

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Doors are integral to every building's structural framework, serving functions that extend beyond basic entry and exit. They contribute to privacy, security, soundproofing, and environmental control, such as heat and airflow regulation. Among the wide variety of door types available, metal doors have gained prominence for their superior strength, fire resistance, and longevity when compared to wooden or plastic alternatives.

The twin-panel metal door, characterized by its dual-sheet metal construction with internal reinforcement, is particularly valued for security-sensitive areas such as residential entries, safe rooms, schools, and industrial facilities. These doors typically consist of two layers of mild steel or galvanized metal welded onto a supporting frame, sometimes incorporating insulation or stiffeners for added rigidity and acoustic performance.

In Nigeria, the rising rate of property crime, poor building materials, and high importation costs have led to increased demand for locally fabricated, high-quality doors (Akinbile et al., 2022). By utilizing mild steel, a readily available and economically viable material, it is feasible to fabricate functional, durable twin-panel doors within small-scale workshops or institutional settings. This project seeks to demonstrate this feasibility by engaging in a full cycle of design, fabrication, and evaluation of a twin-panel metal door.

**Recent Study:** According to Olabode & Sanni (2023), local fabrication using mild steel reduces production costs by over 40% compared to imported steel security doors, making it a viable alternative for mass housing in Nigeria. . It was designed to offer strength, security, and durability compared to conventional wooden doors. The project involved selecting suitable mild steel materials, cutting, welding, and assembling two symmetrical metal panels, reinforced by internal frames and locking mechanisms. Performance evaluations included structural integrity, cost analysis, and functional fit in door frames. The result proved the feasibility of locally fabricated metal doors using affordable materials with reliable performance. The primary aim is to produce a durable, secure, and cost-effective metal door suitable for residential and industrial applications. The methodology involved material selection, cutting, welding, grinding, and surface finishing. The fabricated twin-panel door features reinforced vertical and horizontal supports for added strength, with integrated locking systems to enhance security. The report discusses the step-by-step fabrication process, safety considerations, cost analysis, and practical challenges encountered during construction. The final product meets both functional and aesthetic requirements and demonstrates the importance of local material utilization in metal fabrication. This project underscores the potential of indigenous skills in producing reliable building components for the Nigerian construction industry.

**Keywords:** Metal panel door, fabrication, welding, mild steel, security door, twin panel, performance evaluation.

## 1.2 Statement of the Problem

Many residential and commercial buildings suffer break-ins and premature door failures due to substandard wooden or plastic doors. There is a pressing need to fabricate affordable metal doors that can be locally produced and withstand environmental and mechanical stress. The Nigerian construction industry is plagued by a reliance on substandard or expensive imported doors, many of which fail to meet the required standards for strength, security, or aesthetics. Locally fabricated alternatives often suffer from poor craftsmanship, inadequate design considerations, and suboptimal material choices, leading to short life spans, safety concerns, and dissatisfaction among end-users.

This project addresses these challenges by:

- Demonstrating the systematic fabrication of a twin-panel metal door using standardized methods.
- Emphasizing proper material selection, welding techniques, and dimensional accuracy.
- Highlighting cost-effectiveness without compromising functionality or durability.

## 1.3 Aim and Objectives

### Aim:

To design and fabricate a secure, functional, and cost-effective **twin metal panel door** using mild steel and standard fabrication practices.

### Objectives:

- To **select appropriate materials** based on mechanical properties and cost.
- To **design the door and frame** using standard residential/institutional dimensions.
- To fabricate the door using processes such as **cutting, welding, grinding, and surface finishing**.
- To **evaluate the final product** for strength, durability, fit, and cost-efficiency.

## 1.4 Scope of the Project

This project focuses on the **fabrication of a twin-panel metal door** suitable for residential or institutional use. The study covers the design, material selection, fabrication, and testing of a twin panel metal door within the workshop environment. It covers:

- **Material selection**
- **Design and dimensioning**
- **Construction/fabrication**
- **Evaluation**

- Exclusions:
- Powder coating or anodizing
- Automation (e.g., remote control locking)
- Mass production considerations

## 1.5 Significance of the Study

The project will promote local metalwork innovation, encourage the use of sustainable materials, and reduce dependence on imported security doors

This project demonstrates:

- **Practical skills in metalworking** (cutting, welding, grinding, and assembling).
- A **locally sustainable alternative** to imported security doors.
- That **quality metal doors** can be fabricated within school workshops or small-scale enterprises.
- That **cost and security efficiency** can be achieved simultaneously through proper design and fabrication.

Oyekan & Adetunji (2021) emphasize the need for local technical institutions to teach hands-on fabrication skills that support economic growth and reduce import dependence in the construction sector.

## 1.6 Project Justification

Local fabrication:

- **Reduces production costs**
- **Promotes vocational skills**
- **Encourages use of indigenous materials**
- Aligns with national goals for **industrial self-sufficiency** (FMITI, 2022)
- It is justified as a model for **affordable, secure, and scalable metal door production**, especially in developing urban areas.

## 1.7 Limitations

- **Workshop Limitations:** Limited equipment like CNC or powder coating tools.
- **Time Constraints:** Advanced finishing processes were not feasible within the project period.
- **Financial Constraints:** Restricted the bulk procurement of high-grade steel or enhanced hardware (e.g., biometric locks).