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# Natural Language Processing Integrated into a CRM System for Document Control and Sales Logistics at a Car Dealership

María Yaneth Vega-Flores[1], Roberto Ortiz-Gómez[1], Miriam Zulma Sánchez-Hernández *[1], Julio César González-Juárez[1], Abel Alberto Pintor-Estrada[1] and Jorge Sergio Téllez-Martínez[1]
[1] *Tecnológico Nacional de México/Instituto Tecnológico de Morelia, Morelia 58120, Mexico*

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**ABSTRACT**

Weighting queries to car manufacturers determines possible options for developing CRM systems. The results of commercial statistics on sales in the automotive sector guide, for example, the distribution of models and colours in vehicles and comfort ranges depending on customer selections in each country's geographic area. Accordingly, this allows GM to improve the logistics of production and distribution of vehicle needs, including control over lean manufacturing processes and the methodology of transporting products on demand, whether from a national or foreign plant, to define delivery schedules. The development of microservices for CRM, implementing in their programming the use of APIs of distributed functionality platforms such as LeadIT, can be obtained through a LeadIT External Web Service layer and optimised with testing tools for secure information exchange protocols and optimised with natural language processing analysis tools through artificial intelligence training. As a result, greater efficiency is achieved in the accuracy and protection of sensitive data and a system that benefits the company-marketer-consumer combination.

**Keywords:** CRM-ERP system; NLP Azure; Development Software; Agencies Logistic; Web Services.

## INTRODUCTION

The risk of data breaches from cyberattacks has increased today, requiring organisations to implement stricter protection measures [1]. Adopting new technologies and digital platforms has made protecting a business's customer information crucial to maintaining trust and complying with privacy regulations. Although external agents often threaten personal information held by companies, the threats can be more internal [2]. Therefore, businesses must ensure their data-handling practices are transparent and secure to maintain trust. In particular, General Motors (GM) promoted the development of Lead Connect or LeadIT for automotive sales logistics as an effective tool for automated communication with lead management agencies. LeadIT is a web-based lead data distribution application built in .NET with a SQL backbone. It enables car agencies to manage lead information and provide mandatory feedback on their interactions by following up with sales prospects to create a more organised network [3]. Therefore, this concept was explored as a development framework in the present work.

GM uses LeadIT web services to streamline its operations and improve the efficiency of its business processes. These services enable the integration of disparate systems within the company, facilitating communication and data exchange between different applications and platforms. Today, web services are crucial for GM, enabling greater interoperability between manufacturing, logistics and sales systems, better supply chain management and improved customer experience. By leveraging web services technology, GM can ensure fluid, real-time communication to remain competitive in the automotive industry [4]. In this sense, the integrated management of sales, marketing, customer service and all points of contact requires the development of IT systems for customer relationship management (CRM) [5].

In this project, the development of a CRM system was strategically linked to Microsoft Azure® [6] to increase document processing and privacy protection. Azure complies with a variety of international data protection regulations, such as the General Data Protection Regulation (GDPR) and the Personal Information Protection and

Electronic Documents Act (PIPEDA), helping businesses maintain compliance with data privacy and security standards [7]. Azure technologies were initially designed to integrate into the workflow to help reduce operational costs and improve decision-making by providing actionable insights from complex documents and data using its artificial intelligence tools [8]. Azure's suite of services and tools was designed to assist organisations by providing data encryption at rest and in transit, multi-factor authentication, and role-based access controls to ensure that only authorised users can access sensitive information. Organisations can automate review and targeted query-ing of large volumes of documents using Azure Cognitive Services, which contains technologies such as natural language processing (NLP) and optical character recognition (OCR). These capabilities make it easy to convert unstructured data into structured data, improving accuracy and processing speed [9-10].

## OBJECTIVES

- Computer systems engineering can be used to develop a CRM system that increases sales and document control while maintaining high security and privacy.
- Implement the CRM system developed at a car dealership and conduct an audit to validate the sales growth trend by interacting with manufacturing plants.

## METHODS

Figure 1 shows the structure of a CRM designed to meet GM standards. The logistics for collecting documentation that meets this CRM's model can be concentrated in vehicle sales agencies.

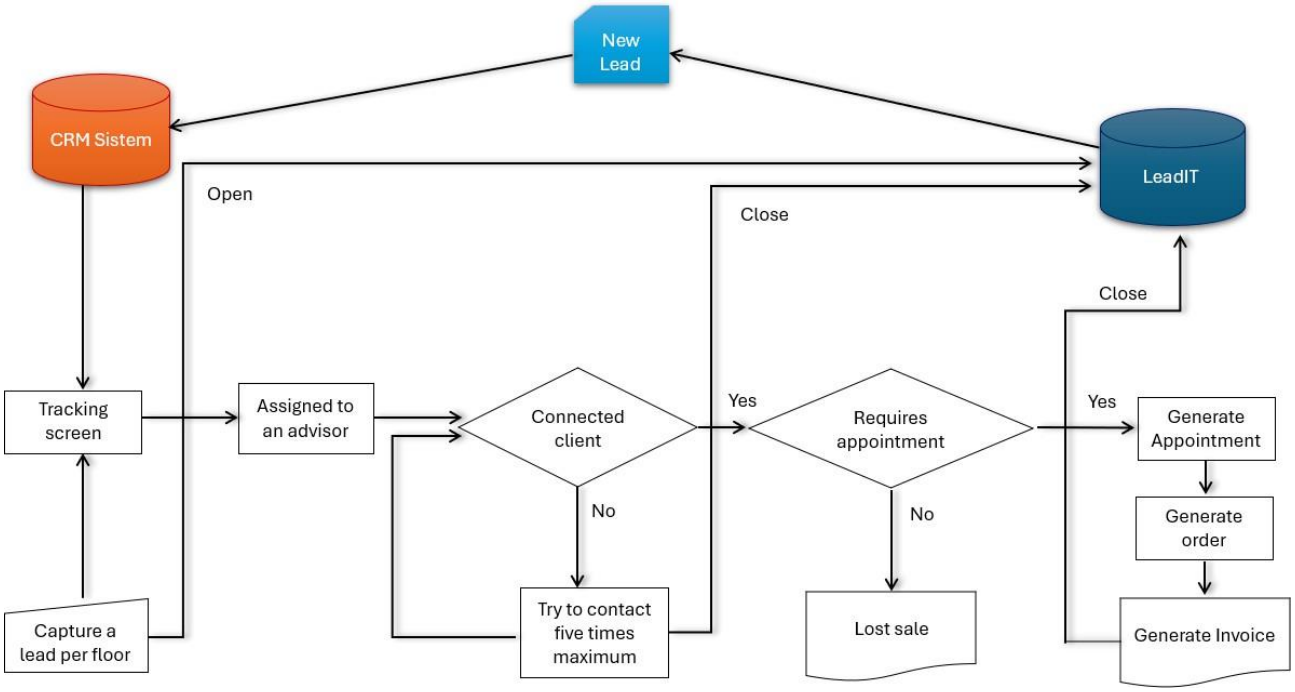



**Figure 1.** Diagram of the logistics for collecting documentation that meets CRM's model to a local vehicle sale agency.

Therefore, in the model proposed for this work, between the first contact with the client and the billing, the sales advisor, the local management, the general management, and the billing agent can manage the documentation requirements. Figure 2 shows the possible responsibilities assigned to each administrative figure involved in the document collection process.

Based on the above, it is possible to focus on three groups of documents. The first group, defined as external files, corresponds to the documents provided by the client to the agency. The second group is the so-called internal files, which the agency generates with the collected information. The last group corresponds to government files issued by entities supported by laws (such as privacy notices). In the development implemented with this project, it was designed that the documents would be collected methodologically through configurations of a graphical user interface of the CRM system. Specifically, the lists in the procedure outlined in Figure 3a were designated.

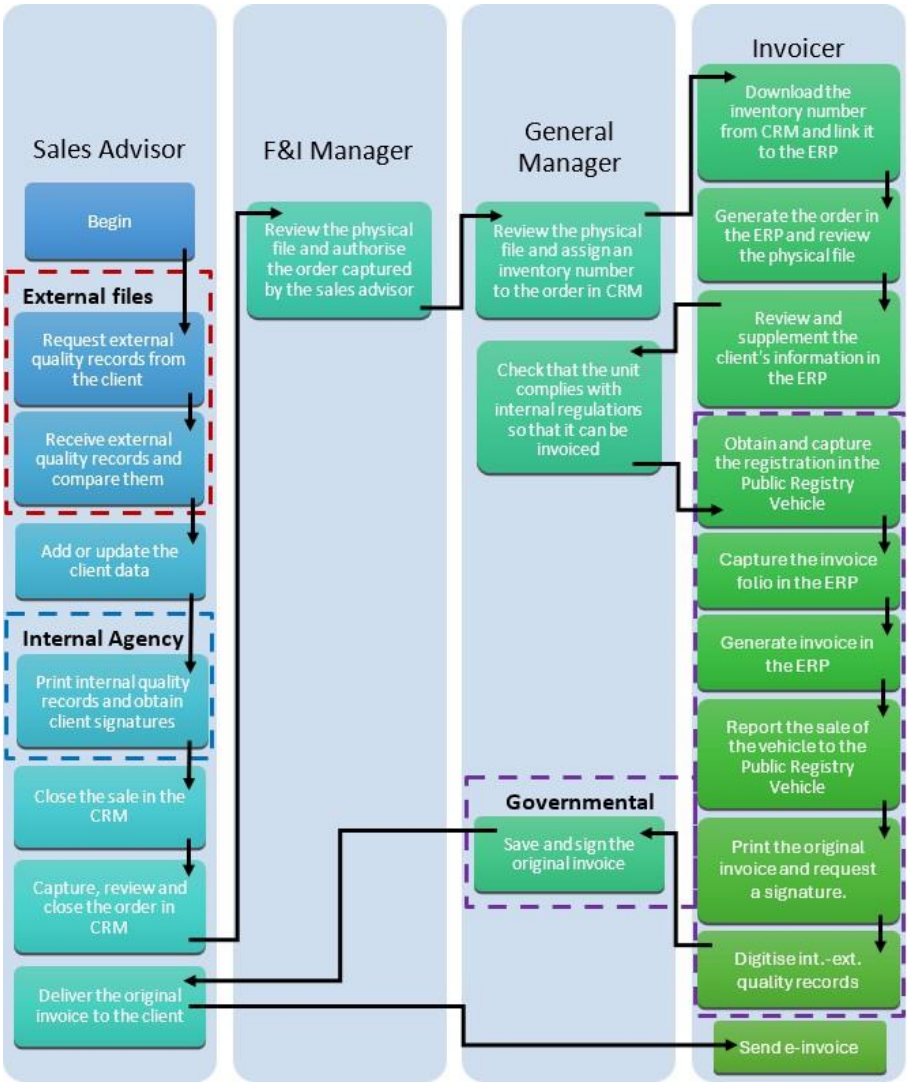
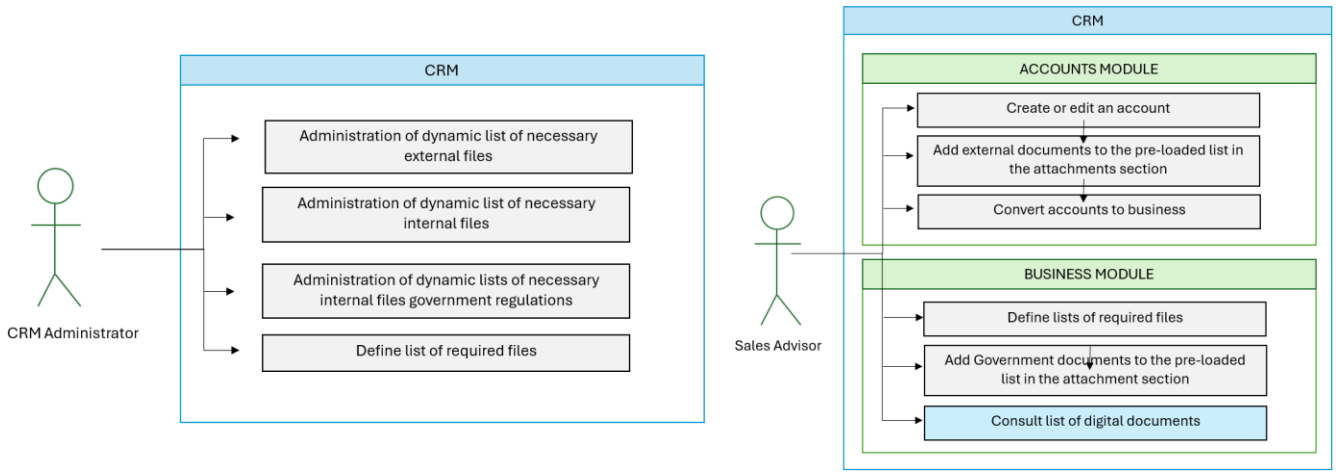



**Figure 2.** Requirements and information flow for the design of the CRM system architecture.




(**a**) (**b**)

**Figure 3.** Needs in the CRM system: (a) Diagram of integration of digitalisation by administrator; (b) Diagram of interaction of the sales advisor with the digitalisation process.

The lists are configurable, so the CRM system administrator can conveniently adjust them to the particular management process. Additionally, in support of logistics, it was determined that a sales advisor initiates a process by digitising the documents requested from the Accounts Module to integrate the list of additional documents required in the Business Module (see Figure 3b).

The digitisation diagram in Figure 4 is established by integrating documentation provided and generated through the CRM system. CRM integration is transferred to the enterprise resource planning system (ERP) to manage legal documents for billing. The transfer process is performed with special and unique key privileges that GM provides for encryption and tracking sales and audit processes.

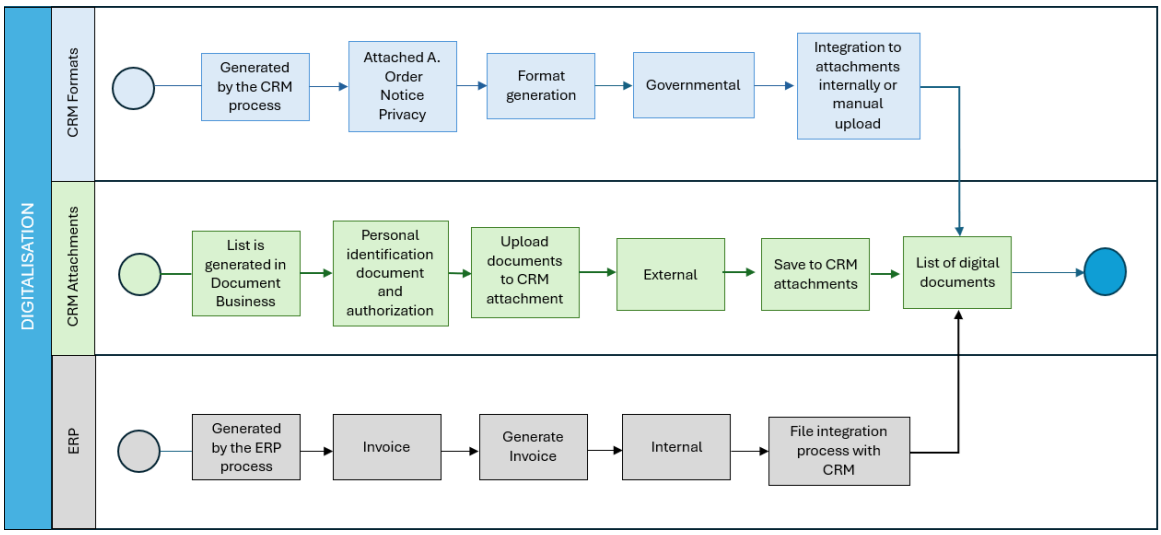



**Figure 4**. Integrating documentation provided and generated through the CRM-ERP system.

Integrating Microsoft Azure tools, a series of digitalised documents were used to perform and evaluate the AI algorithm's training with images to the Prediction API endpoint. Once the API behaviour was configured to meet the processing needs of the images managed by the CRM system, Prediction URL and Prediction-Key references were generated to point to each target image [9].

The CRM system's development with the previously mentioned characteristics was implemented considering LeadIT's concept of distributed functionality through a layer at the LeadIT External WS Layer level, as shown in Figure 5.

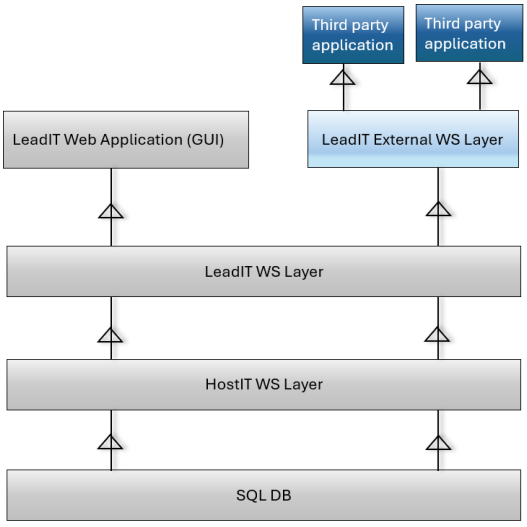



**Figure 5**. Diagram of LeadIT's distributed functionality concept for interaction with the CRM system through the external web services layer.

## RESULTS

Fortunately, the LeadIT WS Layer API provides a robust interface for integrating web services protocols that can be controlled through Simple Object Access Protocol (SOAP) based tools such as SoapUI® [11], ensuring a seamless connection between third-party applications (CRM-ERP system development companies, tax administration services), as well as with external systems (marketing, telemarketing or call centre companies), to facilitate real-time data exchange [12]. Thus, by automating key pro-cesses in this project, such as data synchronisation and lead management, operational efficiency and decision-making accuracy were improved for data integration, lead creation and management, to which even seductive marketing campaigns can be noti-fied.

Once the nodes with which GM establishes the conversion for the connections with the API have been selected, the list of Leads available for the GM distributor with particular records can be obtained, as shown in Figure 6. Generating the base container of the microservices WebSocket is integrated with SOAP and REST as compatible protocols for automating development with the GM external API. The Raw files in the SOAP interface integrate the addressing encoding modules and the record log.

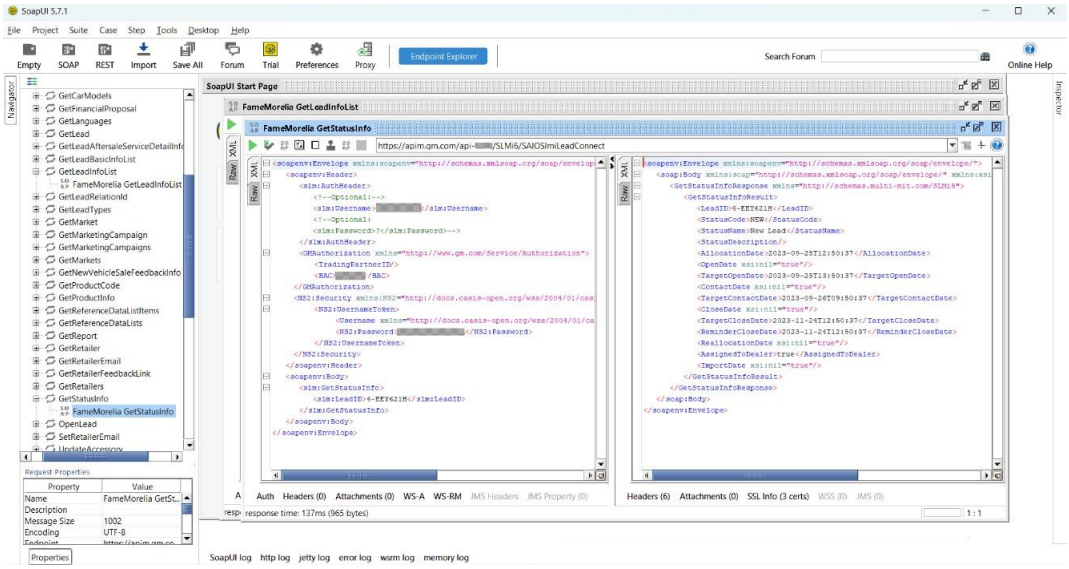


**Figure 6**. Development of communication between CRM systems and the LeadIT WS layer through the SoapUI platform [9].

Registration forms were considered within the CRM's graphical user interface design activities, as exemplified in Figure 7. In this case, the interface links lead management through SOAP to follow up on the External Documents required for a Personal Account.

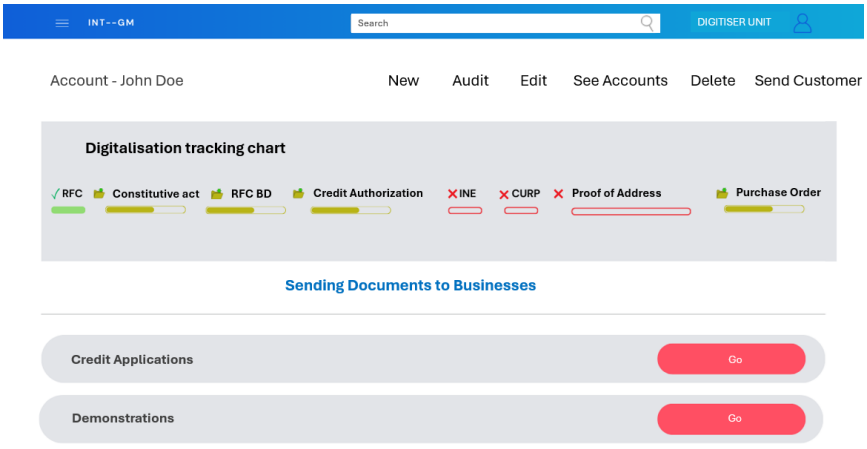



**Figure 7**. Customer account information form for Lead integration into the graphical user interface designed for the local CRM system.

In the interface, a colour code indicates the importance of the documents, with red indicating documents with a high degree of confidentiality according to federal data protection laws.

Once a prospect's account is created, an automated recursive process of updating management data begins so that the information is transferred to the assembly plant at the location where it is located to determine the manufacturing characteristics and thus be able to supply the specific demand in the commercial region. Figure 8 shows the flow of information from the registration unit to the destination in the plant management for decision-making.

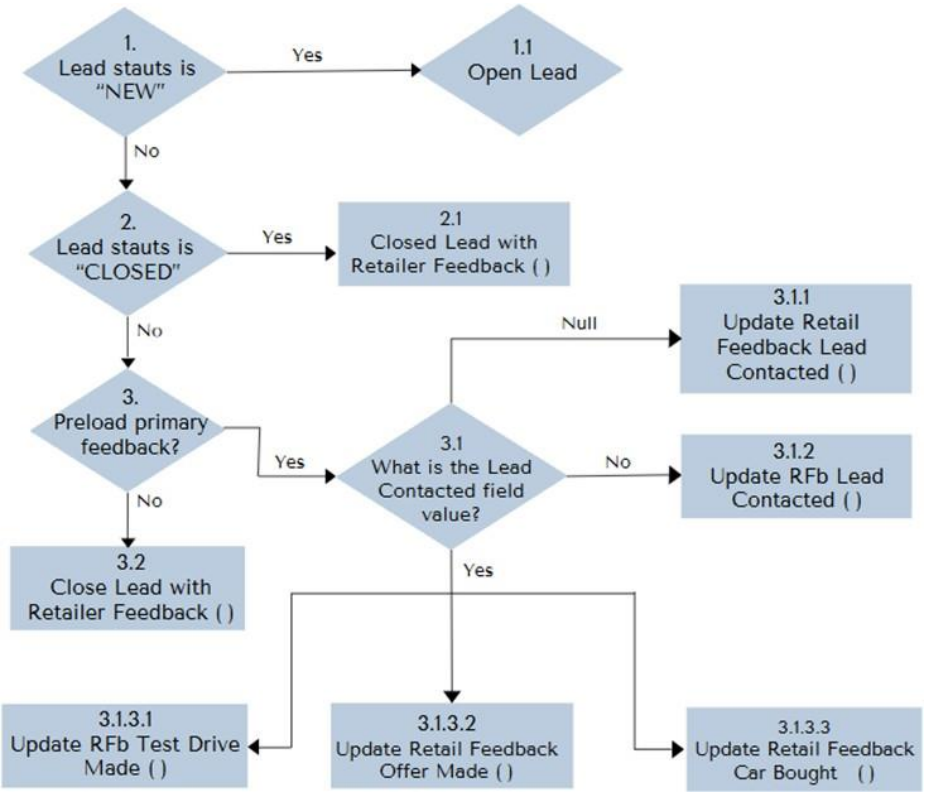
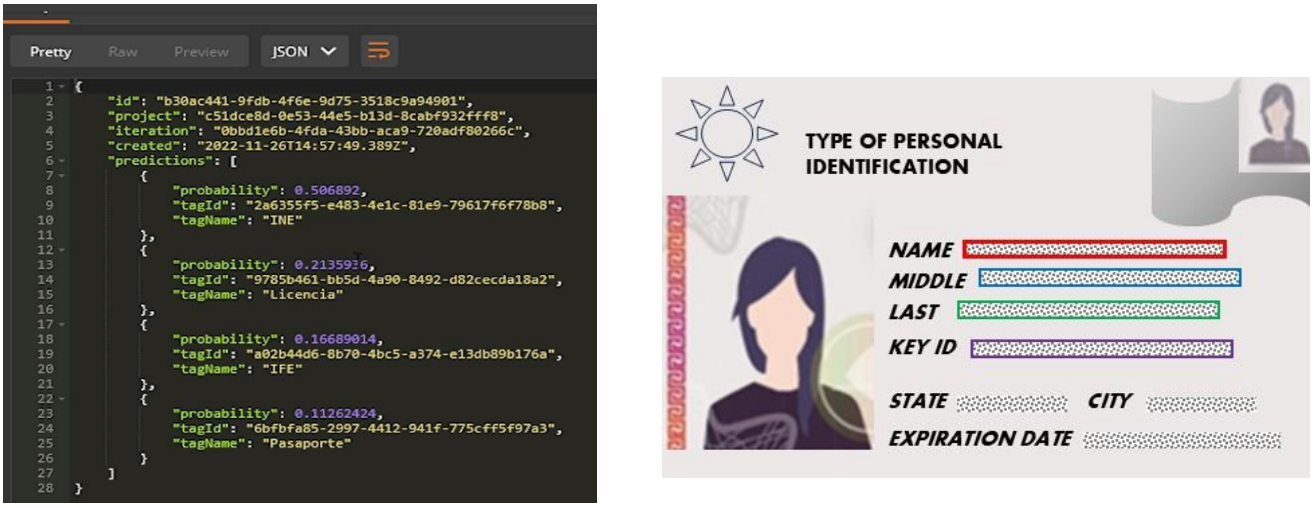



**Figure 8**. The diagram shows the workflow when opening leads and updating their retailer feedback.

In the administration of the information in the plant, the specific production authorisation is established and transferred through the CRM to the site user, resulting in a notification to begin notifying the buyer about the pre-sale process. Each record con-tains the information collected by LeadConnect, an ID provided by the GM interface, as well as data from the campaign to which it belongs and the type of Lead with which it was catalogued, which are integrated into the system throughout the entire sales process to make this communication with the CRM interface automatic. The importance of this process lies in the fact that GM requires constant communication to follow up on the sale. Suppose it detects a drop in customer service at a given source. In that case, the algorithm directs its Leads to another distributor that demands a situation with similar requirements or for positioning in strategic places, including other brands within its automotive group, for promotions that involve capturing the attention of captive or new customers.

The feedback for decision-making takes into account contact information, appointments, calls, data collected from customers and details about sales made. Thus, it was decided to integrate Azure's Cognitive Service tools to ensure data quality. The tool requires training Azure artificial intelligence in its Custom Vision and Form Recognizer versions. In this process, the verification of digitised documents is validated and facilitated by comparing the information captured in their official status with the tax administration services. In this way, the coding of the training process is generated within the project platform in Microsoft Azure. For example, taking a personal identification document as a reference, the system locates key information. It recognises the format to define whether it is a passport or an equivalent document with the same official validity. Figure 9b contains the structure in which the code returns the JSON tags associated with defining the maximum probability of the document type with that of Figure 9b, determining a 92% success rate.




(a) (b)

**Figure 9**. Code extract from the JSON tags (a) associated with defining the maximum probability of the type of personal identification document (b) analysed with the NLP AI linked to the CRM system for the local agency.

Table 1 summarises data from audits conducted in person and virtually at an agency in 2023. As can be seen, the automated system, in this case through the Billed in the CRM system, supported the sale of 36 units in May alone, and the cumulative to October figure was 112 units. The sales were achieved quickly due to the supervision and monitoring of the processes with the distributors and plant. The sales achieved were consolidated after registering 5,315 requests or the registration of potential clients through the Lead management system, which would not have been tangible manually.

**Table 1.** Audited data at the agency with the CRM system implemented between May and October 2023.

| Month (2023) | Recorded by agency | Billed by the agency | Recorded by CRM system | Billed in the CRM system | Total billing |
|---|---|---|---|---|---|
| May | 179 | 85 | 858 | 36 | 121 |
| June | 264 | 96 | 657 | 28 | 124 |
| July | 314 | 115 | 882 | 12 | 127 |
| August | 484 | 103 | 1131 | 13 | 116 |
| September | 266 | 44 | 839 | 13 | 57 |
| October | 302 | 12 | 948 | 10 | 22 |
| Total | 1809 | 455 | 5315 | 112 | 567 |

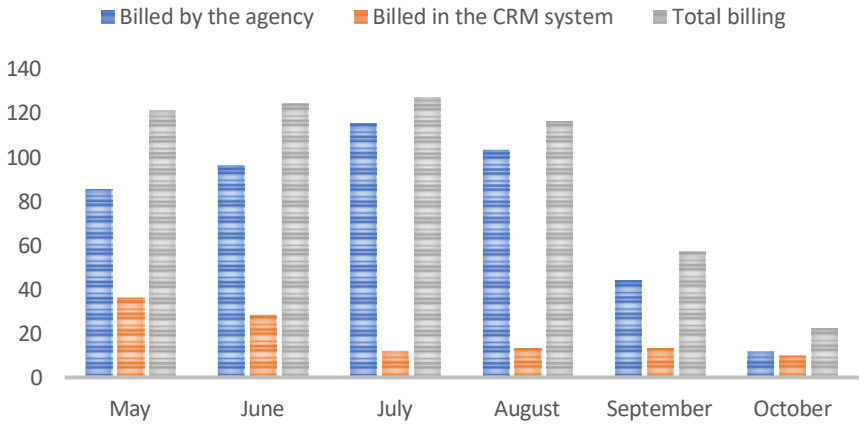



**Figure 10.** Representation of sales was obtained at the local agency, and the CRM system was implemented (quantities represented in Table 1).

In the same example, sales statistics were referenced to the integration of Document Digitization at 19.75% of overall sales, the equivalent of the brown bars shown in Figure 10. Consequently, car sales will also increase sales of services and spare parts. In addition, the record that remains in the CRM generates benefits such as data permeability to evaluate trends and customer tastes for campaigns offering new brand models.

## DISCUSSION

As part of the methodology for developing a CRM-ERP system, the documents necessary to start a purchase-sale analysis process for a vehicle supported by the General Motors company were detected and classified. The platform provided by the company called LeadIT, for the interaction connectivity of its web services, allows the management of information that supports the manufacturing demands of vehicle models and their comfort characteristics, which are liked by customers who comply with the provisions of regulatory documentation according to GM management policies. In this way, by creating a CRM-ERP system that satisfies the requirements of client-agency-GM interaction, an efficient tool is obtained that benefits the three actors. Some general provisions in the design of the CRM-ERP system that were taken into account for the development in this work imply considering that once the design has been approved and it has been integrated as External LeadIT WS Layer:

- The CRM-ERP system provider cannot implement updates without proper authorisation from GM.
- GM will communicate to all agencies associated with the brand the new linked system's existence for transferring Leads to or from a new distributor relative to the weighting of efficiency in the attention to potential clients.

Modules designed by GM implement and monitor a flow of information, promoting its correct and confidential use. This guarantees the system's effective adoption for its long-term effectiveness. The modules implement feedback communication with the CRM through programming with the LeadIT APIs.

Furthermore, one of the outstanding features of the CRM-ERP designed in this project is the integration with Azure Cognitive Services and its Custom Vision and Form Recognizer tools for digitalising documents and recognising forms and text through artificial intelligence mechanisms. The integration adds added value to the CRM-ERP system since it automates the filling of forms and creates an information tracking environment with a higher percentage of success than that done manually through standard input. In this way, more effective control of the bilateral transfer of information is obtained since the designation of product manufacturing by GM and customer satisfaction by the agency depend on it.

Test references must be strategically chosen to achieve efficiency standards in a training structure for artificial intelligence tools. Otherwise, there is a risk of obtaining low performance by generating confusion or disorganised documentation affecting policies and the privacy of sensitive information. In such a case, client administration may be transferred to other agencies with higher-performance CRM platforms under GM's standard procedures.

The statistical data from implementing the CRM-ERP developed for a local agency reflects its positive impact. Nearly 75% of the records captured in the CRM were Leads generated through the CRM system.

## CONCLUSION

In logistics optimisation to improve product positioning and leadership, companies such as General Motors (GM) call for collaboration with CRM-ERP system development companies to provide tools to distributors of their brands and models. Strategically, logistics is based on microservice systems implementing computer programming technology with APIs. Through a service called LeadIT, each CRM system is linked to the information management service layers that GM uses to make decisions about specific products. The selective production strategy allows GM to meet vehicle demands in different markets, effectively and leanly control its consumption, and improve the manufacturing prioritisation relationship in its assembly plants.

Using a CRM-ERP system establishes a competitive advantage for the agencies and GM. On the one hand, it allows agencies to offer an exclusive service, expanding their reach in the market. On the other hand, it will enable GM to optimise its production cells by devoting only to manufacturing the vehicles demanded by each client.

Regarding the coding of the algorithms for the development of the CRM-ERP system microservices associated with the communication with the LeadIT WS layer and with third-party applications, they depended on the capabilities of

the available API tools and the feasibility of implementation through SOAP. However, the appropriate mechanisms existed for successful implementation.

Additionally, the integration of Azure Cognitive Services tools optimised documentation processing, reducing the risk of incorrect references in the integration of the Leads file.

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