Development of a Target-Based Configurable Business-to-Business Model for Electronic Wholesale Information System in East Java

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***Abstract*—Until the end of 2021, most of the electronics wholesale market in East Java has found obstacles in contract administration and monitoring of consumers' sales targets managed conventionally in contract management and sales target monitoring aspects. This phenomenon becomes complicated because most wholesaler systems have specific rules of management. The research discusses information systems that can be configured for various business processes in the wholesale sale of electronic goods. The case-study approach is applied by analyzing, designing, constructing, and validating the new proposed system based on three case studies with different business processes. The result of the analysis phase explains minimum sales value, the number of item variants in sales, verification rules for sales supervisors, and the configuration of user access rights that are highly flexible when applied. This system is developed as web-based to make easy access to multiple platforms to accommodate flexibility. The result summarizes that companies have the power of freedom to customize their target and help them to monitor wholesale store sales to meet sales target achievement. Alternatively, suppose companies create their new sub-companies with different targets and segments. In that case, they can easily configure target sales rules without spending significant money on developing another application.**

***Index Terms*—Target-Based Configuration, Business-to-Business Model, Electronic Wholesale, Information System, East Java**

I. Introduction

BUSINESS-to-Business (B2B) or wholesale businesses are generally large, complex, and competitive and have small profit margins [1]. Although Information Technology (IT) development keeps growing, some wholesale businesses still choose to run their business conventionally. One of the reasons for this condition is that the velocity of money is high, but the profit margin is small. Because of unpredictable conditions, the owner does not use a standard information system. The general information system does not have a suitable configuration for the B2B business climate. After all, the development and maintenance costs are high [1].

Furthermore, the global pandemic of COVID-19 stimulates adjustments to numerous human lifestyles [2], including interaction and communication habits [3]. Customers' preference for online transactions represents an adjustment [4], which leads to increased online business opportunities [5]. According to BPS (Central Statistical Board) data published in 2021 [6], the number of online business players (retail and wholesale) increased by 22.04% in 2020, and 78.36% of them still used social media or instant messaging as their technology solution. The online wholesale business in Indonesia recorded 28.77% of the total online business currently operating.

The two contradictory conditions have led to the need for an affordable online sales system. A configurable system is a solution. A configurable system can form a new heterogeneous system [7]. In addition, a configurable system can adapt to various forms of business processes so that it can respond relatively to changes that occur within the company [8]. Multiple forms of configuration can be done in a computerized system. One of them is providing module units that the users can set themselves. Configuration features are applied close to the main transaction modules to increase users' attractiveness and positive response to the application [9]. The advantages of a configurable system are that it can reduce user dependence on system developers, increase independence in managing systems and data, and reduce the time and costs incurred in

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building the system [10, 11]. The convenience offered in the configured system should also pay attention to fulfilling customer satisfaction. Based on previous research, customer satisfaction in online sales systems depends on evident transaction completion, consumer trust, involvement/interaction in the system, and ease of use [12, 13]. Customer satisfaction and interest in continuing to buy can be measured by fulfilling the sales target achievement of each retailer. Customer decisions in certain online purchases are influenced by brand loyalty and the customer experience in using the services provided, as they have close ties to certain services or brands [14].

The research discusses information systems that can be configured for various business processes in the wholesale sale of electronic goods, with case studies of three companies in East Java, Indonesia. The research has several expectations. First, it is expected to find several parameters about sales management in the wholesale model, which can be used in a configurable system. Second, it can determine a feature system to monitor sales targets to reduce human involvement in the calculations. Last, the system can apply the custom target rules if the company creates a new subsystem.

II. Research Method

The research applies a case-based approach based on previous research [15] to the wholesale electronics industry in East Java. The research investigates three electronics wholesales from big cities in East Java, namely Surabaya, Pasuruan, and Kediri. The four research stages are based on the Waterfall Software Development Life Cycle approach [16]. The detail of the activities are as follows.

1) Collecting and analyzing current conditions with owner, staff, and stakeholders. Three main focuses in the B2B business are interviewed in this section: sales, contracts, and payment realization. The questions focus on the activities and restrictions involved in capturing, monitoring, and reporting sales, contracts, and payments, as well as using tools suitable to the environment in East Java. This activity gathers data about the current condition of the actual industry in East Java [17].
2) Designing flow and data. Data flow and structure are designed based on East Java's requirements and activities. Entity-Relationship Diagram (ERD) notation is used to illustrate the data model, and Business Process Modeling Notation (BPMN) demonstrates the business process [18].
3) Constructing program based on data structure and business process. A web-based application is decided because it provides flexibility to access many devices (cross-platform).
4) Verifying and validating the proposed system. Verification ensures that all features are working properly and error-free [19]. Three wholesale business owners and department heads and two retail business owners as consumers try the system firsthand and evaluate its functionality based on black box testing. The goal is to assess the usability of each feature.

III. Results and Discussion

During the data collection and analysis phase, activities from the electronic wholesaler are discovered. The points are summarized to find out several parameters of sales management.

- Most companies have specific sales rules and targets with a formal contract.
- Most rewards calculation is performed manually by the supervisor. The target calculation method is based on real retailers' transactions or calculating the total transactions made at the end of the contract period.
- All the sales system is credit-based, and the majority of the billing department is handled via phone or instant message manually.
- In sales management, all companies have the freedom to classify sales areas.
- The return process is recorded conventionally by exchanging a cut note, the same item, or other items.
- Most East Java people know about product catalogs applied to popular e-commerce.
- Reminder notification helps their work-life to maintain and monitor the data.
- Most East Java people have mobile phones. On the other hand, companies are willing to provide personal computers or laptops for their employees.

Next, based on the analysis phase, several parameters are found in the contracts and sales targets process, such as minimum sales value and item variations in sales. Verification for sales supervisors is also essential in this case. Based on the behavior of people of East Java, reminder notifications for each sales phase and progress notifications of contract targets are key features of the requirement of this system.

After finding out and determining the key feature of the proposed solution, the data design with Entity Relationship (ER) diagram is built and can be seen in Appendix A1. The ER diagram provides a database of contracts, sales, purchases, stock, user access rights, and notifications. There are several keys to the database structure. First, each retailer is required to make a contract that has a specific key to success. These keys

are determined quantitatively on '$detail\_target$' and '$detail\_success$'. Second, every retailer that makes a purchase will automatically be paired with an active milestone target based on the time and date of the transaction. It is illustrated in the relationship between '$detail\_sales\_receipt$' and '$detail\_target$'.

The early stage of the wholesale management process is the contract commitment between the company and the retailer at a specific date. Because of the fluidity of target and milestone, the communication between the company and retailer must be transparent and measurable until an agreement is reached. Each reward point must be clarified in the contract document, and the final contract is delivered via email, instant message, or system dashboard (Appendix A2). Moreover, each item transaction of retail must comply with the terms of the retailer's contract (Appendix A3). The system automatically counts the target based on the existing contract if a transaction is complete. The system has the capability to order milestones based on the complexity of the contracts. The priority is based on product type, category, brand combination, brand, category, and quantity. The system will notify administrative and retail staff if the transaction target is achieved. However, if there are no refunds within a specific time, retailers will receive rewards only when the bill is already paid.

Next, Appendix A4 illustrates a confirmation email process. It can be configured based on each predetermined user. The types of available notifications are push notifications, emails, and system dashboard information. Notifications provided include debt/receipt due, contract goal achievement, and contract negotiation. A supervisor with permission to validate the process in the system can access notifications to confirm via the system dashboard.

In the proposed solution, the system is developed with the Laravel framework and MySQL database. The applied notification in the proposed solution uses a scheduler system like Cron Job on web hosting based on Linux. There are three types of notifications: push notifications using Firebase Cloud Messaging (FCM), emails, and available notifications on the system dashboard.

Next, there are several things to consider when applying push notifications using FCM. First, FCM requires an HTTPS connection. Second, to receive notifications, users must give the browser permission to display push notifications. Third, the desktop browser must be active (open) to receive notifications. Smartphone users can still receive notifications even without using the browser. The implementation of automatic reminder notifications involves several components integrated as follows.

- Cron Jobs. It is a tool to automatically run a task or script at a previously scheduled time. For example, in the configuration, it has been determined that the Cron Job will run the script every six minutes. Then, the system cannot run the Cron Job every one to five minutes. The script to be run is Kernel.php which is in application/ console/Kernel.php.
- Kernel.php. Data are retrieved from the database. The data taken are the setting data of the day and time of notification delivery, which is stored in the settings table. Each notification type has three slots. For example, the system has been configured to send reminder notifications seven days, three days, and a day before a retail payment is due. Then, attributes of $attributes\_and\_retail\_payments$ in the settings table store the configuration of the sales note about payment due notification for retail. The attributes store data in the form of a string with the format $hours|reminder1\_reminder2\_reminder3$. Getting the hour and day schedule is done by making use of the explode function. After that, it is compared to the current clock. The "$reminder : payment$" command will be executed if the current clock matches the configured clock.
- $Sendnotif$ function. It is a function on the UserController that sends notifications in the form of push notifications and saves notifications into the database. The next step is to set up the curl command to run an HTTP Request to the FCM API. Then, the research runs the curl command with curl_exec.
- $RetailPayment$ email class. It is a mailable class used to send an email. Like other classes, the retail payment email class has properties, constructors, and methods. The command to send email is in the build function. Email views are created using the built-in markdown template from Laravel. Markdown is an email template that combines Blade components and Markdown syntax to make email creation easy by leveraging Laravel's built-in User Interface (UI) components. The data submitted to markdown will be displayed as part of the email message sent to the retailer.

Figure 1 represents a push notification sent by the system to retailers to inform them about new contract offers. Then, the retailers can open the notification to view the specifics of sales contract offers. For the sales, the company may establish specific sales for retailers, or sales may send offers to multiple retailers.

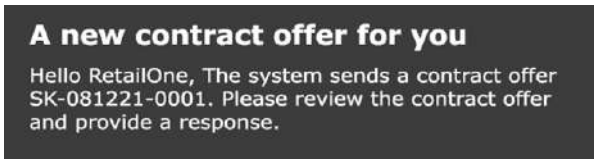

Fig. 1. Notification of contract offer.

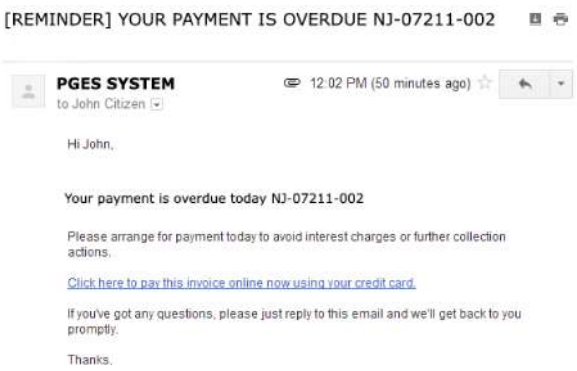

Fig. 2. Notification of overdue bill reminder.

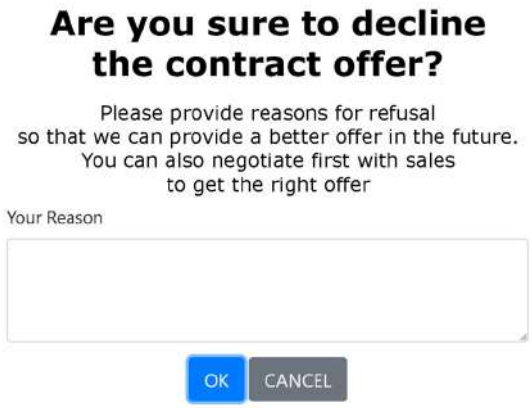

Fig. 3. Retailers' confirmation of the contract.

Next, Fig. 2 presents an overdue bill notification sent via email. The users' preferences determine the reports sent to retailers. Sending reminder notifications for the duration of the debt can be arranged according to the company's rules, such as H-15 or H-7, from the maturity of the debt. Figure 3 illustrates the retailer confirmation procedure for new contract offer notifications. This notification allows retailers to accept or reject the offer.

The calculation of target achievement is carried out by the system, every time a sales process occurs. For each detail of the sales note, the $generate\_arr\_possibility$ function is called. This function accepts one parameter, which is an object

Listing 1 Implementation of find possibility.

```
private function generate_arr_possibility(DetailProduk $dp){
            $k = DB::select('call sp_findcategory(?,?)', array($dp->product->category->id,$dp->
            product->category->level));
    $arr_possibility[] = "TYP#RP#" . $dp->id;
    $arr_possibility[] = "TYP#UN#" . $dp->id;
            if(!empty($k[0]->lv4)) {
              $arr_possibility[] = "CBR#RP#" . $k[0]->idlv4 . "_" .
                  $dp->produk->id_brand;
              $arr_possibility[] = "CBR#UN#" . $k[0]->idlv4 . "_" .
                  $dp->produk->id_brand;
            }
           if(!empty($k[0]->lv3)) {
             ...
           }
            $arr_possibility[] = "BRN#RP#" . $dp->produk-> id_brand;
            $arr_possibility[] = "BRN#UN#" . $dp->produk-> id_brand;
        if(!empty($k[0]->lv4)) {
            $arr_possibility[] = "CAT#RP#" . $k[0]->idlv4;
            $arr_possibility[] = "CAT#UN#" . $k[0]->idlv4;
        }
        if(!empty($k[0]->lv3)) {
            $arr_possibility[] = "CAT#RP#" . $k[0]->idlv3;
            $arr_possibility[] = "CAT#UN#" . $k[0]->idlv3;
        }
        if(!empty($k[0]->lv2)) {
            $arr_possibility[] = "CAT#RP#" . $k[0]->idlv2;
            $arr_possibility[] = "CAT#UN#" . $k[0]->idlv2;
        }
        $arr_possibility[] = "CAT#RP#" . $k[0]->idlv1;
        $arr_possibility[] = "CAT#UN#" . $k[0]->idlv1;
    $arr_possibility[] = "VAL#RP";
    return $arr_possibility;
}
```

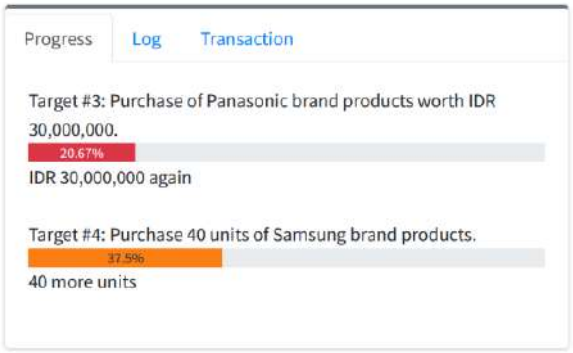

Fig. 4. Example of sales progress and achievement.

of the type of $DetailProduct$. An array containing a list of possible contract targets will be created from that object. The order of priority in calculating contract targets is prioritized based on the difficulty level.

The more specific a goal is, the more challenging it will be to achieve. Therefore, the goal will have a higher priority. The priority order of target types is (1) product type/TYP; (2) category & brand/CBR combination; (3) brand/BRN; (4) category/CAT; and (5) nominal/VAL. The arrangement of elements in $\$arr$ is likely based on the order of this priority. Then, a flexible priority implementation uses the concept of sorting with a priority queue method placed in the $generate\_arr\_possibility$ function. When $\$arr\_possibility$ is later matched against the contract target list array, the more difficult target will be met first. Listing 1 displays code snippets $generate\_arr\_possibility$.

Figure 4 represents the results of the target contract achievement calculation based on the contract activity log (Appendix A5). The implementation of the system produces a web-based system equipped with a Progressive Web App (PWA). By implementing PWA, a website that is initially only accessible from a browser can be downloaded and installed on the users' devices

Fig. 5. Display of PWA assessed from the computer.

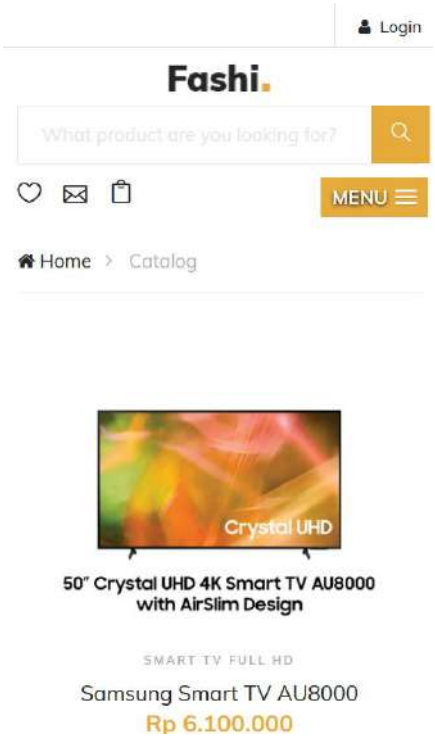

Fig. 6. Display of PWA assessed from the mobile device.

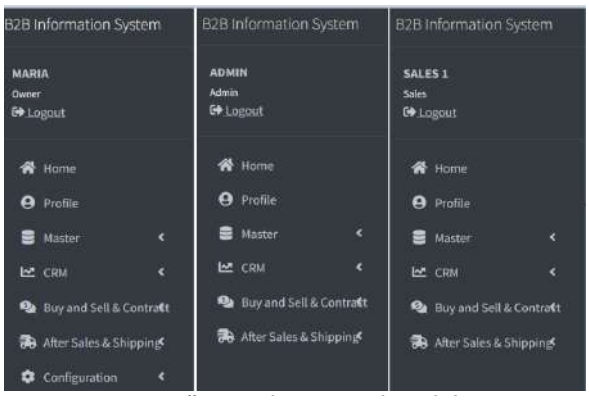

Fig. 7. Different access between owner, admin, and sales.

like a native application. PWA implementation is done using a package in Laravel called silviolleite/laravel-pwa. Then, the system is inserted into the hosting so it can be accessed online.

The trial of PWA installation is performed on two devices. The first device is the ASUS Zenbook 13 with the Windows 10 operating system and Chrome browser. The second device uses a mobile device. It is Samsung Galaxy A50 with the Android R operating system and Chrome browser. Both devices indicate that PWA can work properly. Figure 5 shows PWA on a laptop, and Fig. 6 shows PWA on a mobile device.

Figure 7 represents the results of configuring user access roles. In the system, types of users are divided into company owners, admins who carry out internal processes, and sales that carry out external processes related to consumers. Each user has different access rights. The company owner can access all the data in the database. Meanwhile, admins can perform billing processes, generate reports, achieve targets for each customer, and perform other internal administrative processes. Then, sales can see the target consumer achievement data handled and input sales data and other processes related to sales.

During the implementation phase, several findings require special attention. These findings are predicted to serve as lessons for future system development. The following is a description of the challenges encountered and the proposed solutions in the research. First, the implementation of push notifications using FCM is affected by several factors, including the users' permission to send notifications and Internet connection. If the

users do not give consent in their browser or activate "do not disturb mode", the notification will not go to the users. In addition, if the user accidentally clears all push notifications (which is generally done by swiping the notification), the notification will disappear. There is no other way to see the notification again. It may result in users missing important information. The alternative solution is to save the notification to the database and send an email notification to the users. Thus, the system will send notifications via push notifications and email and save the notification to the database. Push notifications contain notifications in a concise form, while email contains more detailed messages. In addition, with the storage of notifications in the database, users can re-access their notifications when logging into the system. Second, PWA and push notification implementations using FCM require an HTTPS connection. Therefore, the project is put on a hosting equipped with Secure Socket Layer (SSL) so that the connection is HTTPS.

Three wholesale electronics companies as sellers and three retail electronics companies as buyers are validated using the Blackbox method. Due to the limited number of respondents, interviews are utilized in this validation procedure. After the respondents tested the system, they are asked to respond to the posed questions. The following is a summary of the results of the interviews conducted.

First, according to company respondents, the contract-making procedure is informative and adaptable because it can be applied to specific requirements. Additionally, the contract activity log can be used as a source of information when problems arise after the contract period. Second, the retailer states that visual contract achievement data facilitates easier goal monitoring. Negotiating new contracts also provides retailers clear and structured information and reduces phone-based misunderstandings. Third, system notifications help company and retail employees to monitor contract negotiations, accomplishments, and billings. On the retail side, they feel a little irritated by the repeated billing notifications. However, it can be communicated to the company so that it can set the regularity of the notifications to be compatible with the demands of the retailers. Fourth, companies and retailers have reported that the system's interface is intuitive and easy to use. They appreciate the system's ability to facilitate interaction between companies and retailers without needing a phone or instant messaging. Last, after the interview, respondents from the company side express interest in implementing this system in their organization because the system can be used immediately with the initial configuration adapted to the organizational requirements.

IV. Conclusion

The research discusses information systems that can be configured for various business processes in the wholesale sale of electronic goods. Several parameters that influence sales management in the wholesale business model are identified. The number of minimum sales and variation items in a single transaction become affected parameters to achieve the sales target. In an applied application, the system must provide notification at each stage of the selling process. Due to the fluidity of management in business wholesale, the ability and accessibility to configure user access are also essential.

The result from interviewing with companies and stakeholders are positive. With the proposed system, the manager can adjust their sales-target goals with quantitative parameters more easily than preparing to build the system from scratch. For a long period, this mechanism will increase the productivity of whole company employees to focus on their sales goal. In addition, human involvement can be minimized by calculating the achievement of targets automatically on a computerized system. Hence, human errors can be suppressed, and employee productivity can be transferred to other jobs.

However, because of the pandemic, monitoring is not optimally conducted. On the other hand, the implication of the notification system highly improves the work by focusing on achieving sales goals. In addition, the case studies are taken in the East Java area only, so there may be differences in the characteristics of business processes in other areas. In future research, a system can be developed to provide contract recommendations for consumers based on historical data previously owned in this system.

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APPENDIX

The appendice can be seen in the next page.

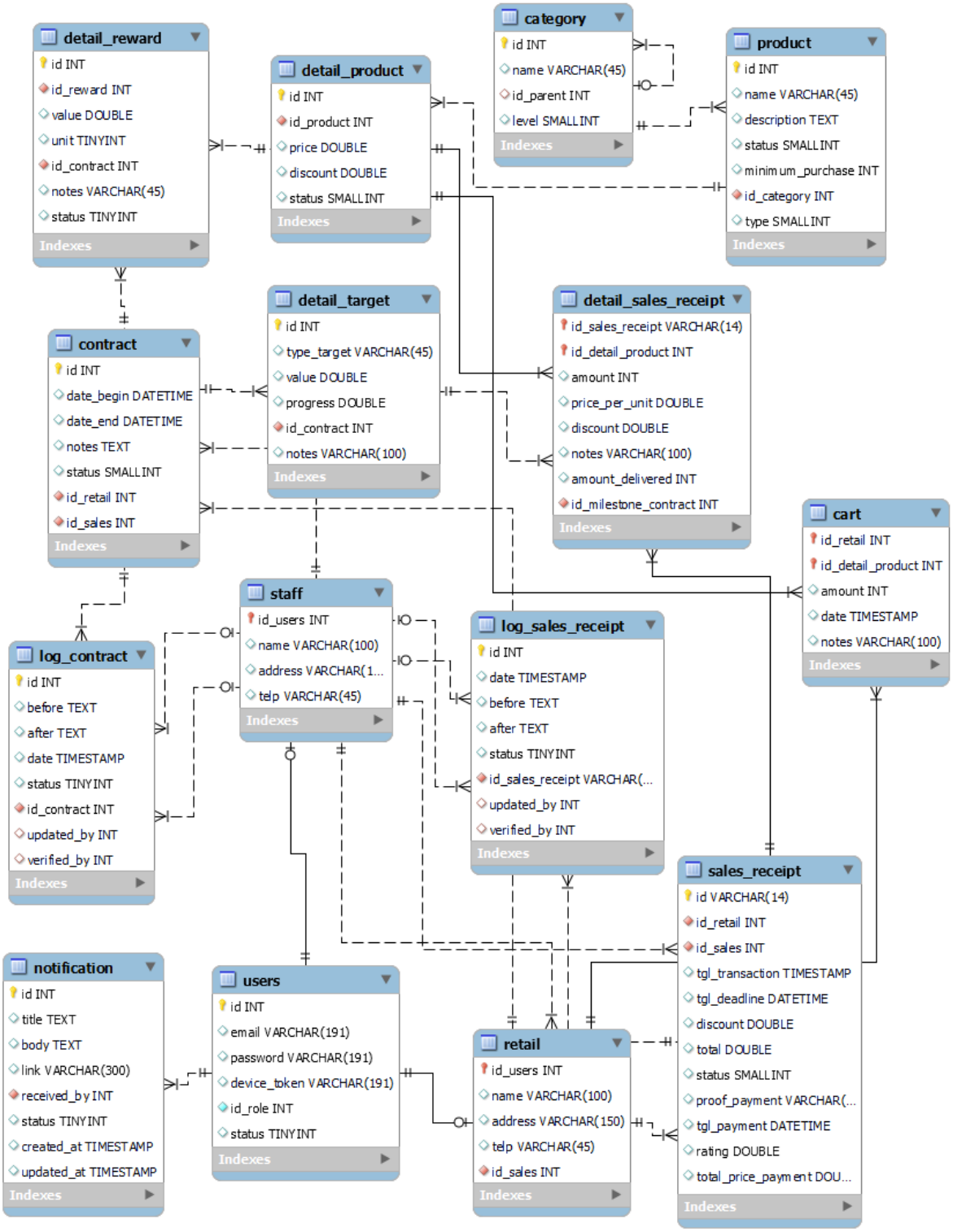

Fig. A1. Database design with ERD notation.

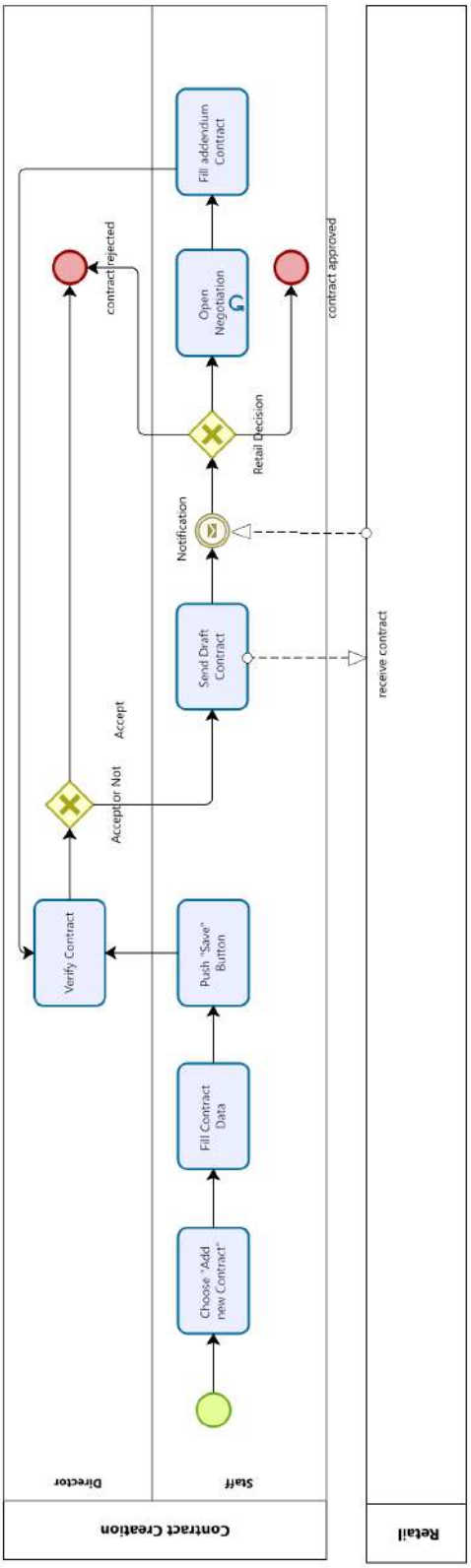

Fig. A2. Business process of the contract process.

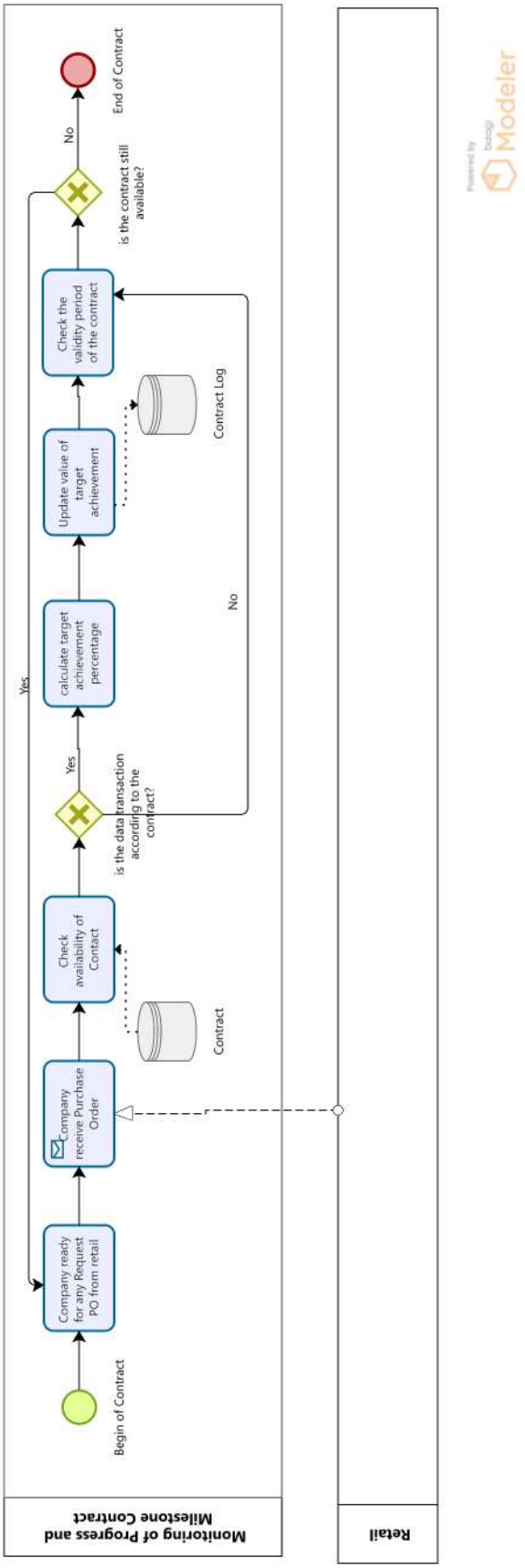

Fig. A3. The business process of target achievement checking process.

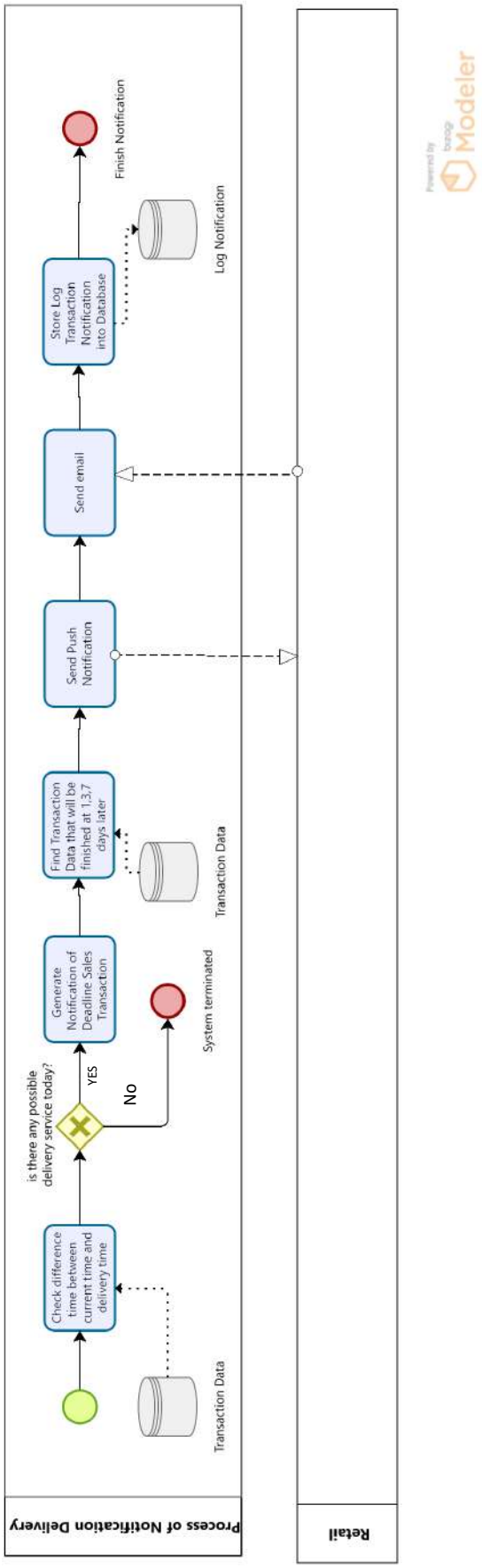

Fig. A4. The business process of notification delivery.

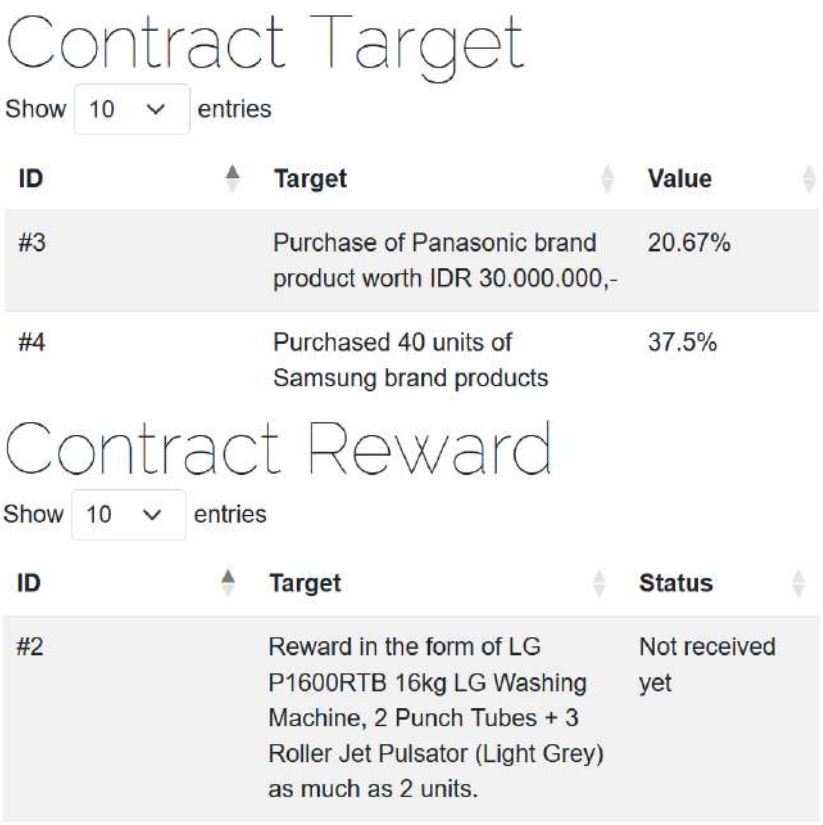

Fig. A5. Contract activity log.

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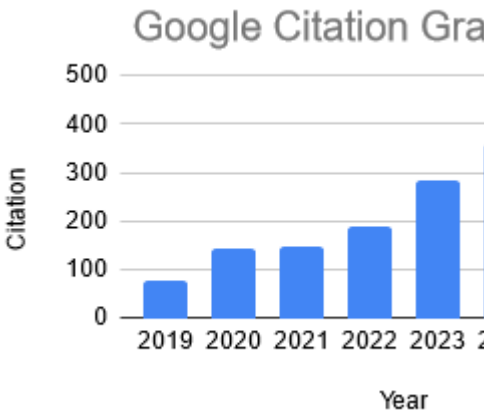

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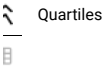
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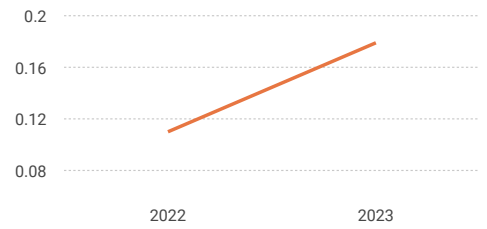

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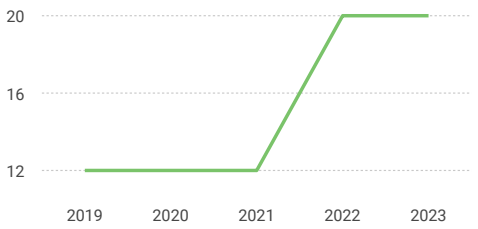

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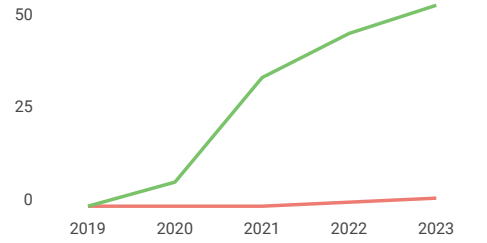

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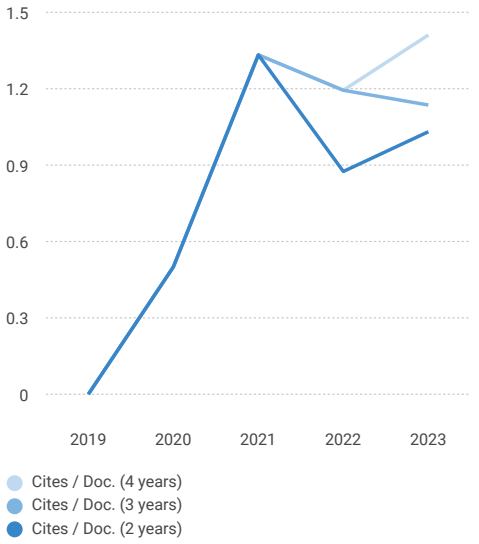

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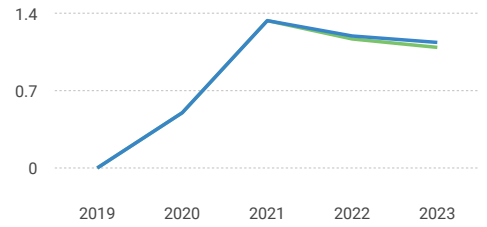

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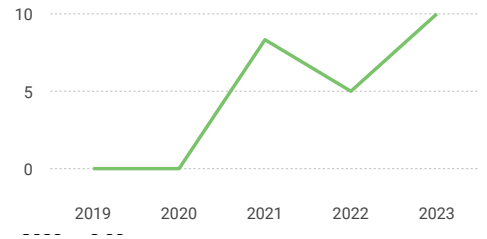

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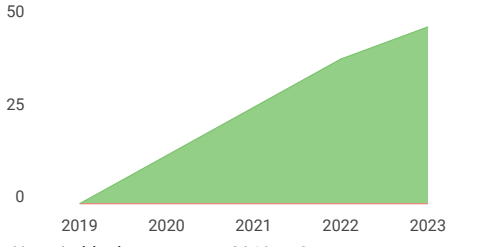

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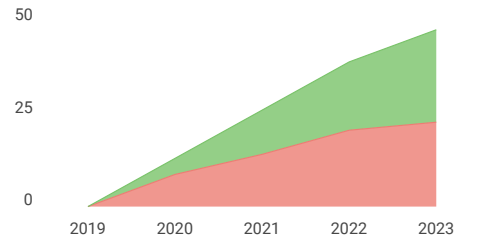

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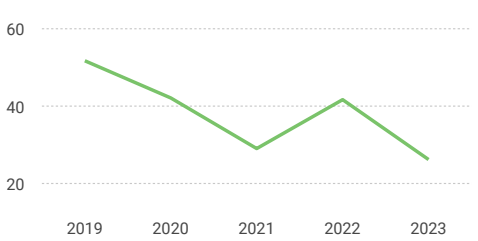

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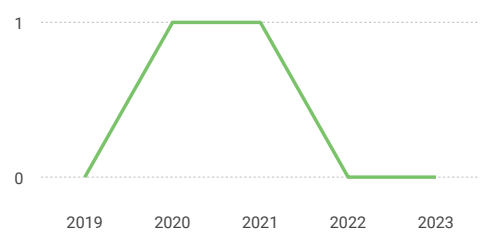

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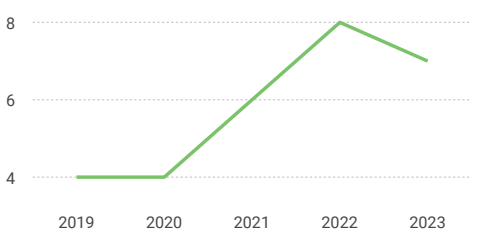

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