

Employee Reimbursement System for a Manufacturing Company

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Abstract—Manual processes are still evident in firms today despite the advancements in technology. Reducing manual processes can improve an organization's competitiveness by maximizing resources and preventing disruptions. The current reimbursement process of Company ABC is a manual process that utilizes manpower, material, and financial resources. This study aims to propose an employee reimbursement system to facilitate the process using the systems analysis approach, which consists of modeling requirements, data and process modeling, object modeling, and consideration of development strategies. The JUSTINMIND software was used as the prototyping tool for the design of the user interface. The proposed process may facilitate the reimbursement process through by reducing manual workload through process automation.

Keywords—manual process, reimbursement system, systems analysis

I. INTRODUCTION

Office automation systems are a type of information system (IS) that helps employees create and share documents to support daily activities [1]. Automation is an integral part of the digital transformation of a business. Digital transformation is a response to adapt to the constantly changing business environment. Firms are pressured by time to market, changing customer expectations, and supply chain disruptions [2].

Consequently, they need to revisit their processes to develop strategies that could maximize opportunities and prevent harmful disruption [3]. According to the recent study of Forrester Research, Inc (2020), only 25–35% of tasks are automated in large firms in the UK, France, US, Nordics, Germany, and Japan [4]. Two-thirds of the tasks of these large enterprises are performed manually. Thus, organizations still have a lot of work to do in terms of reducing manual processes [5].

The filing and processing of reimbursements in Company ABC present a case of a manual process. Over 200 employees file for reimbursement on a bi-monthly basis except for medical-related expenses, which are filed

every quarter. The finance department handles the manual reimbursement process using spreadsheets, printouts, and emails. This study aims to develop a reimbursement system to facilitate the process. This study can be beneficial in reducing the workload of those involved in the process.

A. Company Background

The company is a Denmark-based organization. Their objective is to create a positive global impact through its sustainability efforts in clean water production. Their goal is to facilitate access to clean water, safeguard water resources, and mitigate climate change. The firm has several offices across the globe. Each country is spearheaded by a General Manager (GM) which is assigned to oversee operations such as Human Resources and Finance.

B. Situational and Problem Analysis

The section presents the Identification of Needs for Computer Based Information System (CBIS). This consists of the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, evaluation of the current process, Root Cause Analysis (RCA), problem statement, and objectives of the study.

1) SWOT analysis

This study utilized the SWOT analysis to determine the strengths, weaknesses, opportunities, and threats of the company's existing employee reimbursement system. The strengths of the current process are its low cost, low maintenance, minimal training required, independent system, and offline capability characteristics. On the other hand, the manual filing system does not provide the ease of access when backtracking transactions. Tracking and prioritizing requests is a labor-intensive task for managers and finance personnel. In addition, the email transactions do not comply with data privacy regulations as it does not have any restrictions or protection. The opportunities for the company are to comply to data privacy regulations, facilitate tracking of reimbursements, integration of the process with the company's system, and the use of

collected and organized data for analytics. The present method is faced with threats namely, overwhelming the resource handling reimbursement requests, data loss and corruption, and security breach.

2) Evaluation of the current process

The employee initiates the process by uploading receipts and accomplishing the reimbursement form. The request is submitted via email to the line manager. The line manager receives and reviews the submission. If there are issues with the submission, an issue report is created via email and then sent to the requester. If the request is approved, the line manager forwards the email to the finance resource stating that the request was "approved". The finance employee reviews the submission. If it has issues, finance replies to the same email thread to inform the employee. If accepted, finance will process the reimbursement and send the confirmation of approval to the requester. The reimbursement will now be received by the employee on the succeeding payday. In addition, the finance resource transposes and collates data to generate reports for management. From this, the pain points of the procedure were identified and used as the basis for the formulation of the Root Cause Analysis (RCA).

3) Root Cause Analysis (RCA)

Delays, errors, and inefficiencies were categorized in the existing employee reimbursement process. For manpower, human error has been the cause of missing receipts/attachments in the requests. Limited resource was identified as the cause of bottlenecks. For machines, the lack of data validation leads to incorrectly filled-up spreadsheet forms. For the method, manual filing, human error, and manual tracking are the root cause of delays.

4) Problem statement and objectives

Company ABC has a manual reimbursement filing process. The current process requires the tedious filing of forms and manual monitoring of reimbursement requests.

The proposed employee reimbursement system aims to facilitate the reimbursement process by reducing repetitive tasks, errors, inefficiencies, and delays. In addition, the data collected and organized will be used to generate reimbursement reports.

II. REVIEW OF RELATED STUDIES

Reimbursement is the out-of-pocket expenses incurred by an employee paid for by the organization they belong to Tuovila [6]. Reimbursement is considered a cumbersome process of extracting information from scanned invoices [7]. Manpower, material, and financial resources are wasted because of the use of paper invoices [8]. Because of this, previous research has delved into improving the process to reduce inefficiencies. In the study of Meng et al., they have used "Deep Learning" technology to reduce the manpower required to encode text information from the images of the receipts [7]. Their study proposed a new Hough Transform Accumulator (HTA) algorithm for distortion correction of the image. They introduced a deep learning model to extract essential information from invoices and a Regular Matching and

Recursive Segmentation (RMRS) algorithm, which outputs standard format characters from the images. In healthcare, the comparative study of Cavalieri *et al.* state that reimbursement systems significantly affect the quality of healthcare service [9]. There was a significant difference in hospitals that used Prospective Payment Systems (PPS) and those that are in less competitive environments. In another study, the electronic filing of reimbursements is said to have the ease of integrating with other medical information systems despite its higher cost [10]. In the study of Seng and Tsai, they have developed a structural approach in transforming an existing cash receipt/reimbursement system [11]. They utilized structured analysis and design techniques using a Data Flow Diagram (DFD), Entity-Relationship Diagram (ERD), and system flow chart. A paper by Feng *et al.* focused on the use of blockchain technology to improve the taxation system in China. However, they have also stated that blockchain technology is only at its early stages [8]. The non-inductive invoice reimbursement system they proposed cannot be established within two to three years. A study by Zhu *et al.* provided a solution using Optical Character Recognition (OCR) technology to extract relevant entities from document images. Their solution offered a paper-free framework of capturing, transporting, and storing documents, and unconstrained data mining approach in extracting entities from unstructured document images, and automation of auditing procedures [12].

III. METHODOLOGY

The systems analysis approach was used to develop the proposed employee reimbursement system of the company. The technique involves modeling requirements, data and process modeling, object modeling, and consideration of development strategies [13]. Requirement's modeling is a fact-finding approach in defining inputs, outputs, process, performance, and security. In data and process modeling, the output is the formulation of a logical model of how data is processed. It uses the Data Flow Diagram (DFD) to exhibit the movement of data through an information system. The DFD is referenced on the system's Hierarchy plus Input-Process-Output (HIPO) diagram. The HIPO technique was introduced in the 1970s [14]. In this study, it was used to define the scope of the proposed system. For object modeling, the object-oriented analysis aims to demonstrate the interaction of objects. The Unified Modeling Language (UML) was utilized to represent use cases of different business functions. The proposed interaction between objects is presented in each use case. Then, it was consolidated in a process map using the swim lane diagram. For the development strategy, it aims to set the system requirements. The system user interface design will be constructed based on the system analysis. In this study, the "JUSTINMIND" prototyping tool was used to present the user interface. It exhibits the application of the requirements.

IV. RESULTS AND DISCUSSION

A. System Analysis

1) System requirements

The researchers have identified the system requirements of the proposed reimbursement system. For the inputs, the new system requires employee identification using login credentials to access the system and the user will provide reimbursement details which includes attaching receipts. The output of the system is the user being able to view the details and status of the reimbursement filed and reports could be generated based on the filters set. This feature will also be available to department heads on a per department view access. The high-level management would also have access to view the overall reimbursement requests, approvals, and releases. The system includes an automated notification which is triggered once the request has been submitted, approved, an issue has been filed by managers and finance, and once the reimbursement has been released. For the process, the system must be capable of sorting the data. It must be able to generate up to date reimbursement reports based on filters set by the user. It must be able to generate and send out notification emails. In terms of performance, the reimbursement system must support simultaneous use by multiple users. It must be operational 24 hours a day, seven days a week due to the company’s global operations. From this requirement, a backup system with a recovery plan must be available in the event of hardware, software, or network failure. For the control requirements, security protocols will be applied. This requires login credentials with access of each user customized accordingly. Changes in employee records can only be performed by high-level personnel. The system administrator can control the level of access of each user.

2) Form of current process

An excel spreadsheet is used for the manual entry of reimbursement requests. The employee inputs details which include name, employee number, department, and payment details. The payment details includes when the payment was made, payee as the vendor, document number or the receipt number, details of the expense, and the amount. Below the payment details is the list of approvers, which consists of the line manager and finance admin. In a separate sheet, the employee attaches the screenshot of the receipt. The line manager and the finance admin review the attachments prior approval. The line manager signs the document, attaches the signed form, and sends the email to the finance admin with the employee carbon copied in the email

B. System Design

1) Scope of proposed system

The objective of the proposed system is to facilitate the reimbursement requests of employees across the organization. There are five subsystems: user authentication, reimbursement form, approval, issue report, and report generation. User authentication acts as a gate to allow access to the system and defines the viewing access and functionalities based on the user’s role (security permission). Some functionalities are only applicable specifically for line managers and finance admin, such as

the approval and admin settings. The user authentication is integrated to the user database of the company for single sign-on. A reimbursement form will have fields for encoding and uploading receipts. Approval system will be used by line manager and finance admin to perform approval or rejection. Upon rejection of the request, they will be able to add comments. Once the comments are submitted, it will automatically send a notification to the requester. The interface will display all issues assigned or created by a user. Lastly, report generation allows users to view the historical data based on the filter set.

2) Use cases

a) Employee

The employee initiates the use of the system by logging in using their credentials which consists of employee user identification and password. Users will be prompted if the details do not match the records. After successful login, the employee may initiate a request by filling up reimbursement forms. The system allows the user to edit prior submission, upload receipts/invoices, and submit the reimbursement form. The request is sent to the line manager. If approved, the reimbursement request is forwarded to the finance. If the line manager or finance cites issues, the request is sent back to the employee. The employee can submit the resolution directly to the user who returned the request. The employee can also verify the status of their reimbursement request. The reimbursement status will be fed by the system based on the approvals or rejections of the line manager and finance, respectively. Lastly, the employee, manager or finance may generate reimbursement reports.

b) Line manager

The line manager has the capability to approve reimbursement or file an issue regarding the request. An issue can be but is not limited to incorrect or missing details, clarification, etc. Additional use case is the generation of reports.

c) Finance

The finance personnel are capable of approving reimbursement requests or filing an issue. Additional use cases consist of the release of payment confirmation and generation of reports.

3) Data flow diagram

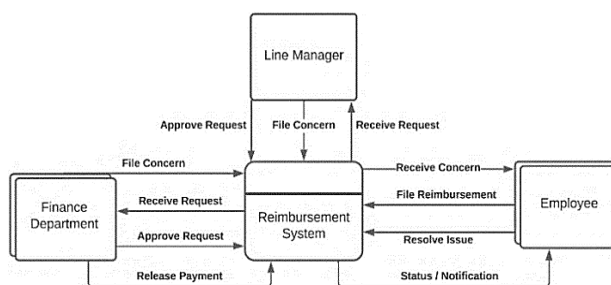


Figure 1. Contextual diagram – reimbursement system.

The reimbursement system is presented in Fig. 1 below. Fig. 1 represents the context diagram of the system that shows the interaction of primary and secondary actors to the reimbursement system. An employee can file for

reimbursement, receive notifications or status, and resolve issues. The line manager can approve requests, file concerns, and receive requests. Lastly, the finance department can file for reimbursement concerns, receive requests, approve requests, and release payments.

4) Business rules

The reimbursement system employs the rules set out by the company. In submitting the reimbursement form, the employees select from three categories namely medical reimbursement, winter clothes, and others (food, transportation, etc.). Once submitted, the employee will not be able to modify the submission unless rejected by the approver. The approver is notified of the request via email and through the system. The system will automatically prevent the submission of request if it did not meet the criteria per category. The system performs data validation by notifying users if there are no receipts attached or incorrect characters are inserted. For medical reimbursements, it must not be greater than Php 12,000 per annum. For winter clothing, it must not be greater than Php 7,000 per annum. For others, it will be subject to the manual approval of the line manager and finance. Only the line manager and finance personnel can approve or reject the request of the employee. There will be a system generated reminder to each employee stating the unused amount of medical reimbursement.

5) System / user interface

This section presents the user interface of the proposed employee reimbursement system.



Figure 2. Employee landing page.

Upon successfully login, the employee landing page displays the list of all reimbursements filed. User clicks “+” plus button to create new requests (See Fig. 2).

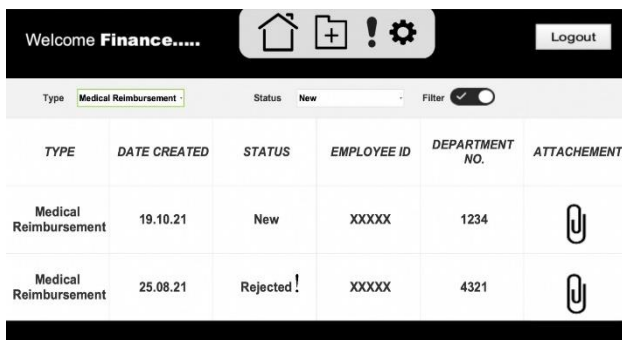


Figure 3. Finance landing page.

The Line Manager and Finance landing page displays the list of reimbursement requests (See Fig. 3). However, in the finance account, the business rule configuration (gear icon) is displayed. The report generation feature is available on both line manager and finance. The finance and line manager can view their own reimbursements by clicking “Filter”. If the user selects their employee’s submission, it will redirect to the Approval/Reject page.

File reimbursement page (See Fig. 4). In this page, users will enter details such as type, date, payee, receipt no., description, and cost. Once the button “ADD” is clicked and a file is uploaded, the paper clip icon will display in the same row. Users can submit multiple requests. “Submit” button is clicked when user has finished entering the necessary details.

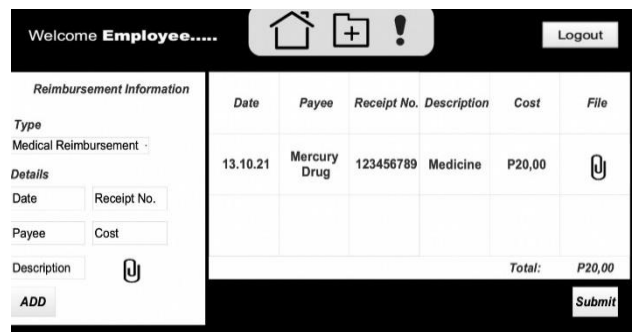


Figure 4. Employee reimbursement page.

In the reimbursement list of the line manager or finance, if the user clicks a request, it will automatically redirect to the approval/reject page. Here, they will be able to view the details of the request. The paper clip icon indicates the uploaded receipt (See Fig. 5). If the line manager or finance intends to reject the request, the system allows user to enter a comment and return to submitter.



Figure 5. Approval / reject page.

C. System Evaluation

The current reimbursement system in the Philippines-Manila office is performed manually; the steps consist of submission, approval, notification, and report generation. The current process starts with the employee filling up the spreadsheet template and attaching receipts. However, based on the analysis, there are multiple causes of delays, inefficiencies, and errors. Incorrect details are encountered because there is no data validation. For the approver, tracking requests and issues are difficult due to the number of incoming emails. In the proposed system, requests and issues are displayed in rows and are arranged based on date.

The new system will perform data validation that will notify the user of invalid data entry and missing attachments. The proposed system will automatically generate notification emails to be sent to employees, line managers, and finance. With the help of the new system, the management will have ease of access to up-to-date reports leading to better timing in terms of making financial decisions in the company.

V. CONCLUSION

The existing manual process is slow, repetitive, and prone to human errors. The proposed reimbursement system can provide benefits for Company ABC by mitigating delays, errors, and inefficiencies. The manual tracking in spreadsheets and submission of hard copies will be replaced with information system technology. All the tasks pertaining to reimbursements are done in one system. The effort previously required can be reallocated to the other operational tasks of the finance department. As of now, the system is designed to the reimbursement process of one Company. However, in the future it may also be integrated with other systems and allow cross-company functionalities. Generally, the completion of this research will be the first iteration. It is recommended to conduct several iterations using the same process in the Information Systems Analysis to improve the system continuously.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Dhan Joseph Praga gathered the data from Company ABC and designed the User Interface. Dhan Joseph Praga and Ralph Andre C. Roque conducted the research and wrote the paper. Ralph Andre C. Roque developed the diagrams and performed revisions. Grace Lorraine Intal supervised and guided the research. All authors approved the final version.

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