

1. COMPANY OVERVIEW

Introduction

in this chapter, we will present the company first, then we will present the project context,problem and the requirements of the project.

1.1. Lear company

Lear Corporation is a world leader in the automotive technology industry, specializing in the complex design and lean manufacturing of seating solutions and electrical distribution systems. Lear has a massive employee base of over 170,000 committed workers, who are dispersed in a whopping total of 38 countries worldwide. Lear proudly services almost every major automaker in the world.



Figure 1: LEAR Corporation logo

1.2. History of Lear Corporation

Lear Corporation was founded in 1917 as the American Metal Products Company in Detroit, Michigan. Initially, the company specialized in manufacturing tubular, welded, and stamped assemblies for the automotive and aircraft industries. Over the decades, Lear underwent several transformations, expanding its capabilities and diversifying its product portfolio.

Key milestones in Lear’s history include:

Table 1: Lear's history timeline

1960s-1970s	Expansion into automotive seating and interior systems.
1988	Renamed Lear Corporation after a series of acquisitions and restructuring.
1994	Became a publicly traded company, listed on the New York Stock Exchange.
2000s	Strategic acquisitions, including United Technologies’ Automotive unit, strengthened its position in electrical systems.
2010s-Present	Focused on innovation, sustainability, and intelligent seating technologies, with significant investments in research and development.

1.3. Products and Services

Lear Corporation operates under two major business segments: Seating and E-Systems.

1.3.1. Seating

Lear is one of the world’s leading manufacturers of complete automotive seat systems and related components. The seating division focuses on:

- Seat Structures & Mechanisms: Development of durable and lightweight seat frames.
- Foam & Comfort Solutions: Advanced foam technologies for enhanced comfort.

- Trim & Surface Materials: High-quality leather, fabric, and synthetic materials.
- Seating Electronics: Integration of climate control, massage functions, and safety features.



Figure 2: Seat made by lear

1.3.2. E-System

Lear's E-Systems division specializes in electrical and electronic components for vehicles, including:

- Wiring Harnesses: Advanced connectivity solutions for automotive electrical systems.
- Power Distribution Units: Smart distribution of electrical power within vehicles.
- Connectivity Solutions: Infotainment, communication modules, and cybersecurity systems.
- Battery Management Systems: Technology supporting electric and hybrid vehicle batteries.



Figure 3: E-system fo lear corporation

1.4. Global Presence

Lear Corporation operates in 39 countries with more than 257 locations worldwide. Major production and engineering facilities are located in North America, Europe, and Asia, ensuring close collaboration with leading automakers.



Figure 4: LEAR implantation in the world

- United States: Headquarters in Southfield, Michigan, and several manufacturing plants.
- Mexico: A major production center for automotive seating and wiring systems.
- Germany & UK: European R&D and innovation centers.
- China & India: Growing markets for electric and connected vehicle technologies.

1.5. Lear Corporation in Tunisia

Over the last few years, Tunisia has increasingly become an important and strategically located production base for Lear, mainly due to the availability of a highly qualified and skilled workforce, competitively low and affordable costs of production, and its geographical location in very close proximity to Europe. Due to these favorable factors, the company has been able to set up and is now running several plants in the country.

1.5.1. Tunisian Facilities

Lear Corporation has several facilities in Tunisia, including:

- Bir El Bey Facility: Specializes in electronic component production for automotive applications.
- Menzel Bourguiba Plant: Involved in assembly, wiring systems, and quality control.
- Bizerte Industrial Complex: Opened in 2023, this facility is expected to employ over 7,000 workers by 2027, focusing on advanced automotive technologies.

1.6. Problem Statement

The Menzel Bourguiba facility, which shows growth and modernization, experiences standard beginning challenges in its new manufacturing operations.

Plant visits alongside worker interviews confirmed that the facility's maintenance management systems remained paper-based without any digital transformation. The maintenance teams received machine fault reports exclusively through paper documentation while the operators provided verbal fault information.

The operational difficulties result in decreased production efficiency and longer response times and worsened equipment durability throughout the lifecycle.

Figure 5: Work order:

Code Défaut 1 (What)	Code Défaut 2 (Why)	Code Défaut 3 (Where)	Pièce de rechange: Réf	Quantité
1 Mécanique	1 Cassure	2 Sewing		
2 Electrique	2 Usure	3 Line UP		
3 Pneumatique	3 Saleté	4 Punch		
4 Hydraulique	4 Blocage	5 Fawl		
5 Maintenance	5 Desserrage	6 Komax		
6 Logiciel	6 Surcharge	7 Ondale		
7 Inspection	7 Mauvaise utilisation	8 Amada		
	8 Mauvaise Réglage	9 Imprimante		
	9 Alimentation électrique	10 Lecteur Code à Barre		
	10 Court circuit	11 Lampe éclairage		
		12 Caméra		
		13 Presse sertissage		
		14 PC		
		15 Dérouleuse		
		16 Armoire électrique		
		17 Bloc électrovanne		
		18 système de guidage		
		19 Tete Sewing		

Figure 6: Intervention form

1.7. Proposed Solution

The proposed solution to the problems listed above would address them through the use of a Web-Based IIoT Monitoring System with an in-house tailored GMAO (CMMS) module. The proposed system is to be deployed on one prototype sorting machine, with simulation of the real-world factory environment in the Menzel Bourguiba factory.

By showing the integration of Siemens S7-1200 PLC, edge communication using Python, and maintenance portal using Django, the project has immediate applicability to Lear's broader Industry 4.0 vision:

- Improve fault visibility and response time,
- Reduce machine downtime,
- Enable data-driven maintenance planning,
- Provide a low-cost, scalable alternative to SCADA systems.

By implementing this system at Lear Corporation, the factory can significantly enhance its maintenance efficiency, reduce unplanned downtime, and improve overall operational performance.

Conclusion

This chapter provides the context to the project by tracing the history of Lear Corporation, identification of the major maintenance issues, and offering the suggested Webapp solution.

The Later chapters provide further details regarding the design, execution, and evaluation of the combined system, its merits, and how it can benefit Lear's business.