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GIẢI PHÁP TRUNG TÂM GOM HÀNG CHO LOGISTICS ĐÔ THỊ - TRƯỜNG HỢP BRISTOL VÀ BATH, ANH QUỐC VÀ ỨNG DỤNG CHO THÀNH PHỐ HỒ CHÍ MINH, VIỆT NAM

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Tóm tắt

Vận chuyển hàng hóa đô thị trong những năm gần đây đã đặt ra những thách thức đáng kể cho các thành phố lớn với các vấn đề như ùn tắc giao thông, ô nhiễm không khí và hệ thống giao hàng kém hiệu quả. Đứng trước vấn đề này, trung tâm gom hàng đô thị (UCC) là một giải pháp đầy hứa hẹn, hoạt động bằng cách hợp nhất hàng hóa từ nhiều lần giao hàng để giao ít chuyến hơn trên phương tiện lớn hơn, sạch hơn và phân phối tới các điểm cuối trong thành phố. Bài viết hướng tới phân tích việc triển khai UCC thành công ở Bristol và Bath, Anh, đánh giá tác động của nó đối với giao thông, khí thải và hiệu quả logistics. Bằng cách lấy ví dụ điển hình này, nghiên cứu đánh giá tiềm năng nhân rộng mô hình UCC tương tự tại Thành phố Hồ Chí Minh, dựa trên các đặc điểm và thách thức riêng biệt của thành phố. Nghiên cứu sử dụng phương pháp định tính, kết hợp dữ liệu thứ cấp từ nhiều nguồn, bao gồm các nghiên cứu, báo cáo và bài viết trước đây.

Từ khóa: Bristol và Bath, Logistics đô thị, Thành phố Hồ Chí Minh, Trung tâm gom hàng

URBAN CONSOLIDATION CENTER (UCC) SOLUTION FOR CITY LOGISTICS - BRISTOL AND BATH, UK CASE STUDY AND IMPLICATIONS FOR HO CHI MINH CITY, VIETNAM

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Abstract:

Urban freight transportation poses significant challenges for major cities in recent years with issues like traffic congestion, air pollution, and inefficient delivery systems. Urban Consolidation Centers (UCCs) emerge as a promising solution by consolidating goods from multiple deliveries into fewer, larger, and cleaner vehicles for final distribution within the city. This paper explores the successful UCC implementation in Bristol and Bath, UK, analyzing its impact on traffic, emissions, and logistics efficiency. By drawing on this case study, the paper assesses the potential for replicating a similar UCC model in Ho Chi Minh City, considering the city's unique characteristics and challenges. This qualitative research incorporates secondary data from multiple sources including previous research papers, reports and articles.

Keywords: Bristol & Bath, City logistics, Ho Chi Minh City, Urban Consolidation Centers

1. Introduction

The last decades have witnessed an increased interest in city logistics originating from both the research and the practitioners' communities all over the world. A lively and accessible city center is vital to trade and cultural growth, yet so far the distribution of goods has not been in accordance with the efficient use of city space and the environment. The increasing number of urban vehicles to meet the compelling promises of fast delivery has led to unnecessarily increased congestion, air pollution and noise. In Vietnam, city centers such as Ho Chi Minh City are the telling examples. unlike other cities, Ho Chi Minh has its unique potential facilitated by its strategic location, the dynamic workforce, the ever flourishing market in e-commerce and guaranteed long-term government support. For that reason, the research group has chosen Ho Chi Minh city as the primary subject for the study.

One solution for the negative impacts of increasing vehicle use that has received increasing attention is the implementation of Urban Consolidation Centers (UCCs) – centralized hubs that streamline the distribution of goods, reduce congestion, and minimize environmental impact. While current research offers valuable insights into city logistics, often encompassing various aspects of transportation, infrastructure, and sustainability, a noticeable gap still exists concerning the feasibility in applying the UCCs model into the specific context of Vietnam.

In selecting a city for this research, it became apparent that Ho Chi Minh City stands out from others due to several unique factors. Firstly, the city is already dotted with numerous logistics hubs and distribution centers, alongside well-developed infrastructure, including modern roads, ports, and airports, which facilitate efficient transportation and connectivity. In addition, the concentration of businesses and manufacturing facilities in HCMC presents an opportunity to optimize supply chains and improve operational efficiency by strategically locating the consolidation center within or near industrial areas. Furthermore, as the largest economic hub in Vietnam, HCMC offers unparalleled business opportunities and market potential, creating a favorable environment for the establishment of a consolidation center and maximizing its utilization.

Addressing this gap, this paper "**UCC solutions for City logistics - Bristol and Bath Case study and Implications for HCMC Vietnam**" delves into the case study of Bristol and

Bath Urban Consolidation Centre (BBUCC) which has successfully reaped numerous achievements. From there, the study aims to examine how Vietnamese enterprises and public authorities in Ho Chi Minh can learn from them, considering the unique challenges and opportunities of Vietnam.

Our team use qualitative analysis to offer insights into the analysis of the case study of BBUCC and propose solutions for applications in Ho Chi Minh city. Secondary data is collected from diverse references, including industry reports, academic literature, and assessments from international organizations.

2. Literature review

Alongside with the rapid development of city logistics, the question of whether or not to build urban consolidation centers has become one of the main concerns of city policymakers. To answer this question, several studies have been conducted over the past few decades to analyze and evaluate the effectiveness of UCCs that have been built. The study of Allen et al. (2012), "The Role of Urban Consolidation Centres in Sustainable Freight Transport" assessed the impact of 67 UCCs from through four main indicators: changes in the number of trips, distance traveled by vehicles, fuel consumption and emissions into the environment. Another study by Browne et al. (2012), "A Review of Urban Consolidation Centers in the Supply Chain Based on a Case Study Approach" has looked into the operating models of 6 UCCs in urban areas in European countries and provided in-depth analyzes of the impacts of UCCs on urban traffic and the environment. Triantafyllou et al. (2014) also conducted a research focusing on reviewing various consolidation centres in the UK, particularly in Southampton, in which the authors found that with the utilisation of UCC in different scenarios, the collection trips had decreased drastically, resulting in a fall in the amount of waste accordingly.

It can be seen that most of these studies were conducted in developed countries in Europe and there is an absence of studies proposing the construction of urban consolidation centers in other continents such as Asia, where rapid urbanization and population growth have intensified the strain on transportation networks and exacerbated congestion issues.

In Vietnam, however, there are not any consolidation centers being developed, leading to a lack of studies assessing their potentiality in Vietnamese cities. The only study conducted by Nguyen et al. (2020), titled "An analysis of factors affecting decisions to construct urban consolidation centers in Hanoi," examines the factors influencing the decision-making process regarding the construction of freight consolidation centers in urban settings, focusing on the case of Hanoi. This highlights a significant gap in the research landscape concerning the implementation and impact of UCCs in Vietnam. Besides, there has been no study that goes into detail in determining the specific scale, location, and mode of operation of potential freight consolidation centers in cities in Vietnam.

For this reason, our study aims to address this gap by delving into the intricacies of establishing freight consolidation centers in Vietnamese cities and suggesting viable strategies for their implementation in Ho Chi Minh City by drawing upon the successful example of the Bath and Bristol UCC in the UK.

3. Theoretical framework

3.1. Overview of City logistics

3.1.1. The concept of City logistics

In the context of rapid urbanization, growing e-commerce, and growing demand for fast, sustainable delivery, city logistics has become more complicated and needs more development to adapt to the current situation. City logistics is defined as: "All logistical activities of strafing, delivering, and collecting goods happening within a city, including the goods movement to, from, within, and through urban areas." (Yanqiang, 2014). City logistics is the process of managing, organizing, and implementing the transportation, distribution, and storage of goods in urban areas, aiming to optimize the flow of goods and minimize negative impacts on the environment.

3.1.2. Urban sustainability and city logistics

As urban centers globally face the complexities of increasing population, dwindling resources, and environmental decline, the urgency of establishing sustainable urban settings has become a critical priority. Urban sustainability is the use of resources to "improve the quality of life in a city, including ecological, cultural, political, institutional, social, and economic components without leaving a burden on the future generations" (Anastasiadis and Metaxas, 2010). One of the key factors contributing to the success of urban sustainability is the pivotal role played by sustainable city logistics which can help to optimize transportation, reduce carbon emissions, and enhance environmental resilience.

To achieve sustainable city logistics, two strategies to improve efficiency need to be implemented: Consolidation of supply and Reduction of transportation flows (Kauf, 2016). Supplier consolidation is carried out at distribution centers, consolidation, and cooperation models with the participation of relevant parties through the process of gathering goods from suppliers and then transporting them to the end customers. As for the Reduction of transportation flows, this is a strategy aimed at simplifying transport routes, thereby limiting the unnecessary movement of goods in urban areas. An effective measure to combine the above two strategies can be the application of Urban Consolidation Centers (UCCs), the centralized facilities that streamline the sorting and distribution of goods from multiple suppliers, promoting efficient and sustainable last-mile delivery in urban areas.

3.2. Overview of Urban Consolidation Center (UCC)

3.2.1. Definition of UCC

Urban Consolidation Centers (UCCs) are logistic facilities located close to the geographic region they serve, which can be a town, a city center, or a specific location, from which consolidated deliveries are made within that area (Gogas and Nathanail, 2016). In other words, UCCs combine deliveries into a smaller number of vehicles (Akgün, Monios and Fonzone, 2019) and avoid vehicles intended for regional transportation entering an urban area (Johansson and Björklund, 2017). Transport operators transfer goods bound for the metropolitan area to the UCC storage space, where they are processed and consolidated before being transported to the final destination by the UCC operator (Allen et al., 2014).

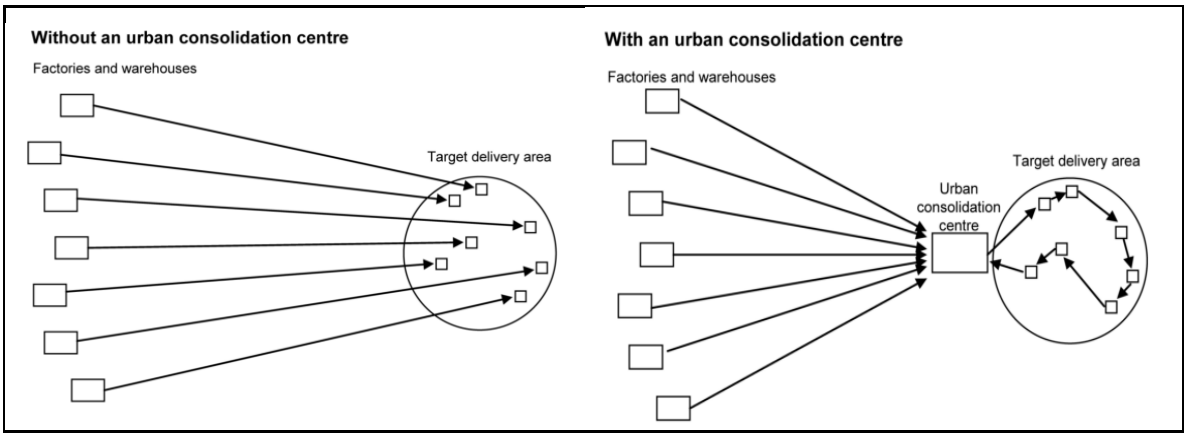

Figure 1: Urban distribution systems with and without urban consolidation centers

Source: Allen et al., 2014

3.2.2. Classification

Allen et al. (2014) divided UCCs into three location categories as follows:

UCCs serving all or part of an urban area

UCCs in this category often target markets within a town or city, having problems, such as congestion, delivery delays, high levels of air pollution, restricted access times, and insufficient parking space (Allen et al., 2012), with the aim to minimize trips through urban areas' (Yanqiang, 2014).

UCCs serving large sites with a single landlord

A single landlord means the target market is in one location, which is geographically isolated and faces transportation difficulties due to heavy congestion and pollution. Examples include UCCs in hospitals, airports, and shopping centers. These sites' goal is to optimize space by reducing on-site storage and the requirement for several delivery hubs.

Construction project UCCs

Construction project UCCs are specially built to aggregate construction materials needed for large buildings, such as housing developments, office complexes, and public buildings. It can be a temporary establishment for the length of a construction projects.

3.2.3. Beneficiaries

According to Yanqiang (2014), there are two main beneficiaries of UCCs, including supply chain partners and goods receivers.

Logistics firms benefit significantly from UCCs as these hubs facilitate substantial time and cost savings by redirecting cargo flow away from metropolitan areas (Allen et al., 2014). By consolidating multiple smaller shipments into larger, more cost-effective loads, logistics firms can achieve notable cost savings in transportation.

Meanwhile, Johansson and Björklund (2017) stated in their publication that 'the stakeholder group that might have the most to gain from the implementation of a UCC is the

receivers'. Receiving items from the UCCs may improve delivery credibility, supply availability, decrease on-site storage space, and allow free space and staff for crucial activities (Allen et al., 2014).

It is worth mentioning the public as one of the beneficiaries of the consolidation program (Akgün, Monios, and Fonzone, 2019) since they can benefit from health and well-being, quality of life in cities, and economic growth (Harrington et al. 2016).

3.2.4. Service range

UCC services range from primary services to value-added services (Triantafyllou, Cherrett and Browne, 2014). As stated by Shakantu, Tookey, and Bowen (2002), the most common services offered by a UCC consist of consolidation, multiple daily deliveries, cross-docking, stockholding, and replenishment. Furthermore, UCCs provide a number of value-added logistics and retail services.

3.2.5. Location

Accessibility to the target market is a crucial factor in the success of efficient UCCs. Due to the high traffic volume UCCs may encounter daily, they are typically located on the outskirts of cities (Allen et al., 2014), far from residential areas. Ensuring UCC access to inner cities thus becomes a primary responsibility. UCCs should be placed in places with accessible roadways and adequate capacity for container trucks or even trains to access the UCC without difficulty. The infrastructure should also be well-connected to the national highway network to reduce travel time. Most essentially, there must be an existing distribution infrastructure that can accommodate consolidation services. Many UCCs are either located near or well connected to main logistical facilities like ports, and airports. This facilitates logistics and increases the UCC's attractiveness to shippers/suppliers.

3.2.6. Operational model

OPERATIONAL MODEL	CONTENT
Public Setup and Private Operation	Private LSPs as tenderer/subcontractor
Public-private joint venture	UCCs' establishment and operation are initiated under public-private joint venture
Private Setup and Private Operation	UCCs are owned by landlords of the retailer sites and operated by appointed/subcontracted LSPs
Private joint venture	The cooperating carriers deliver goods to a depot (UCC) owned and operated by a "neutral" company

Figure 2: UCC operational models

Source: Yanqiang, 2014

Urban consolidation centers (UCCs) can adopt 4 main operational models (Yanqiang, 2014) based on specific urban logistics requirements:

- In the Public Setup and Private Operation model, the consolidation center is established and owned by a public entity (e.g., government), but its day-to-day operations are managed by a private operator.
- In a Public-private joint venture, both public and private entities collaborate to establish and operate the consolidation center. Both parties contribute resources and share responsibilities in the management and ownership of the facility.
- The Private Setup and Private Operation model involves a solely private entity establishing and owning the consolidation center, and it is also responsible for its day-to-day operations..
- In a Private joint venture, two or more private entities come together to establish and operate the consolidation center. These entities jointly contribute resources and share responsibilities in both ownership and management of the facility.

4. Analysis of Bristol and Bath Urban Consolidation Center (BBUCC)

4.1. Overview of BBUCC

4.1.1. Background

The city of Bristol

Bristol is the biggest cultural, economic, and educational city in the southwest region of England in which high levels of pollution are a result of urban overcrowding. In fact, the technical staff of Bristol City Council stated in a 2013 interview that there are over 500,000 car movements in and out of the city center every day. This suggests that average speeds are less than 25 kilometers per hour, which places Bristol among the UK's most congested cities at the time (Paddeu, 2014).

Freight vehicle activities contribute significantly to this congestion and the associated adverse external effects. In the same year, the Bristol City Council reported that 104,802 vehicles entered Bristol each day, with light and heavy goods vehicles accounting for 13,3% of all incoming vehicles (11,682 LGVs and 2,206 HGVs). The city's economy, which is heavily reliant on the delivery of goods in the city center, was looking for a highly efficient transportation plan (Paddeu, 2014).

The city of Bath

Bath, a city in southwest England, is well-known for some of the best Roman ruins and 18th-century architecture in Europe. It was designated as a UNESCO World Heritage Site in 1987. Situated in the Avon River Valley and 20 kilometers away from Bristol, Bath is a popular tourist destination. For this reason, one of the city's main concerns was the effects of traffic. Compared to the volume of HGV traffic, heavy-goods vehicle (HGV) traffic contributed disproportionately to noise pollution, poor air quality, historic building severance, and damage to the structure of these buildings.

Both Bath and Bristol city councils struggled with the existing distribution-related problems and failed to meet the European norms on air quality in the city centers. This presented the need for an effective logistics solution serving two cities.

BBUCC Project

Bristol was involved in three trial projects funded by the European Union that provided for the use of a Consolidation Centre. The first project was the CIVITAS VIVALDI (2002-2006). In 2007, the second project started - START (2007-2008). The third project was CIVITAS-RENAISSANCE (2009-2013), which directly involved both Bristol and its neighbor city, Bath. The Bristol - Bath Urban Consolidation Center stands out as the only consolidation center in the UK that serves 2 cities and the project proves to be the most successful scheme due to its enduring and effective operational history. After the trial period funded by the European Union ended, the BBUCC came into full operation, with an aim to alleviate the logistical challenges faced by both cities in the long term (Paddeu, 2017).

4.1.2. Location

Target area: Broadmead, the central area of Bristol - core area for retail activities.

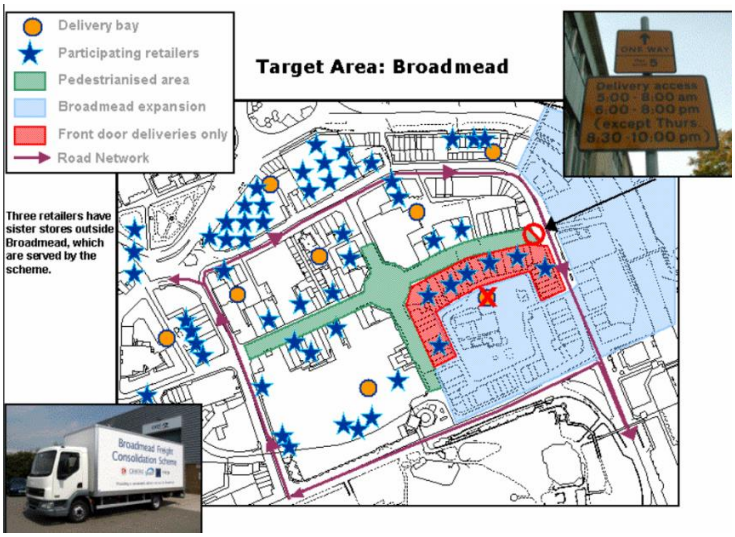

Figure 3: The area of Broadmead - served location for BBUCC

Source: Bristol City Council

The area served has been expanded from Broadmead to the new Cabot Circus Centre retail development which opened in 2008, which adds 40% more retail floorspace to the existing. Also in 2008, new pedestrian areas were introduced and tighter loading time limitations were imposed (05:00–08:00 for Broadmead's major pedestrian area). This has encouraged more retailers to make use of the consolidation centre (the project of START, 2008). Approximately 70 out of the nearly 400 retail outlets in the catchment region presently employ the consolidation strategy (Minihane, 2009).

The 500-square-meter consolidation center is situated on an industrial estate on the M4 and M5 motorways on Bristol's northwest side. It is 15 kilometers (or a 25-minute drive) from the Broadmead neighborhood. The center's proximity to both the M4 and M5 motorways

ensures quick and convenient access to major transportation routes. This facilitates efficient distribution and transportation of goods to and from the center (Travelwest, 2015).

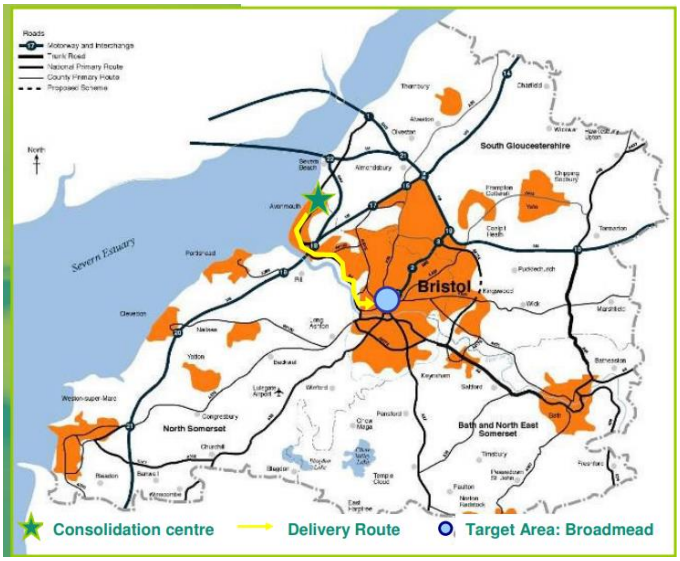

Figure 4: The Bristol and Bath Urban Consolidation Center - location

Source: Bristol City Council

4.1.3. Objectives

The project was put into trial with 2 main goals. First, to lessen the number of trucks in the Broadmead central retail district, which would help to ease traffic congestion, enhance air quality, and decrease vehicle conflict at loading yards and delivery bays in both cities. Additionally, the trial aimed to improve logistics services for retailers and suppliers by eliminating the need for suppliers to send their vehicles into central Bristol, boosting delivery reliability, and providing a variety of value-added services like packaging, waste collection, and pre-retailing (Allen et al., 2014).

4.2. Operational structure

4.2.1. Service range

BBUCC is a cross-dock center, where goods are unloaded by heavy goods vehicles coming from every part of the UK and then are loaded into full-load electric vans and delivered to the city center of both cities. However, since BBUCC also serves the extended area of both the city of Bristol and Bath, it was thereby serving those receivers who were not located in the city centers. The main receivers are small-to medium size retail outlets (telecommunications, fashion, perfume, body shop,..) - retailers that receive a few box deliveries, multiple times per week. The number of receivers participating in the scheme are 81 in Bristol and 25 in Bath, all of which are part of big companies: 49 receivers translate into 106 outlets in total (Paddeu et al. 2017).

BBUCC offers a wide range of added value services, such as just-in-time deliveries, pre-retailing, crisis stock management, drip feed of stock, recycling of packaging – i.e. cardboard and plastics (Paddeu, 2017).

The goods delivered are non-perishable classifying into various categories: clothing, footwear, household appliances, cosmetics,... and exclude potentially hazardous items requiring specialised handling (gas canisters, pressurised kegs) and low to medium value products.

4.2.2. Distribution process

For the city distribution, the key activities are conducted as follows:

The goods from multiple retailers are transported and disposed at the center, and inbound operations run from 22:00 to 06:30 in the morning. Afterwards, the transshipment stock is loaded onto two electric vehicles (EV) and dispatched, leaving the warehouse empty during the day. The distribution of the goods requires 8 hours. Both EVs have the following characteristics: operating range - 120 km, maximum speed - 60 km/hour, capacity - 2.5 metric tonnes, and recharging time required 8 hours (Duin et al., 2016).

First, three large customers are served in the pre-opening hours in the Bristol area. Subsequently, one truck departed for Bath, and the other trucks dropped the cargo in Bristol. The load factor of the trucks was, on average, 74%, indicating that each truck was utilized efficiently and not leaving too much empty space, loaded to approximately 74% of its capacity (Duin et al., 2016).

BBUCC directly delivers goods to the stock room at the disposal of the retailers, allowing them to save staff working time. Receivers view it as a financial benefit to their companies since the UCC eliminates the need for them to have a big space for storing items in the stock room. As a result, they can downsize the stock room and utilize nearly all of the available space for direct sales activities.

However, due to the out-of-service time of the electric vehicle, it was at times replaced by a diesel vehicle to transport the goods; thus, the reductions could have been greater if the deliveries had only been made by electric vehicles. Having said that, although the emissions reductions are potentially significant, they are currently limited by the limited scale of the UCC. Additionally, it was determined that there had been a considerable decrease in HGV usage in Bristol's center, with a mean of 75.5% and a peak value of 80.19% in April 2012 (Paddeu et al., 2014).

4.3.3. Vehicles use

Two major delivery vehicles were used to transport goods to the city centre, which were two 9-tonne Smith Newton electric vans provided by DHL with a load factor amounting to 5 metric tonnes (equivalent to 8 pallet spaces or 15 cage spaces). With an electric powertrain, this vehicle aligns with environmental considerations and aims to reduce the ecological footprint associated with urban logistics. It is noteworthy that the electric vehicle has a range limitation, covering approximately 120 kilometers per charge. While this limitation may restrict its use for extensive routes, it perfectly suits the localized delivery requirements of the Bristol-Bath UCC (Hapgood, 2009).

Another vehicle utilised in the center was the 18-tonne diesel van equipped with a Euro IV engine, ensuring compliance with contemporary emission standards (Hapgood, 2009). This vehicle also occasionally served additional functions during times of unforeseen circumstances,

such as breakdowns or peak periods like Christmas. The flexibility to deploy these vans contributes to the overall resilience and effectiveness of the logistics system, adapting to the dynamic demands of the business, especially during peak seasons or unexpected events.

Figure 5: Smith Newton electric vans at Bristol - Bath consolidation centre

Source: CIVITAS, n.d

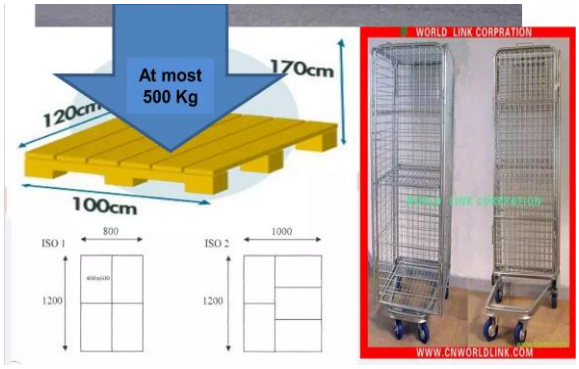

Figure 6: Pallets and cages used inside the vans

Source: Paddeu, 2017

The operational schedule of the center span six days per week, ensuring consistent and reliable service for the handling of retail goods (Bastien, 2007). What is more, with a view to optimizing delivery efficiency, the local transport authority has granted the Bristol-Bath UCC special access to designated bus lanes on a trial basis. This strategic allowance is intended to facilitate the transit of UCC vehicles to and from the city center. By utilizing bus lanes, the center had been able to reduce delivery times and enhance overall logistical reliability, encourage the integration of its operations within the urban transport infrastructure (Hapgood, 2009).

4.3.4. Pricing scheme

During the initial trial period of the RENAISSANCE project in Europe, the delivery service was provided free of charge to encourage receivers to join the scheme, thanks to European subsidies. After the trial period, Bristol City Council (BCC) and Bath and North East Somerset Council (BNEC) contributed to financing the project. Both councils pay a monthly charge based on the number of deliveries performed. While the exact amount is not publicly disclosed due to commercial confidentiality, these funds are insufficient to cover all BBUCC costs.

To address the shortfall, receivers using the BBUCC service started paying a fee. The payment options include fees per pallet, cage, or box. Official charges under the RENAISSANCE project are £9 per cage and £12 per pallet, though these charges are flexible based on individual commercial agreements between DHL and the scheme's receivers. Despite the introduction of charges, there has been no withdrawal from the scheme, as retailers recognized the benefits provided by the BBUCC (Paddeu, 2017). Any additional services, include offerings such as storage, pre-retailing, crisis stock management, drip feed of stock, and recycling of packaging, are individually subject to charges. This diverse array of additional services contributes to generating an alternative revenue stream for BBUCC. What is more, in case there is available space on the trucks, DHL's own transportation needs

are also accommodated. However, this is internally invoiced, creating revenue for the consolidation center.

Up until now, the BBUCC has operated with support from public subsidies. However, both BCC and BNESC have expressed their intent to discontinue these subsidies, potentially compromising the scheme's operation. This challenge arises from the framework of users involved, where receivers and suppliers/carriers, belonging to major chains, currently bear costs only from one side (receivers pay while suppliers/ carriers do not). When public subsidies cease, both receivers and suppliers/carriers has contributed equally for the BBUCC to remain economically sustainable.

5. The success of BBUCC

The main objective of the Bristol and Bath Urban Consolidation Center (BBUCC) is the optimization of storage and transportation capacity, which generates favorable outcomes across environmental, economic, and social aspects.

5.1. Economic aspect

BBUCC's implementation of sustainable logistics practices serves as a catalyst for cost efficiencies and enhanced profitability.

(1) For BBUCC's advantage:

Transportation cost efficiency

By consolidating goods from multiple suppliers and using large goods vehicles, BBUCC reduced the number of vehicles entering the center of Bristol and Bath. From January 2011 to May 2012, the UCC recorded a total vehicle reduction of 1332 deliveries (as shown in Figure ...). By 2014, this data increased to a 77 percent reduction in vehicle deliveries to participating retailers. This was equivalent to a total reduction of approximately 10,000 vehicle deliveries per annum, with a saving of 250,000 vehicle kilometers (Allen et al., 2014).

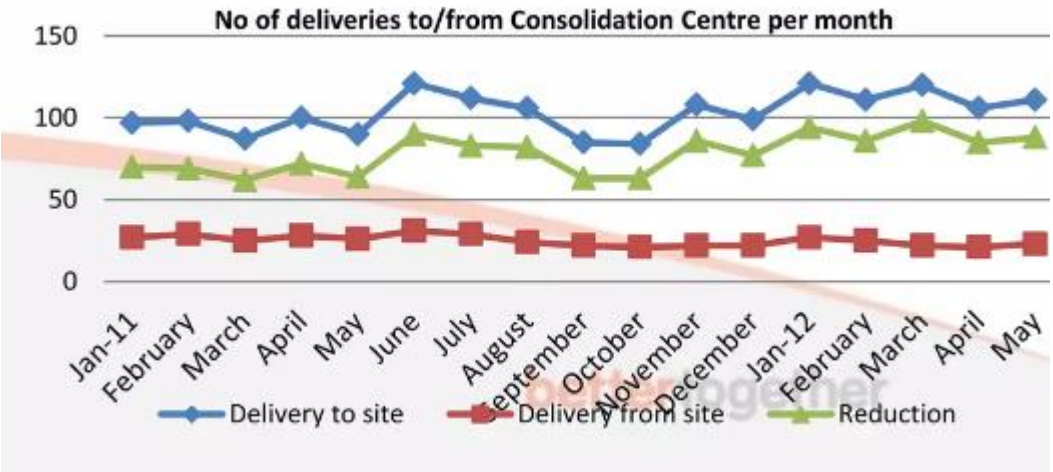

Figure 7: Number of deliveries to/from BBUCC per month from January 2011 to May 2012.

Source: Paddeu et al. 2014

Improved customer experience

From the perspective of retailers who are the main customers of BBUCC, by providing delayed cross-docking facilities and consolidation services, the numerous daily deliveries are condensed into just a few weekly drops scheduled at convenient times. This leads to reduced time spent on receiving deliveries and avoids having delivery trucks arrive at the doorstep during peak shopping hours.

Retailers generally seem to appreciate the improved service and cost-reduction opportunities offered by channeling deliveries through the UCC (Allen et al., 2014).

Figure 8: Satisfaction level of retailer customers towards services of BBUCC

Source: Author's adaptation from the survey of Paddeu, 2014.

Bristol-Bath UCC deliveries are 100% on time and only 2 stock losses (thefts from vehicles) in 10 years (Paddeu, 2017), indicating a high level of service reliability. In Paddeu's survey assessing retailer satisfaction with delivery and overall services provided by BBUCC, retailers were asked to rate their satisfaction on a scale of 1 (not at all satisfied) to 5 (very satisfied). The survey findings from over 81 retailers revealed that 67% were highly satisfied with delivery frequency, 52% expressed high satisfaction with delivery timing, and 57% were highly satisfied with the overall services offered.

(2) For the retailer's advantage:

By implementing streamlined logistics operations and optimizing the process of receiving deliveries, retailers are able to better allocate their resources, which in turn leads to heightened levels of productivity and increased revenue generation. Retailers have reported saving an average of over 20 minutes per delivery, resulting in 38% of them being able to dedicate more time to serving customers. Furthermore, the flexibility offered by BBUCC, which includes delivering directly to the stockroom, has had a significant impact on retailers. As a result, 45%

of retailers have noted an improvement in staff morale due to the enhanced convenience and efficiency of the service (Minihane, 2009).

5.2. Social aspect

BBUCC's dedication to improving residents' life quality strives to create a more serene and secure environment.

Reduced traffic congestion

With the consolidation supply chain, goods for the participating businesses are delivered to a warehouse conveniently situated for access from the strategic highway network on the edge of the city, meaning that not many delivery vehicles have to enter the city (CIVITAS, n.d). According to findings from Paddeu (2017), 139 trips were eliminated, resulting in a reduction of up to 30,000 total vehicle kilometers during peak hours per month. This decrease contributes to alleviating congestion in the Bristol-Bath region.

Increased safety and reduced pollution

The decrease in the presence of heavy goods vehicles (HGVs) within the city center contributes to enhanced safety for pedestrians and cyclists, leading to an overall improvement in the quality of life for residents. Additionally, the concurrent decrease in noise and air pollution levels further enhances the urban living experience, fostering a quieter and cleaner atmosphere conducive to well-being (The Bristol Method, 2015).

5.3. Environmental aspect

BBUCC's practices not only have positive implications for local communities and society but also align with global environmental goals at large.

High reduction rates of polluting emissions

The reduction of emissions in Bristol was attributed to the practice of utilizing shared delivery vehicles for the final leg of the supply chain - the last-mile deliveries. By employing electric vehicles for deliveries, there was a decrease in the number of heavy goods vehicles (HGVs) in the city center, leading to reduced pollutant emissions. As shown in Figure …, this approach resulted in the reduction of 28,677 kg of CO2, 122.29 kg of NOx, 2.31 kg of PM10, 20.32 kg of CO, and 9,854 kg of fuel (Paddeu et al., 2014).

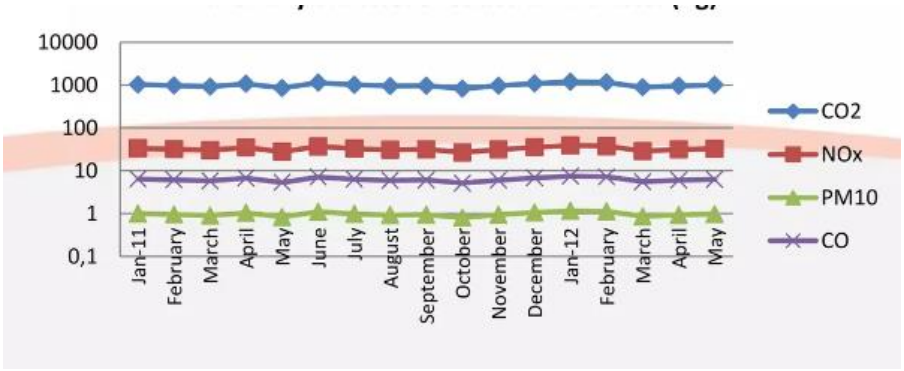

Figure 9: Monthly emission reductions in Bristol from January 2011 to May 2012 (in kg)

Source: Paddeu et al. 2014

However, due to the out-of-service time of the electric vehicle, it was sometimes substituted by a diesel vehicle to make the deliveries and so reductions could have certainly been higher if the deliveries had been made by electric vehicles only.

Resource Conservation

By consolidating goods from multiple suppliers into larger shipments, BBUCC reduced the number of individual delivery trips required to transport the same volume of goods. This optimization of transportation leads to reduced fuel consumption, lower carbon emissions, and less wear and tear on vehicles. The reduction in deliveries thanks to BBUCC has led to a decrease of 6000 to 14000 fossil fuel vehicle kilometers per month (J.H.R. van Duin et al., 2016).

Furthermore, BBUCC promoted efficient space utilization through centralized storage and warehouse management practices. Receivers perceive it as an economic advantage to their businesses because they do not need a large space to stock the goods in the stock room due to the UCC. As a result, they can downsize their stockrooms and allocate almost all available space directly to sales activities (J.H.R. van Duin et al., 2016).

6. Implications for implementing (building) UCC in Ho Chi Minh City, Vietnam

6.1. Current trends in city logistics solutions

Utilization of Internet of Things

Nowadays, application of IoT in logistics has become the norm, spanding its realm from smart tracking and management to automation and optimized solutions. The market for the global IoT powered logistics market has witnessed recent positive changes and its compound annual growth rate (CAGR) is forecasted to reach 12,4% in the 2023-2031 period with North America and Asia Pacific being the top players in the market (Transparency Market Research, 2023).

Shared mobility

UCCs are a promising solution to optimize this solution by allowing logistics companies to work together to consolidate their shipments, especially large parcel deliveries and share their delivery capacity via a peer-to-peer platform. This collaborative effort can lead to increased efficiency, reduced operational costs and smaller carbon footprint thus, encouraging a more sustainable and eco-friendly approach.

Electric solutions

In recent years, many big companies like DHL or FedEx have been actively participating in the electric vehicle race within the logistics sector. According to Selex, by the end of 2022, FedEx aims to add over 20,000 medium-sized electric vehicles, and by 2030, all newly purchased delivery vehicles will be electric. The transition from gasoline/diesel vehicles to electric vehicles in logistics not only fulfills environmental protection requirements but also brings various other benefits and represents a concerted effort toward sustainable and energy-efficient transportation.

6.2. Current landscape of Ho Chi Minh City's logistics

6.1.1. Ho Chi Minh City current logistics situation

High rate of urbanization

With a high population of 9 million inhabitants in 2023, Ho Chi Minh City stands as Vietnam's largest urban center, offering significant economic potential and contributions to the nation. In July 2022, Ho Chi Minh City People's Committee held a conference to publicly announce the project "Adjusting construction planning of Ho Chi Minh City region to 2030 and vision to 2050" and stated that by 2050, the urbanization rate of Ho Chi Minh city would reach 70-75%.

The rapid pace of urbanization has placed efforts towards economic development, creating additional employment opportunities and expanding the consumer market. However, the challenges stemming from urbanization and population have led to a number of issues like traffic overload and adverse environmental impacts.

The rapid growth of e-commerce

In the latest report released in April 2021, "Ho Chi Minh City leads the e-commerce index with a total score of 67.6 points." (Acclime Vietnam, 2022). In 2022, the city's e-commerce GMV (Gross Merchandise Value) reached US$ 17 billion and it is anticipated to achieve more significant growth in the upcoming years.

As online shopping is becoming highly prevalent among urban dwellers, it has created a large demand for inner city delivery service to meet customers' needs. This has resulted in an on-going increase in the daily transportation volume and delivery packages while the logistics system remains relatively underdeveloped.

Unorganized retail environment

Vietnam FMCG (Fast Moving Consumer Goods), which accounts for a large portion of daily consumption, remains largely unorganized at 88% (FM Logistics Report, 2022). The shopping behavior of Ho Chi Minh City citizens is still notably influenced by small and corner shops. To be more specific, different from online organized platforms or modern trade, small and independent shop owners may deliver large order volumes but most are divided into many small individual orders to different locations within the city. Such separation and disconnection lead to ineffectiveness in the adaptation of an optimal logistics system which is afterward followed by problems namely higher cost, unnecessarily more transportation on streets, or loss of goods.

6.1.2. Evaluation of Ho Chi Minh City urban logistics for the implementation of UCC

(1) Strengths

Strategic location

Ho Chi Minh City's strategic location in the heart of Southern Vietnam contributes significantly to its logistics strength. With Tan Son Nhat Airport facilitating air transport and Cat Lai Port catering to sea logistics, the city has established itself as a key transportation hub.

The ongoing expansion of the highway network enhances connectivity, while the availability of spacious warehouse facilities further enforce its logistical infrastructure.

The abundance of workforce

The city's dense population not only reflects a vibrant urban environment but also provides a substantial workforce, creating a pool of skilled and unskilled labor for various economic activities. This abundant human resource is a crucial asset for the logistics sector, ensuring the availability of skilled professionals and the necessary manpower to support efficient logistics operations, particularly the operation of a consolidation center.

Market potential

The robust consumption demand has established a dynamic market with immense potential for logistics services in Ho Chi Minh City. Furthermore, the surge in e-commerce activities adds a new dimension to the market, presenting opportunities for logistics providers to meet the evolving needs of consumers and businesses.

(2) Weaknesses

Space constraints

One of the most significant inherent weaknesses of Ho Chi Minh city is space constraints due to densely populated metropolises, especially within the city center along with the problem of high land costs. Lack of proper urban planning, lack of land availability for industrial zones in Ho Chi Minh City (Ngoc Hien, 2024) cause difficulties in establishment of the UCCs by limited location choices and slso high costs for establishment.

Limited infrastructure

The infrastructure challenges also pose many difficulties. Ho Chi Minh City’s roads and gateways are always overloaded during rush hours and many inner-city roads see traffic conflicts, even during non-peak hours. The city is still struggling in providing citizens with alternatives to private transport to reduce traffic. Many vital infrastructure projects have been delayed while there is an emerging urge for logistics enhancement (Michael Tatarski, 2022).

(3) Opportunities

Growing demand

As mentioned above, as consumer spending increases, efficient logistics solutions become crucial. Customers increasingly want to experience optimal delivery service and the logistics industry is rapidly expanding, which can be explained by the growth of e-commerce. In the need for city logistics solutions, UCCs can cater to this demand by optimizing deliveries and improving service quality.

Increasing government support

As the fastest-growing city in Vietnam, Ho Chi Minh City attracts considerable government support and investment. The authorities recognize the pivotal role of logistics in the city's development and are actively investing in initiatives to enhance overall infrastructure, including transportation and logistics systems. This support creates a convenient environment for the growth and efficiency of logistics services.

(4) Threats

Traffic congestion

During rush hours, existing traffic problems within the city can significantly slow down goods movement, negating some of the efficiency gains, increase time of delivery which as a result creates frustration for the customers and the staff and reduce the efficiency. Moreover, the congestion leads to driving logistics costs higher, particularly the cost of wasting materials, decreasing in successful delivery within a time duration.

Fragmented transport networks

The means of transportation involved lack the connection but still working separately, inefficient integration between different modes (cars, trucks, motorbikes,...) can hinder seamless goods transfer and overall operation smoothness. This can cause the domino effect of order drop-offs in the case of one transport being late when the order has to be transferred among so many different means of transport.

Insufficient technology

Although Ho Chi Minh City is the leading city of Vietnam in terms of logistics however the system still seems to fall behind other developed countries with the in-use UCCs, to effectively implement and use UCCs, the system also needs to be modernized by catch up with the new technology such as IoT, smart warehouse, robotics and so on.

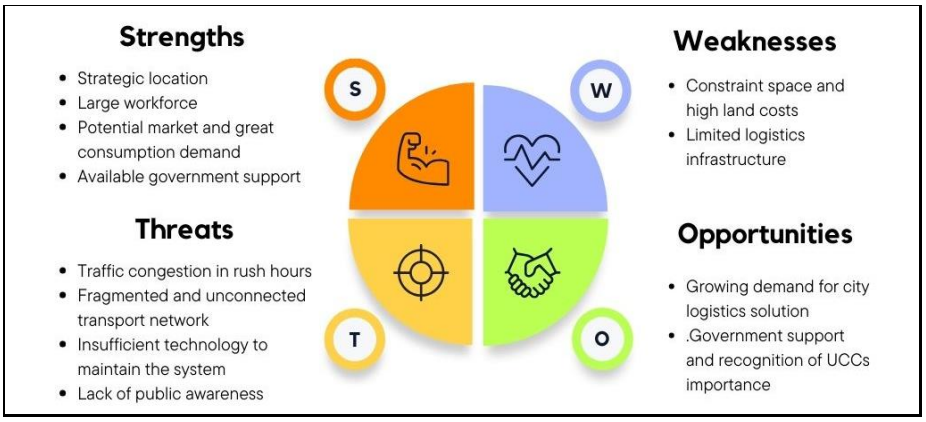

Figure 10: SWOT analysis of Ho Chi Minh City potential for implementing UCCs

Source: Synthesized by author

6.3. Implications for implementing UCC in HCMC, Vietnam

Applying the lessons learned from the Bristol and Bath Urban Consolidation Center to improve city logistics in Ho Chi Minh City involves considering the unique characteristics and challenges of HCMC's urban environment, integrating our knowledge of the world's current movements in the logistics sector and incorporating the experience of our own. In this part, the study will put forward some recommendations and point out several remarkable notices in the establishment of UCCs in HCMC.

(1) Potential location

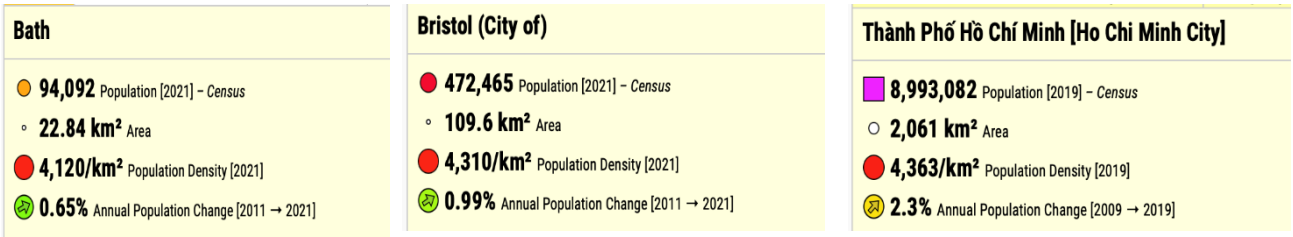

Figure 11: Population statistics for Bristol, Bath and Ho Chi Minh

Source: Citypopulation, 2022

As can be seen in the table, HCMC has a population that clearly outstrips the sum of population in Bath and Bristol (560 thousand people) by an overwhelming margin, standing at almost 9 million people. This number is the result of a 2,3% increase throughout a 10-year period starting from 2019 and this trend is expected to continue in the following years. Meanwhile, the area of Bristol and Bath accounts for around 130 km square, which is quite a lot smaller than the total area of HCMC, which also explains why these countries have certain similarities in population density (over 4000/km square).

The BBUCC is located in the suburban area near the serve area of Broadmead, the central area of Bristol to take advantage of the small total area and to yield the highest productivity in connectivity and distribution. However, in the case of HCMC, it would be more complicated for a much larger and crowded city with limited infrastructure capability, less experience and less developed logistics sector. As a result, the research team has decided to put forward the recommendation of the ideal location of the UCCs at the beginning stage of development:

Implementation area: Thu Duc city, the suburban area of HCMC city.

Serving area: City center of HCMC

Figure 12: Distribution of districts in HCMC

Source: Quy Hoạch Việt Nam, 2020

Thu Duc City, with its advantageous geographical position, is suitable to become the first area of UCC implementation. In terms of proximity to major transportation routes, Thu Duc lies at the crossroads of several major highways, including **Highway 1A** (National Route 1A) and **Highway 13**. These highways connect Thu Duc to neighboring provinces and cities, facilitating the movement of goods and people. Thu Duc is also connected with the city centre via **Ha Noi Highway** (45 minutes travel time). In addition, Thu Duc's proximity to **Tan Son Nhat Airport** and **Cat Lai Port**, the 2 strategic points for air and maritime trade flows, enables efficient freight operations (Son Nghia, 2023).

In addition, as mentioned in 5.2.2, the long term plan of HCMC's authorities would involve the establishment of a logistics hub in Thu Duc city. By constructing UCCs close to the logistics hubs, businesses can take advantage of integration as the connectivity between suppliers, distributors and consumers can be greatly improved. If UCCs are located near logistics centers, it can help to improve the efficiency of freight transport in cities and thereby reduce its traffic and environmental impacts (Allen et al., 2014)

(2) Utilization of electric vehicles

The predominant types of vehicle used in the BBUCC model involve large-capacity electric vehicles. This strategic approach would maximize the volume carried per trip and reduce the number of vehicles entering the center of Bristol and Bath. For Vietnam, however, the limited capabilities in the infrastructure for charging and maintenance or the cost for carriers would affect the adoption of EVs in the UCC model. Therefore, this research would propose an alternative to large-capacity electric trucks, which are **electric scooters with built-in storage compartments**. Lazada Logistics, a part of the Lazada Vietnam e-commerce platform, has taken proactive steps by collaborating with Selex Motors, a Vietnamese EV company.

Figure 13: Selex Camel Electric Scooter

Source: Selex, 2023

With an electric powertrain, this vehicle aligns with environmental considerations and aims to reduce the ecological footprint associated with urban logistics. In contrast to other electric motorbikes on the market today, this solution offers a rare unit serving the electric cargo motorbike segment with a load capacity of up to hundreds of kg (Vietnambiz, 2023).

Another vehicle utilized in the model could be the **high-capacity diesel van**. This vehicle is quite common in goods delivery in Vietnam because of its durability. Another remarkable point is to prioritize fuel-efficient vehicles to reduce operational costs, especially important for frequent stop-and-start traffic conditions in urban areas.

(3) Operational aspects

The development and trial phase (4 years for BBUCC) should be implemented in the location of Thu Duc, Ho Chi Minh, as proposed in the above sections before going into full operation and expansion.

In terms of distribution, HCMC would need to take advantage of the fuel-powered vehicles that could carry bulk shipments to the centre, before utilizing built-in storage electric scooters to deliver the goods to customers. The flexibility to choose from these two vehicles strategically allows the UCCs to adapt to the dynamic demands of the business, especially during peak seasons or unexpected events when traffic congestion has become the norm in HCMC, thus maximizing the overall resilience and effectiveness of the logistics system. It is also suggested for further utilization of BRT bus lanes as the local transport authority allows UCC vehicles to access them to and from the city centre on a trial basis to cut delivery times and improve reliability (Hapgood, 2009).

(4) Integration of Smart Logistics Solutions

HCMC can integrate smart logistics solutions into transportation and distribution processes through a UCC, from **real-time tracking** to optimizing transportation routes. By using GPS devices and software, UCC operators can track the location and status of shipments, optimize the routing and scheduling of deliveries, and identify and resolve any delays or issues in the supply chain. In addition, **automated systems** can help better control dock operations and schedule deliveries to reduce the number of vehicles and dwell times at the loading dock. Sensors and RFID technology can be used to monitor the movement and status of goods in the warehouse. This ensures accurate and up-to-date information about the available stock. Additionally, autonomous robots can be used to transport goods from UCCS to or within buildings. These facilities can also serve as a leverage to explore emerging automated delivery systems such as drones. (Carvalho, 2023).

7. Conclusion

This study analyzed the theoretical and practical aspects of implementing UCCs to improve city logistics efficiency and gain social benefits. By evaluating BBUCC's success and current city logistics landscape in Ho Chi Minh City, valuable insights into the opportunities and challenges that Ho Chi Minh City might encounter when adopting a similar model are provided. The study’s findings could serve as one of reference resources for major cities which desire to integrate UCCs solutions into their city logistics operations.

However, the research has certain limitations that should be addressed in further studies. Firstly, limited data sources hinders a more overarching assessment of BBUCC's effectiveness. Secondly, the study's reliance on a single case study restricts its generalizability to broader city

logistics contexts. Therefore, future research should involve diverse examples of UCCS in the world to offer the most comprehensive perspective.

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