difference is that the common user–approver has the ability to approve the uploaded documents (these mod-

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ules are Document Organization, Custom Reports, and Document Viewing).

The study uses the concepts of distributed system algorithm to find a solution for handling data responsibilities. Based on Figure 3, it grouped the features that highlighted the distributed system algorithm these modules are the Document Organization where the uploading of document happens and its data distribution handling within the system. Another module is the Custom Reports, where the compilation of uploaded documents with its required operations and relationships are assigned. Under these modules, happens the occurrence of a distributed system for each data defined in the uploaded requests. A distributed system introduces the new set of phenomena that are accounted for in the program design of a system implementing this type of algorithm. The scalable system and self-management capabilities are appearing as main requirements for generating large-scale, highly dynamic and distributed applications. As such, it binds distributed system planning, system failure, resource management and other capabilities. Though it can be difficult to identify that database functionalities brought basically new strategies into data request distributed processing, it triggered new studies to discover real-life trials of different combinations of protocols and algorithms. This development gradually highlights a system of relevant database building blocks with proven practical efficiency, defined the challenges and techniques applicable in the distributed system.

As illustrated in Figure 3, modules, where distributed system algorithm was applied, are the trickiest part in terms of data handling and processing. Since the developed system applied the concept of the distributed system, problems of this algorithm have a huge chance to occur such as processing site failures, communication media failures and transmission delay. Processing site failures, since the developed application involved uploading a document, verifying the whole content of the document involved processing, each column and row of the document is being validated in terms of its data type, column and row arrangement and also the template being used for uploading. Communication media failures is another kind of failure that is inherent in some distributed systems. Since the developed system uses cloud infrastructure internet, intermittent connection causes this failure. These failures where the raw data/message traveling through the medium are lost, reordered or duplicated. It is not always that the internet connection may cause this failure but there is also temporarily loss of system memory due to buffering. While transmission delays are not necessarily failures, it just can be lead to failures. Transmission delay happens when the time taken for the messages to reach their destinations may vary significantly; these delays can be caused by a number of factors, such as congestion and route taken in the communication medium of each processing site. An example of this is the intermittent internet connection and server failure.

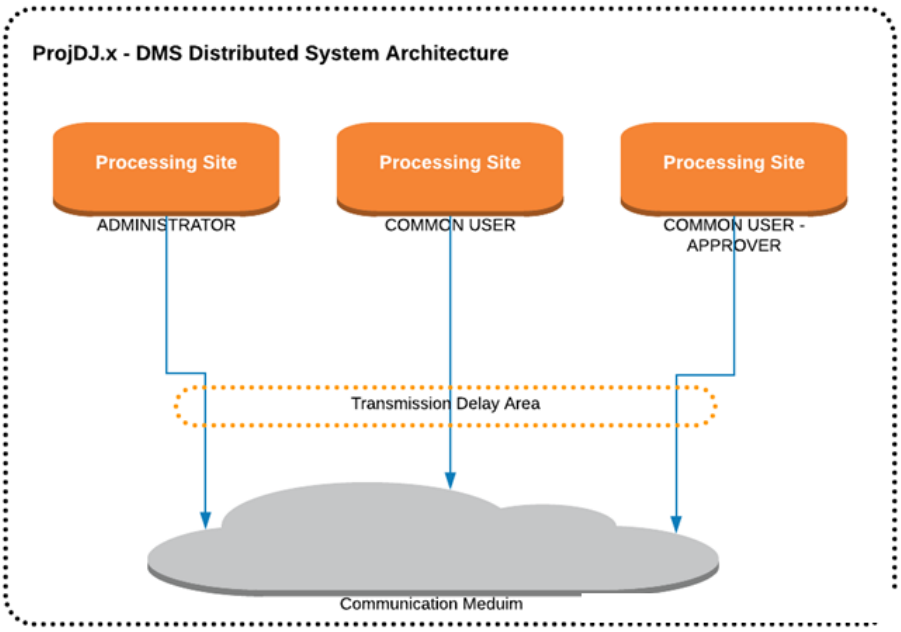

Fig. 4. Distributed system architecture

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Figure 4 shows the distributed system architecture where the challenges in the developed application were plotted. This failure may or may not occur depending on the factors that will show up while the transaction is on-going. In the developing system that uses the concept of distributed system algorithm, it is important to have a plan or decision to eliminate the challenges. By distributed, it means that decisions are reached by consensus; each site must have its own decision according to the rules of the algorithm and factors presented by the other processing sites. In dynamic systems, sites may come and go; this can add common knowledge. These difficulties result when a new task enters the site while the distributed algorithm is in progress.

This study highlighted some techniques that will help to solve the challenges that the distributed system might encounter. These techniques will help to prevent data failures from occurring and ensure the right data structure. These activities are grouped into 3 major sections; Data Consistency, Data Placement and System Coordination.

Data Consistency is well known in the formation of distributed systems and other parts with most likely network divisions or delays. It is not normally feasible to maintain high availability without giving up data consistency because some isolated parts of the database have to function independently in case of a network partition. Although data consistency is a very difficult thing in distributed systems, it can be traded not only to availability. It is sometimes involved in multiple trades. These trades needed to define the requested properties for duplication; first, the availability to ensure that the isolated parts of the database can serve read/write requests in case of a network partition. Scalability and latency handle the request or load once the process is balanced across multiple sites.

Data Placement is dedicated to algorithms that control data placement inside a distributed database [19]. These algorithms are accountable for mapping between data items and their physical sites, migrating of data from one site to another, and general allocation of resources. This section involves the rebalancing. According to [20], it is a task that arises in situations like cluster expansion meaning new nodes are added. Failover means some nodes are interrupted, or rebalancing, in which the data became unevenly distributed across the nodes.

Under System Coordination, distributed systems is an extremely wide area that was a point of intensive study. Detection of failures is the fundamental component of any issues in a distributed system. Most of all protocols of failure detection are based on simple concept messages–components that under observation constantly send a message to monitor the process and the lack of messages for a long time is identified as a failure. Since the study focuses on data handling algorithm and covers up to big data, system coordination would have a big role to detect or to give solution to the possible data failures.

Using these concepts of distributed system algorithms would have a big impact, especially in handling and solving the possible collision of data and would help to find a solution for the right data handling transaction.

B. System Modules

Below are the modules that included in the developed data management system.

1) Common user modules: This module includes all the functionalities that the common user can access of the system, such as Document Organization, Document Viewing, and Custom Report Generation.

2) Document organization: Most of the circumstances in which occur in a business flow can be identify into a few groups: investment of assets, labor, and the later disbursement of payment; adaption of materials into goods and services using the organization's labor and assets and the sales of goods and/or services, and the subsequent receipt of payment. These documents will serve as the basis of the data or transactions for the proposed system. This feature of the system included all the created documents (based on the form set by the rules of the organization) of a certain user can be viewed, modify and update while the transaction is not yet done and for approval. In this part also where you can create a new document transaction and upload Comma Seprated Values (CSV) file as the content of your data transaction. The process flow diagram was illustrated in Figure 5.

3) Document viewing: This feature enables the user to view all the uploaded raw data under the selected form in the document organization. The document ID generated by the system will serve as the input parameter to search the uploaded document. The process flow diagram was illustrated in Figure 6.

4) Custom report generation: This allows the user to generate a certain report based on the approved transaction they created. Filtration on that report may vary on the content on what he uploaded. This is the final output for the processed information based on the data provided by the user. The process flow diagram was illustrated in Figure 7.

5) Administrator maintenance module: Under this module were all the maintenance parts of the system, such as Categories, Field Types, Document Template, Report Template, and User management.

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6) Categories: This feature serves as the classification of created forms. This will help to identify which forms are under a certain category, department, and the like. This module, only the name and the status of the category, is the required field to input. All submitted and active categories will be reflected as sub-menu for Document Organization.

7) Field types: This feature serves as the parameters for the file uploaded content to the database and also as the identifier for the content of the document transaction. Field Types are used to declare the desired field for document transactions. One can create a new one and customize each field, such as the format, default values, and its name. The process flow diagram for this can be found in Figure 8.

8) Document form: This feature enables authorized users to customize the document form before common users can create the document transaction. Published forms are visible to common users. In this module, authorized users can declare all the fields that they needed, based on the available dynamic data field. They can also declare who will be the approvers for that certain transaction. Figure 9 presents the process flow diagram for the document form.

9) Report template: Just like in document forms, users can customize the template of the report that they needed. These report templates will be basically the template used for the custom report generation module. One can add two document forms to compare or match each depends on the rules assigned. Figure 10 shows the process flow diagram for the report template.

10) User management: This feature enables us to create, modify, and update user accounts; this will serve as the authentication of the user to the system. Employee Name, Username, Password (Auto-generate by the system for security purposes). User Group will serve as the identification if a certain employee has the right to access this module of the system.

11) Imports and exports of CSV files: Users can have two options in terms of supplying and exporting data to the system through the CSV file. CSV files are more lightweight and work faster than the excel (xls/xlsx) file. Import for uploading multiple document transactions and export for report generation are the main functions under this.

12) Activity thread: The feature of the system includes all the history changes on the status of a certain document transaction, from the beginning of the transaction up to the different assigned approvers (if set by the rule). This thread notification will be shown upon changing the status of the document. Notification is one of the major concerns of IT when it comes to web applications or not.

The illustration below shows for process flows of the proposed configurable data management system.

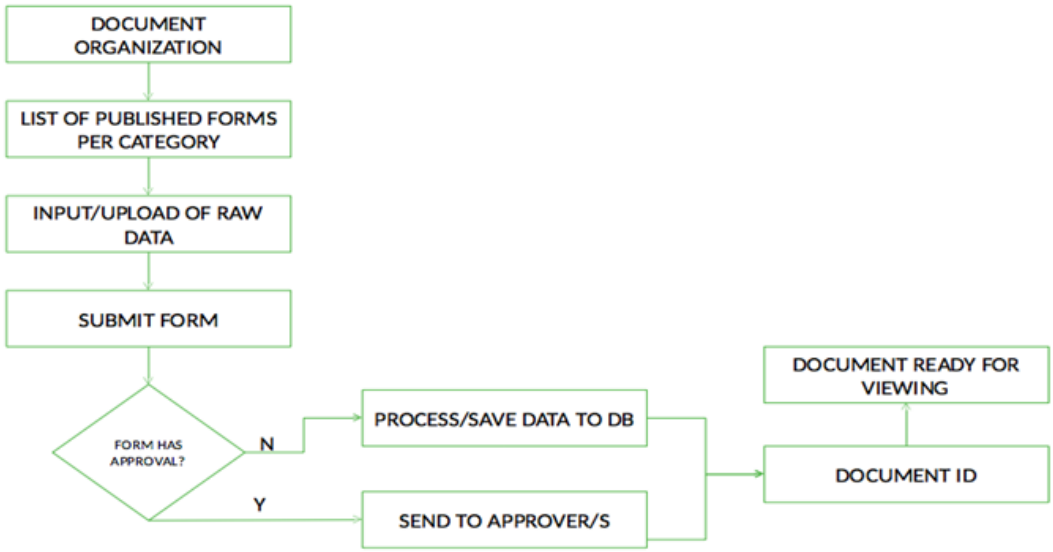

Fig. 5. Process flow for document organization

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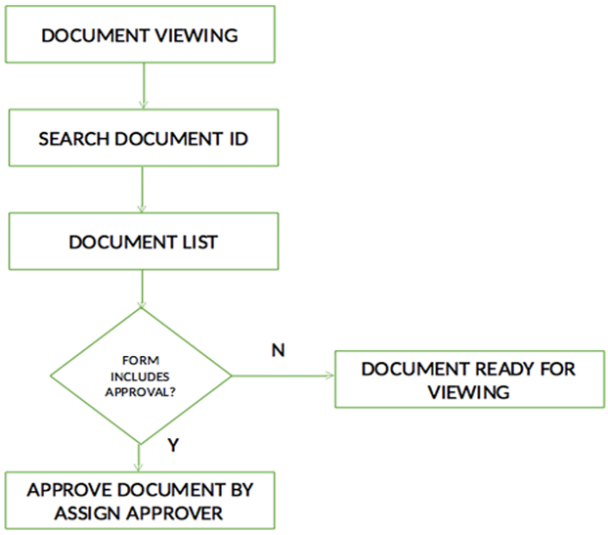

Fig. 6. Process flow for document viewing

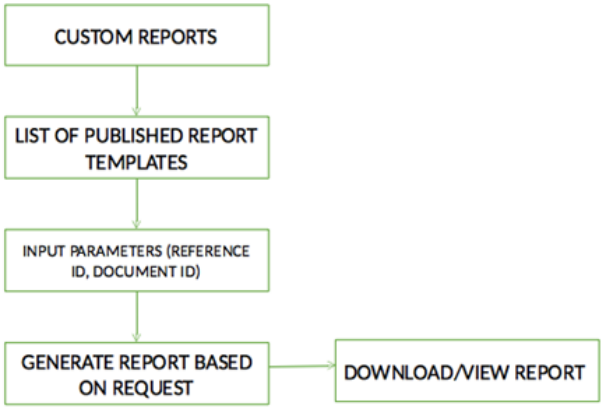

Fig. 7. Process flow for custom reports

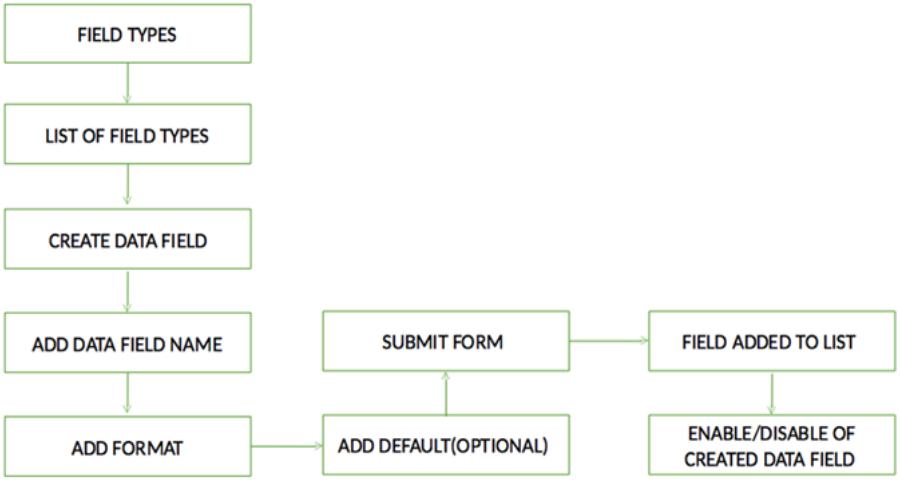

Fig. 8. Process flow for field types

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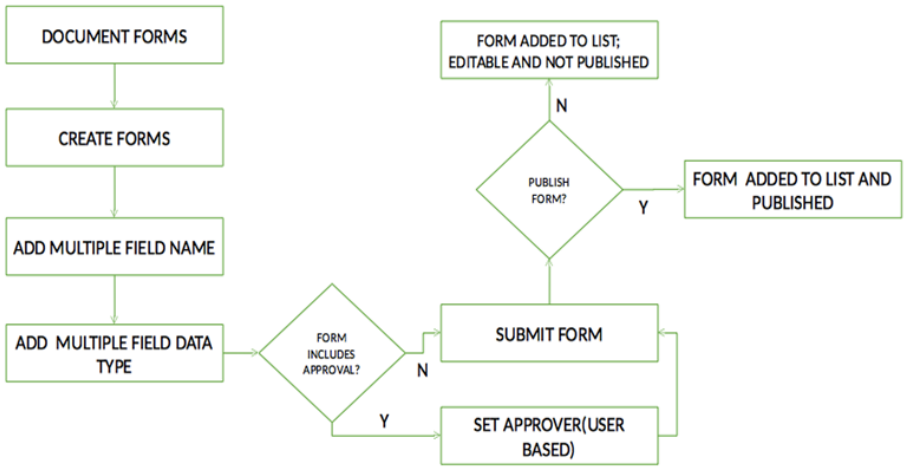

Fig. 9. Process flow for document forms

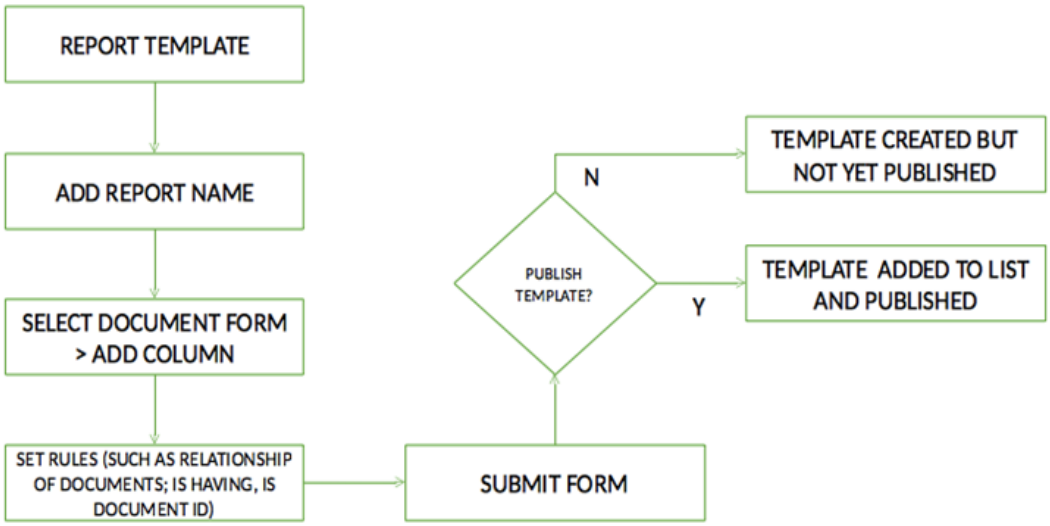

Fig. 10. Process flow for report template

V. RESULTS

The summary of the results based on the identified problems is shown below. Based on the data presented in Table 2, the respondents' awareness in terms of the existence of the listed data management system the overall mean of 3.65. The verbal interpretation for this is "Moderately Aware".

TABLE 2
LEVEL OF AWARENESS OF THE RESPONDENTS ON THE EXISTENCE OF A DATA MANAGEMENT SYSTEM

Parameter	Mean	Interpretation	Rank
SAP ERP	4.77	Highly Aware	1
Oracle Netsuite	4.46	Moderately Aware	2
SAS Data Management	2.77	Aware	3
Microsoft Dynamics	2.27	Slightly Aware	4
Average Mean	3.65	Moderately Aware	

Based on the data shown in Table 3, the importance of having a data management system in the organization shows that the overall average mean is 4.45, interpreted as "Moderately important".

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TABLE 3
LEVEL OF IMPORTANCE BY THE RESPONDENTS ON HAVING A DATA MANAGEMENT SYSTEM IN THE ORGANIZATION

Statement	Mean	Interpretation	Rank
The system can help to improve the business process and transaction of the organization	4.56	Very Important	2
The system can lessen the workload of each member of the business department	4.69	Very Important	1
The system can help to secure that the data processed accurately	4.11	Moderately Important	3
Average Mean	4.45	Moderately Important	

Table 4 shows the satisfaction level of the respondents for the functionality of the developed data management system. The overall mean for satisfaction in terms of functionality is 3.92, which is interpreted as “Moderately Satisfied”.

TABLE 4
LEVEL OF SATISFACTION OF THE RESPONDENTS ON THE DEVELOPED CONFIGURABLE DATA MANAGEMENT

Statement	Mean	Interpretation	Rank
The system can provide template/form based on the business rule	4.11	Moderately Satisfied	1.5
The system allows data manipulation such as creating, approval, and searching	3.46	Satisfied	5
The system processed raw data accurately	4.11	Moderately Satisfied	1.5
The system handles data in a well-organized manner	3.96	Moderately Satisfied	3.5
The system generates, and exhibit s need the information requested by the user	3.96	Moderately Satisfied	3.5
Average Mean	3.92	Moderately Satisfied	

Table 5 shows the satisfaction level of the respondents’ satisfaction with the reliability of the developed data management system. The overall average mean in terms of reliability is 3.93, which is interpreted as “Moderately Satisfied”. This table shows the features of the developed data management system that handles the reliability of the system. Since the primary parameter of the system is “data”, which is used for day-to-day operations and transactions, it is necessary to have a system that can provide a secure and consistent performance.

TABLE 5
SATISFACTION LEVEL OF THE RESPONDENTS DEVELOPED CONFIGURABLE DATA MANAGEMENT SOLUTION OF RELIABILITY

Statement	Mean	Interpretation	Rank
The system can create a dynamic template/form based on business rule	4.11	Moderately Satisfied	1.5
The system provides a dynamic report based on business requirements	3.46	Satisfied	5
The system can provide dynamic content for template/form	4.11	Moderately Satisfied	1.5
The system can handle custom report data accurately	4.04	Moderately Satisfied	3
The system provides a responsive graphical user interface	3.93	Moderately Satisfied	4
Average Mean	3.93	Moderately Satisfied	

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Table 6 on the following page reveals the satisfaction level of the respondents on efficiency based on the developed data management system. The overall average mean for the criteria is 3.89, which is interpreted as "Moderately Satisfied". Respondents are satisfied enough in terms of efficiency of the developed data management system compared to those data management available in the market today it is competitive enough to compensate the need of a business organization without spending plenty of money investing in a paid data management system.

TABLE 6
SATISFACTION LEVEL OF THE RESPONDENTS DEVELOPED CONFIGURABLE DATA MANAGEMENT SOLUTION OF EFFICIENCY

Statement	Mean	Interpretation	Rank
The system can process the data without concurrent access anomaly	3.96	Moderately Satisfied	4
The system can upload raw databases on the selected template/form	4.11	Moderately Satisfied	1.5
The system returns correct data in custom reports	3.23	Satisfied	5
The system provides reliable information upon processed and generated	4.11	Moderately Satisfied	1.5
The system provides user management data correctly	4.04	Moderately Satisfied	3
Average Mean	3.89	Moderately Satisfied	

Table 7 shows the level of satisfaction on the usability of the developed data management system. The overall mean for satisfaction in terms of information content quality is 3.92, which is interpreted as "Moderately Satisfied".

TABLE 7
SATISFACTION LEVEL OF THE RESPONDENTS DEVELOPED CONFIGURABLE DATA MANAGEMENT SOLUTION OF USABILITY

Statement	Mean	Interpretation	Rank
User comprehends how to use the system easily	4.04	Moderately Satisfied	1
User uses the system without much effort	3.96	Moderately Satisfied	2
The system is easily accessible without much effort	4.04	Moderately Satisfied	1
The system provides graphical user design that can be used in any device browser	3.73	Moderately Satisfied	4
The system can be used by a user that has no technical background	3.85	Moderately Satisfied	3
Average Mean	3.92	Moderately Satisfied	

Table 8 shows that the overall mean on the satisfaction level of respondents in the developed system is 3.92 and is interpreted as "Moderately Satisfied". The "Reliability" is first with an average mean of 3.93, followed by the "Functionality" and "Usability" with the same average mean of 3.92, and last is the "Efficiency" with an average mean of 3.89. This result shows that the respondents, on the overall features of the developed data management system, are moderately satisfied.

TABLE 8
OVERALL LEVEL OF SATISFACTION ON THE DEVELOPED CONFIGURABLE DATA MANAGEMENT SOLUTION

Statement	Mean	Interpretation	Rank
Functionality	3.92	Moderately Satisfied	2.5
Reliability	3.93	Moderately Satisfied	1
Efficiency	3.89	Moderately Satisfied	4
Usability	3.92	Moderately Satisfied	2.5
Average Mean	3.92	Moderately Satisfied	

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Table 9 shows the recommendations of the respondents for possible improvements in the developed configurable data management solution. The recommendations were options given by the researcher for the respondents to select if the developed system still needs to be improved.

TABLE 9
RECOMMENDATIONS OF RESPONDANTS POSSIBLE IMPROVEMENTS DEVELOPED CONFIGURABLE DATA MANAGEMENT

Statement	Frequency	Percent	Rank
Include graphical representation in reports viewing	13	52%	1
Include more complex custom report with multiple documents to collaborate	9	36%	2
Include flexible action for grid listing	3	12%	4
Include other notification options, such as email notification	7	28%	3
Others	1	4%	5

VI. DISCUSSION

1. The respondents' level of awareness in terms of the existence of Data management tools got a total grand mean of 3.65 which is "Moderate Aware". It showed that the respondents were not totally aware of all the data management tools that are currently available in the market but based on the gathered data, among all stated data management tools, "SAP ERP" received the highest mean of 4.77 or verbally interpreted as "Highly Aware".
2. Having a data management tool in an organization is only "Moderately Important", with a total mean of 4.45. The respondents agreed that the data management tool could help to lessen the workload of each member of the business department. It received a total mean of 4.69 and verbally interpreted as "Highly Important".
3. The developed Data Management System has various features that were assessed in terms of functionality, reliability, efficiency and usability. With a grand mean of 3.92, the respondents' rating on those features is "Moderately Satisfied". It showed that the respondents are satisfied enough on the overall functionalities, system flow designs and purpose of the application. In terms of Functionality, the respondents have a "Moderately Satisfied" on how the system works and carry out other features, with a total mean of 3.92. Reliability received a total mean of 3.93. The respondents are "Moderately Satisfied" on how the system implements its dynamic features. Efficiency had a 3.89 overall mean. The respondents are "Moderately Satisfied" on how the system handles the uploaded data and generate it upon processing. Finally, for Usability, the respondents were "Moderately Satisfied" on how the system can easily be used and its graphical user interface. It received a total mean of 3.92.
4. 13 or 52% of the respondents recommended to include the graphical representation of reports view. On the other hand, only 1 or 4% of them gave a different suggestion, which is to "Add complex document searching".

VII. CONCLUSION

Based on the findings, the researcher came up with the following conclusions:

1. The respondents are moderately aware of the existence and usage of different data management systems available in the market today. "SAP ERP", however, turned out to be popular among the respondents.
2. The respondents find that having a data management system is moderately important in an organization.
3. The developed Data Management System has features and performance, which make it moderately satisfying for users. Respondents are found to be moderately satisfied with the system's functionality, reliability, efficiency and usability in generating reports, uploading of documents and other relevant features necessary for the users.
4. The respondents have generally recommended the inclusion of the graphical representation in the report viewing to improve the system.

VIII. FUTURE WORK

Based on the given conclusions, the researcher would like to recommend the following.

• Not all small-medium businesses are aware of using data management or even the existence of these applications. Building and promoting these types of application that is cost-efficient and contains the main functionalities of today's data management system, these factors will help to introduce this to businesses that don't prioritize the acquisition of this application which can be of help in their business.

• Using this type of application in a business company is a big factor to improve the services and lessen data failures as a replacement to the manual process. Business owners

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may consider learning more about the advantages of having a data management system in their company.

• The overall features and functionality of a data management system are considered as a large software application, meaning it has a lot of potential to have other functionalities to develop and enhance. A business may choose which facet of functionality can be useful for them.

• In improving functionality, especially in reporting, it could be an added feature, and flexibility for custom report generation if graphical reporting and analysis representation will be included.

• For future researchers, exploring the data management system, particularly the functionalities and modules that needed to illustrate the algorithms, can be useful for study. These algorithms will help to fully understand the system that will lead to find a better solution and enhance a certain module. Considering also the listed recommendations for improving the system can be a good source of idea. These recommendations will help to give a better and easier experience for users while exploring the system.

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