**Abstract:**

The incline in the usage of ecommerce globally has introduced challenges in the last mile delivery process as recipients are not available often. This affects service providers in terms of budget, time and management and customers (Sender and Receiver) in terms of availability and easy to use. **Smart Delivery** will uplift the last mile delivery process towards perfection by automating last mile delivery process. Developed countries like Japan, Sweden & Dubai have already implemented this idea and generating very positive outcomes. Amazon and Dominos got major increment in their revenue by 38% and 5% in first year after automation of delivery process. Automation will increase the annual revenue of service providers and makes delivery process easy for customers.

**Executive Summary:**

In today’s era, ecommerce is getting boosted as the availability of internet and usage of smart devices increasing. Trends of Pakistan in 2024 showed that ecommerce has evolved 12%. Most of the part in boost of ecommerce is acquired by garments and clothing side. This increases the feasibility of our solution as compartment size in delivery box is limited and can be useful for medium size products. As garments and stuff like that can easily be delivered using smart delivery boxes, this gives the hint that this solution will also work in Pakistan as it is uplifting businesses in other countries like Japan, Sweden and Dubai. Smart Delivery will provide facilities to service providers in terms of budget and time while on the other hand, it will facilitate customers on larger scale in terms of availability and time as well.

Firstly, it will minimize the failed delivery attempts to negligible and will increase the revenue. Also, it will minimize the pollution caused by automobiles as failed delivery attempts has been reduced. For example, a receiver has confirmed that I will be able to receive parcel at decided time but unfortunately, he would not be able to receive parcel and delivery attempt gets failed. This happens sometimes in Pakistan that delivery attempt gets failed 1 to 2 times before successful attempt. These failed attempts go negative in revenue of service providers. By automation, failed attempts are decreasing and in return increasing the annual revenue of service providers. As a by product it is beneficial for environment because re attempting delivery will generate more pollution as well which is getting reduced now.

Secondly, it is also up swinging the customer side by making the availability of receiver flexible. Sometimes the receiver wants to change the delivery location due to some reasons, but it does not have option to change the pickup point and delivery attempt gets failed. Smart Delivery will allow receiver to pick his parcel within allowed time. It also enables receiver to change the delivery box within allowed time. Rider will place the parcel in delivery box selected by the receiver and receiver will have selected time to pick up the parcel. This will create ease if receiver does not available at some time to receive parcel.

Furthermore, it will also allow senders to send parcels using delivery boxes. Instead of going to offices of service providers, senders can simply reserve compartment in delivery box, and they can simply place their parcels into delivery box and service providers will deliver it to requested destiny.

Finally, we can say that by automating the last mile delivery process, not only the failed attempts will decrease rather it will create an ease for customers to send and receive parcels according to their schedules. It will also allow riders to directly place the parcels into lockers rather contacting and scheduling time for delivery. Senders are also able to send parcels using delivery boxes. This also increase the annual revenue of service providers which in turn play a crucial role in economic growth and environmental nourishment.

**Abbreviations**:

SP: Service Provider

NFR: Non Functional Requirements

OTP: One Time Password

API: Application Programming Interface

QFDP: Queue of Failed Delivery Parcels

QUP: Queue of Unpicked Parcels

QIC: Queue of Initial Compartments

QFC: Queue of Final Compartments

EV for "Electric Vehicles"

CO2 for "Carbon Dioxide"

SMS for "Short Message Service" (text message).

SDB: Smart Delivery Box

**Definitions**:  
  
Carbon-Neutral:

A state where the net carbon dioxide emissions from a company, service, or product are zero. This is achieved by reducing emissions and offsetting the remaining emissions through sustainable practices, such as planting trees or using renewable energy.

Dynamic Customer Interfaces:

Flexible and interactive platforms that allow customers to modify or control their delivery preferences (e.g., selecting delivery windows, updating delivery locations) in real time.

Self-Learning Algorithms:

Machine learning algorithms that can adapt and improve their performance over time by learning from data. In logistics, they are used for optimizing routes, predicting delivery times, and managing demand efficiently.

**Risk Analysis:**

**1. API Integration with Service Providers**

The success of the system heavily depends on smooth API integration with various service providers. If their systems lack comprehensive or standard APIs, it may slow down the development process or require custom integrations. Engaging early with service providers and ensuring flexibility in API design will ensure smoother collaboration.

**2. Data Privacy and Compliance**

Handling sensitive user data, such as delivery details and authentication codes, comes with risks related to privacy and compliance. Failure to adhere to data protection regulations could result in legal repercussions. Ensuring compliance with data protection laws and implementing data encryption will safeguard privacy and avoid regulatory issues.

**3. Dependence on Hardware Providers**

Relying on external hardware suppliers for smart lockers and components can introduce delays, especially if they fail to meet quality standards or timelines. Establishing relationships with multiple suppliers and conducting thorough quality checks will reduce dependency risks.

**4. Service Provider Collaboration Delays**

Collaborating with service providers may lead to delays, especially if they are slow to provide the necessary technical support or API access. This could affect the overall project timeline. Early engagement and clearly defined agreements will help minimize delays and improve collaboration.

In summary, the success of the smart locker system relies on tackling technical, integration, and operational challenges. Working closely with hardware suppliers and service providers early on, focusing on data privacy, and keeping the design flexible for both hardware and software can reduce risks. Careful planning and regular testing will help ensure smooth development and a successful rollout.