EDUCACIÓN
IPSUMTEC
ISSN: 2594 - 2905

FROM PAPER TO THE CLOUD: THE EXPERIENCE OF CREATING DIGITAL INVENTORY CONTROL

FROM PAPER TO THE CLOUD: THE EXPERIENCE OF CREATING DIGITAL INVENTORY CONTROL

García López Serbando[1] , Gonzalez Guarneros Filiberto[2] , López Aburto María Teresa[3] , Martínez Ramírez Violeta[4] , Trejo Herrera Brandon[5]

[1] National Technological Institute of Mexico/Puebla Technological Institute,serbando.garcia@puebla.tecnm.mx , https://orcid.org/0009-0001-9484-9587
[2] National Technological Institute of Mexico/Technological Institute of Puebla,filiberto.gonzalez@puebla.tecnm.mx , https://orcid.org/0009-0002-2078-7376
[3] National Technological Institute of Mexico/Puebla Technological Institute,mariateresa.lopez@puebla.tecnm.mx , https://orcid.org/0009-0001-9300-0678
[4] National Technological Institute of Mexico/Puebla Technological Institute,violeta.martinez@puebla.tecnm.mx , https://orcid.org/0000-0003-1518-786X
[5] National Technological Institute of Mexico/Puebla Technological Institute,i1922186919@puebla.tecnm.mx , https://orcid.org/0009-0003-6943-8553

https://doi.org/10.61117/ipsumtec.v8i2.427

Abstract -- This paper presents the methodology followed in the development of a digital inventory control system implemented in the Secretariat of Planning, Finance, and Administration (SPFA) of the State of Puebla. The project was developed using Google's no-code AppSheet platform. The methodology applied included phases of documentation, requirements analysis, table design, system development, and results evaluation. The main objective was to replace manual and scattered records with an automated, accessible, and secure application.

Keywords-- inventories, Google, system, automation.

Abstract -- This paper presents the methodology followed in the development of a digital inventory control system implemented at the Secretariat of Planning, Finance, and Administration (SPFA) of the State of Puebla. The project was developed using Google's no-code AppSheet platform. The methodology applied included documentation, requirements analysis, table design, system development, and results evaluation. The main objective was to replace manual and scattered records with an automated, accessible, and secure application.

Key words **–** inventories, Google, system, automation.

INTRODUCTION

The project was developed for the Technology Infrastructure Department, an area responsible for supervising, maintaining, and ensuring the operation of the systems, networks, servers, and technological equipment used by the state agency. It is responsible for ensuring that digital services operate securely, efficiently, and continuously, providing technical support technical support and technological solutions to all areas that make up the SPFA [1].

Its functions include managing technological assets, providing support to internal users, coordinating IT infrastructure projects, and managing the digital tools and platforms used by Secretariat staff. Given that this department handles a large amount of technological equipment and supplies, it is crucial to have an efficient inventory control system, which led to the development of this project.

In any business unit or public sector institution, efficient and balanced inventory management is a top priority, as it must ensure the minimization and prevention of operational errors in the organization's day-to-day activities [2].

What are no-code platforms?

According to the SAP website [3], they are defined as platforms dedicated to providing a development approach for the creation of simple web applications, apps, automations, and IoT integrations with visual tools, simply by dragging components without writing a single line of code. This makes them functional for those who are experts in their administrative area but are not experts in information technology. These platforms consist of the following:

1. Drag-and-drop tools.
2. WYSIWYG ("what you see is what you get") editor.
3. End-to-end environment. Integrated design management and graphic output environment.

From the CLOUD.GOOGLE website [4], Google defines AppSheet as a no-code tool for creating and extending applications where business processes can be quickly automated for all types of web applications or apps, computers, and tablets

Receipt: October 16, 2025 | Acceptance: November 23, 2025 | Publication: December 19, 2025

from various data sources such as Google spreadsheets. It also generates actions and views with user intent using Google's AI and machine learning.

AppSheet was acquired by Google in 2020 and has since integrated native applications with Google Sheets and Google Forms, as well as AWS DynamoDB, Salesforce, Office 365, and Box, among others. What is relevant is not only its suitability for inventory management applications, but also the fact that it offers the most demanding security protocols, as well as compliance with the General Data Protection Regulation (GDPR) [5]. An intent refers to Android components that can request functionality from other Android components. For example, when you open a social media app and want to take a photo from there, an Android intent intervenes [6].

General objective:

Develop an application in AppSheet for inventory control in the state agency, facilitating the management, updating, and monitoring of products through a user-friendly interface.

Specific objectives:

1. Gather customer requirements in the area of Technology Infrastructure Management for analysis.
2. Design the FRONT-END according to the company's organizational standards
3. Design the relational database for the development of the BACK-END.
4. Implement the site on the server for launch.

Scope.

- Accessibility from mobile devices and computers.
- Generation of automated reports on stock and inventory movements.
- Implementation of a real-time registration and update system.

Limitations.

- Updated database of technological infrastructure assets.
- Intended exclusively for authorized Google users in the Secretariat of Planning, Finance, and Administration.

State of the Art

The Peruvian degree study "Inventory management and commercial performance of the leading cloud company Huánuco 2019" [7] highlights the need to integrate a computer system into the inventory control process that promotes customer compliance through precise logistics and warehouse acquisitions without the risk of minimum stock levels, all of which can ensure the company's commercial performance.

Doctoral thesis "Proposal for a Cloud Computing adoption model in the implementation of an inventory control system in SMEs in the hardware sector in the city of Machala" published [8] in Ecuador conducts a study on micro-enterprises in the city of Machala to find out what type of technological applications they use for inventory control. The degree study reflects a minimal trend of 4% adoption of cloud systems and that Excel is still used in almost 21% of the micro-enterprises in the sample. Another 5.2% do it manually. The most digitized companies use ERPs or their own systems for inventory control.

The thesis "Development of an automated inventory management system using object recognition with OpenCV and convolutional neural networks in cloud environments" [9] shows an implementation with AI and machine learning, which allows companies to optimize operations and improve control over their assets based on a cloud infrastructure using technology where the code offers great scalability successfully and without manual intervention.

The thesis entitled "Design of software architecture for an inventory management prototype with cloud technologies" [10] presents a cloud-based inventory management system that offers small and medium-sized business units an affordable real-time technological solution to improve inventory control. Because it is cloud-based, the system allows users to access information at any time and from any device with an internet connection.

DEVELOPMENT

The methodological strategy was based on a practical approach aimed at addressing the lack of a formal inventory control system at the SPFA. A schedule of activities was established that included: requirements gathering, system design, pilot testing, implementation, and validation. The use of AppSheet was justified by its accessibility, affordability, and adaptability to the services already available in Google Workspace. Likewise, the aim was to minimize development costs and ensure compatibility with mobile devices and computers.

Documentation stage:

During this stage, existing information on the Infrastructure department's technological assets was compiled. The limited use of manual records on printed sheets or in Excel was identified, which made asset management difficult. The department already had Google Workspace, which allowed Google Sheets to be integrated as a database linked to the system, optimizing data capture and updating.

Analysis stage:

During this stage, meetings were held with the head of operations and staff in the area to define the requirements. From this interaction, it was established that the system should include the following entities:

1. Area
2. Assets
3. Brand

Receipt: October 16, 2025 | Acceptance: November 23, 2025 | Publication: December 19, 2025

4. Movements
5. Suppliers
6. Responsible parties.

The technologies to be used were also defined: AppSheet as the development environment and database manager, basic SQL as support, and Google Sheets as the central repository.

System design and development:

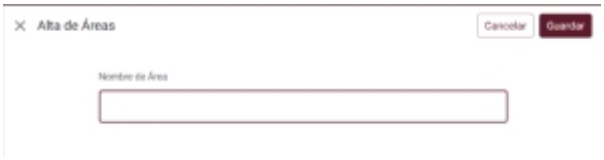
The design included the creation of relational tables with unique identifiers generated automatically using functions such as: UNIQUEID() and TODAY(). Each table was associated with its corresponding relationships, allowing for real-time traceability of goods. An entity-relationship diagram was designed to visualize the structure and dependencies between tables. The user interface was developed with user-friendly forms, ensuring ease of data capture and consultation.

1. Area

The following data will be requested from the user to register an area:

- Area:
- Name of the area. See image 1.

Image 1. *Area capture form*.



Source: *Own creation* (2025).

Why only one?

It was established that only the name of the area would be requested in order to know the location of the property, since a unique identifier called "PK_area" is generated for it and it will be related to the tables:

- Properties
- Responsible (for area)

2. Assets

This is the information that will be requested from the user to register an asset:

- Assets:
- Supplier:
- Brand:
- Name of the asset:
- Quantity:
- Type:
- Date of registration:
- Date of purchase:
- Area to which it belongs:

o The option to register a new area is also enabled. See image 2.

Image 2. *Area registration form*.

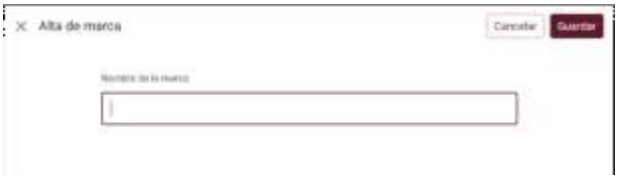
Source: *Own creation* (2025).

3. Brand

Only one piece of information is recorded for the brand, which is the "Brand name." This is solely to establish a link with the goods table, so that when a good is queried, the brand of the good is displayed.

- Brand:
- Brand name. See image 3.

Image 3. *Brand registration form*.



Source: *Own creation* (2025).

4. Movements

This information will be requested from users in order to report the movement of goods:

- Movements:

o Responsible party (name of the person making the movement).

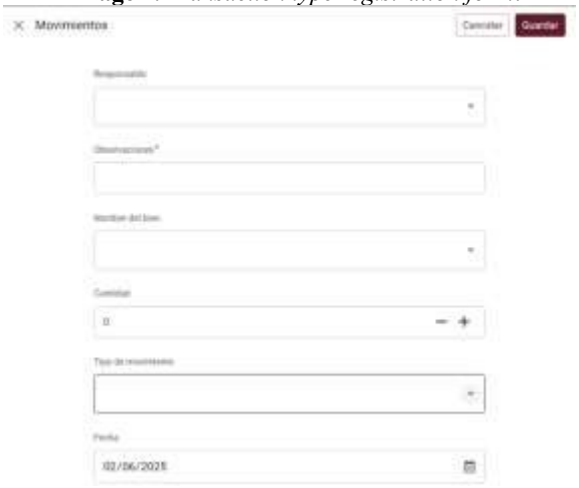
  - Comments.
  - Name of the asset.
  - Quantity.
  - Type of movement:
    - Add
    - Add
    - Repair/Maintenance
  - Date.

For the "PK_movement" data type, the "UNIQUEID()" code was added. This generates a unique identifier that is assigned to each movement made, in order to know who made the movement and when. For security reasons, this is not shown to the user when the movement is made. This identifier can only be seen in the administrator's spreadsheets.

Receipt: October 16, 2025 | Acceptance: November 23, 2025 | Publication: December 19, 2025

user when the movement is made. This identifier can only be seen in the administrator's spreadsheets.
For the "movement_type" data type, an "ENUM" data type was selected. This means that a list of options for the type of movement to be made will be displayed.
For the "date" data type, the code "TODAY()" was added so that, when the movement is made, the date of that day automatically appears. See image 4.

Image 4. *Transaction type registration form*.



Source: *Own work* (2025).

5. Suppliers

This is the information that users will be asked to provide in order to register a supplier(s):

- Supplier name
- Email
- Contact phone number
- Address. See image 5.

Image 5. *Registration form for type of.*

Source: *Own creation* (2025).

6. Responsible

The following is the information required to register an area manager.

- Person in charge:
- Position
- Name of manager
- Area:
  - A list of the areas that have been registered is displayed.

Image 5. *Area manager registration form*.

Source: *Own creation* (2025).

DISCUSSION AND ANALYSIS OF RESULTS

Results obtained:
The final application allowed for the complete digitization of inventory control. Notable features include: login with institutional email addresses, screens for registering and consulting assets, movement control, and management of suppliers and responsible parties. The benefits obtained were significant: reduction of human error, accessibility from any device, automatic report generation, and increased security through access control.
Before and after comparison:
Before:

- Manual records.
- Frequent errors.
- Limited access to information and no clear reports.

- Automated digital system.
- Real-time information.
- Security with authorized users and automatic reports ready for decision-making.

In short, the change was from a manual system to a modern technological solution that does respond to the needs of the area.

Table 1. *Comparative table*.

Aspect	Before (previous situation)	After (AppSheet)
Inventory record	Manual, on printed sheets or Excel.	Automated with AppSheet and Google Sheets.
Accessibility	ly on local computers at .	Real-time access from any device.
Data update	Infrequent, with risk of duplication.	In real time, with centralized data.
Information security	No access control.	Control through institutional emails and user roles. .
Asset query	Slow, with local search.	Fast, with filters and interactive buttons.
Reports	Prepared manually on a local computer.	Automatically generated from the application.
Risk of errors	High, due to manual data entry and lack of validation.	Low, with automatic validations and mandatory fields.
Movement control	No Formally documented.	Detailed tracking with movement history.

Source: *Own elaboration* (2025).

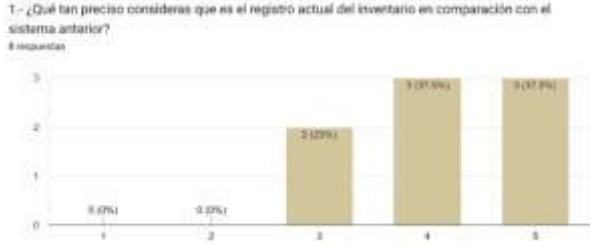
Receipt: October 16, 2025 | Acceptance: November 23, 2025 | Publication: December 19, 2025

Analysis of surveys and their graphs

In order to evaluate the functionality, usability, and overall perception of the developed application, surveys were administered to personnel in the Technology Infrastructure area. The responses obtained made it possible to identify the degree of acceptance of the system, as well as to detect areas for improvement.

The following images show some screenshots of the questions and the results obtained, including graphs summarizing the most relevant responses on topics such as ease of use, system efficiency, visual design, and usefulness in daily activities.

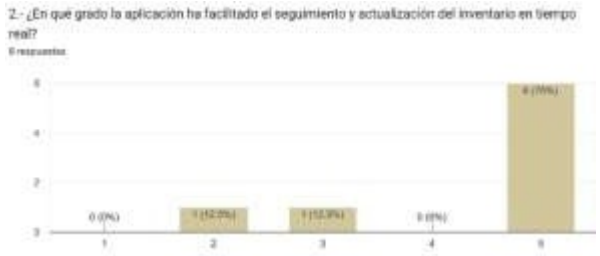
Graph 1. *Question 1 on application functionality.*



Source: *Own elaboration* (2025).

The accuracy of the inventory registration process shows a high level of satisfaction. See graph 1.

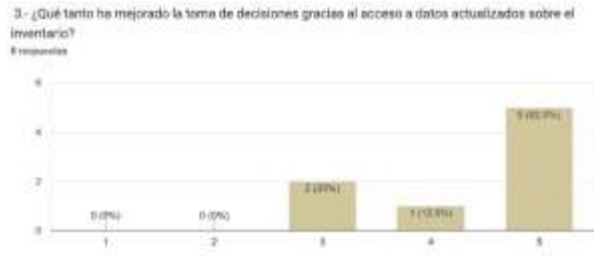
Graph 2. *Question 2 on application functionality*.



Source: *Own elaboration* (2025).

The score received from the evaluation is very favorable in terms of monitoring and updating in line with the expected times. See Figure 2.

Graph 3. *Question 3 on application functionality*.



Source: *Own elaboration* (2025).

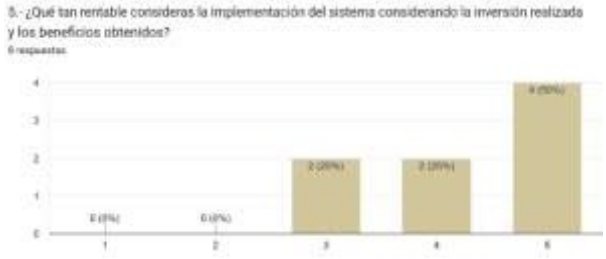
The functionality of the application is mostly rated highly. See graph 3.

Graph 4. *Question 4 on application functionality*.

Source: *Own elaboration* (2025).

The aspect evaluated on the topic of accessibility on different devices is very well rated, satisfying the needs of the end user. See graph 4.

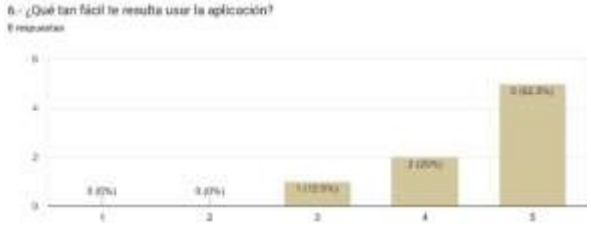
Graph 5. *Question 5 on application functionality*.



Source: *Own elaboration* (2025).

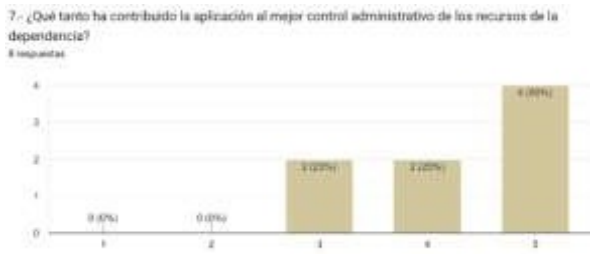
Graph 5 shows that more than 50% agree that the low investment in application development is profitable in terms of the benefits obtained from process automation. See graph 5.

Figure 6. *Question 6 on application functionality*.



Source: *Own elaboration* (2025).

Graph 7. *Question 7 on application functionality*.



Source: *Own elaboration* (2025).

The results show a positive trend, as most participants rated the application at the highest levels of the scale (options 4 and 5). This reflects good acceptance in terms of accessibility, organization of information, and ease of consultation and registration. In addition, some observations were identified that could be considered for future improvements, such as the incorporation of new features or visual adjustments to the interface.

Discussion

The Quixy portal [11] states that the use of no-code platforms provides benefits in terms of time savings and minimal financial investment, "agility and convenience," and even more so in public institutions, as is the case with the work in question.

Experts at ONEGOLIVE [12] state that the low cost and powerful performance of no-code platforms favors the creation of customized applications. In the case of this application, it provided significant savings for the public agency in question.

Choosing innovative tools in the development of this automated inventory control system allows for another "real-life success," as companies such as Amazon and Airbnb have opted for no-code platforms to streamline and innovate quickly [13].

CONCLUSIONS

Evaluation and validation:

In order to validate the usefulness of the system, surveys were conducted among operational staff. The results reflected positive acceptance, with high ratings for accessibility, information organization, and ease of use. Among the areas for improvement identified, it was suggested that new features be incorporated, such as photographic records of assets and automatic alerts.

Feedback:

The project demonstrated that no-code tools represent a viable alternative for public institutions seeking to digitize internal processes. The experience gained highlighted the importance of keeping records up to date, ensuring proper user management, and considering staff feedback during development. The impact was reflected in greater transparency, efficiency in asset management, and optimization of institutional resources.

In conclusion, the methodology implemented made it possible to achieve an adaptable, replicable technological solution aligned with the principles of digital government. The development of the AppSheet application for the SPFA in Puebla is a success story that can serve as a model for other public agencies, demonstrating the potential of no-code platforms in modern inventory management.

Future Work

Once the application has been implemented, it is possible to include improvements to inventory control in the medium term by integrating technologies such as the Internet of Things (IoT), the use of drones for inventory and AI in demand forecasting and warehouse level optimization [14].

The experts at Defontana [15] reiterate the importance of advanced analytics, which incorporates data processing and analysis functions for effective informed decision-making that enhances efficiency, profitability, and accuracy in inventory management and control processes.

BIBLIOGRAPHY

[1] Government of the State of Puebla. Organization Manual of the Ministry of Administration [Internet]. Puebla: Orden Jurídico Poblano; 2020 [cited 2025 Aug 24]. Available at: https://ojp.puebla.gob.mx/media/k2/attachments/Manual_de_Organizacion_de_la_Secretaria_de_Administracion_3072020.pdf

[2] Jasmin. Inventory control: what is it and why is it important? [Internet]. 2019 Apr 10 [cited 2025 Aug 24]. Available at: https://www.jasminsoftware.es/blog/control-de-inventario/

[3] SAP. What is no-code development? [Internet]. 2025 [cited 2025 Aug 24]. Available at: https://www.sap.com/spain/products/technology-platform/build/guide-to-no-code-development.html https://cloud.google.com/appsheet?hl=es

[4] Google Cloud. AppSheet [Internet]. [n.d.] [cited Aug. 24, 2025 24]. Available at: https://cloud.google.com/appsheet?hl=es

[5] Alegria Group. What is Google AppSheet and when should I use it? [Internet]. Feb. 3, 2023 [cited Aug. 24, 2025 24]. Available at: https://www.alegria.group/es/blog/google-appsheet

[6] Envato Tuts+. What are Android Intents? [Internet]. Aug. 24, 2017 [cited Aug. 24, 2025]. Available at: https://code.tutsplus.com/es/what-are-android-intents--cms-29335t

[7] Alcedo Quijano LE. Inventory management and commercial performance of the company Líder Cloud Huánuco 2019 [Internet]. Peru: University of Huánuco; 2020 [cited 2025 Aug 24]. Available from: https://repositorio.udh.edu.pe/handle/123456789/2398

[8] León León EE. Proposal for a Cloud Computing adoption model in the implementation of an inventory control system in SMEs in the hardware sector in the city of Machala [Internet]. Ecuador: University

of Machala; 2021 [cited 2025 Aug 24]. Available from: http://204.199.82.243:8080/handle/123456789/1465
[9] Álvarez Martínez M. Development of an automated inventory management system using object recognition with OpenCV and convolutional neural networks in cloud environments [Internet]. Madrid: Complutense University of Madrid; 2024 [cited 2025 Aug 24]. Available at: https://docta.ucm.es/entities/publication/d7f19d27-d109-4ec9-96d4-d6ba7201342e
[10] Moreno Alfonso FS, Villa Ahmad DA. Software architecture design for an inventory management prototype using cloud technologies [Internet]. Bogotá D.C.: Politécnico Grancolombiano; 2023 [cited 2025 Aug 24]. Available at: https://repository.poligran.edu.co/handle/10823/
[11] Quixy. The top 15 benefits of no-code application development [Internet]. Jan. 8, 2025 [cited Aug. 24, 2025]. Available from: https://quixy.com/blog/top-benefits-of-no-code-app-development/
[12] ONEGOLIVE. What is No-Code? 15 reasons to use this technology [Internet]. May 4, 2021 [cited 2025 Aug 24]. Available at: https://www.onegolive.com/no-code-tecnologia-empresa/
[13] OLLABOT. Advantages of no-code platforms: 5 key benefits revealed [Internet]. 2025 Jul 16 [cited 2025 Aug 24]. Available at: https://ollabot.com/es/ventajas-de-las-plataformas-sin-codigo/
[14] Evolving Logistics. Five technological innovations that are redefining inventory management [Internet]. 2025 [cited 2025 Aug 24]. Available at: https://logisticaevolutiva.puntanetwork.com/innovacion-en-la-cadena-de-suministro/5-innovaciones-tecnologicas-estan-redefiniendo-gestion-inventarios/
[15] Defontana. The future of inventory management: 6 trends in software [Internet]. 2025 [cited 2025 Aug 24]. Available at: https://www.defontana.com/blog/pe/el-futuro-de-la-gestion-de-inventarios-6-tendencias-en-software

Table of Contribution Roles

Role	Author(s)
Conceptualization	Brandon Trejo Herrera
Data Curation	Brandon Trejo Herrera
Methodology	Filiberto Gonzalez Guarneros
Project Management	María Teresa López Aburto
Resources	Review and editing – Violeta Martínez Ramírez
Software	Brandon Trejo Herrera
Supervision	Serbando Garcia Lopez
Validation	Brandon Trejo Herrera
Visualization	María Teresa López Aburto
Writing	Original draft – Violeta Martínez Ramírez
Editing	Revision and editing – Violeta Martínez Ramírez

Receipt: October 16, 2025 | Acceptance: November 23, 2025 | Publication: December 19, 2025