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The Space Syntax Study on The Baltic Station Market of Estonia

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Abstract

The public market is a well-known typology that creates a sense of community and locality within the site and context. The typology is defined as uniqueness, depending on the culture and civilization in which they are found, and they reflect small or large-scale commodities manufacturing. This paper will focus on studying space syntax to extract the level of permeability and wayfinding of a market in Estonia named the Baltic Station Market. The Baltic Station Market is a call designed and enhanced from the old building since 1993. This building is located at the heart of the north of Kalamaja city, close to the locals as an attraction for tourists. This paper will use space syntax methodology, which will be further developed into justified graphs to understand the spatial configuration inside the market. The result shows a very high permeability and straightforward wayfinding from the case study to serve the public users dominantly. Hence, it is said that the case study has achieved desirable circulations without neglecting the usage of adaptive reuse of the existing building's structure and walls.

Discipline: Architecture, Space Syntax

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1 Introduction

Public markets are public spaces where products are sold to the public and community. The areas designated are distinctive, depending on the culture and society living, which represent the production of products (small or large scale). The market is a place to gain and sustain the economy

for every district. The area community can meet and commute within themselves and introduce their products and community to outsiders. The paper is written to study the spatial configurations to determine the floor plans' spatial planning and layout. The aim will focus on the level of permeability of the building and its depth of space.

The case study of a community market in Estonia named the Baltic Station Market by KOKO Architects is chosen for this paper. It is an adaptive reuse market with a size of 25000m2. This market is a well-known market destined for the locals and visitors offering a variety of goods. This project has been shortlisted for the World Architecture Festival (WAF) 2018 under the 'Old and New' category and was awarded the 2017 Construction of the Year Award by the Estonian Association of Architectural and Consulting Engineering Companies (EAACEC). The project was designed with a characterful history related to Tallinn's central railway station and its residential district in Kalamaja. This study will look into the level of wayfinding and permeability in the space functionalities inside the building to see how spaces are made to preserve history while making new contemporary ideas to make it a diverse architecture.

This study will evaluate the level of wayfinding and permeability in the spatial configuration inside the building to see how spaces are made to preserve history while making new contemporary ideas to make it a multi-functional architecture. Therefore, this will cover the spaces' subdivision ranging from the public to the private areas and on the system designated to navigate the users of the market, in enhancing the users' experience.

Each paper must have less than 5000 words including everything. Click “Normal” for all paragraph writings (Thiandee et al., 2019), see Figure 1.

All Figure images must be sharp and of high quality, with clear big text. Grouped text boxes are preferable.

2 Literature Review

2.1 Space Syntax

According to Dursun (2007), space syntax is an analytical theory of space, which quantitively describes spatial information in various forms; buildings, cities, interior spaces, or landscapes. Essential things for space syntax are the linkage and relation between the users and the habitable spaces relatively. The relational characteristic is defined as the characteristic forms resulting from human behavior. It is believed that part of the users can be conveyed through the space. Space Syntax can often comprehend the voids within the wall, fences, and other impediments or obstructions that restrain the traffic and visual field. There are three basic concepts for space syntax analysis. The first one is the convex space, defined as the space where there is no line between any two points. Axial space, known as the axial line, is the second fundamental analysis, which means the straight line or sightline that is possible to follow on foot, and the third is the isovist space, which is the total of the area seen from one point.

2.2 Background Case Study

The Baltic Station Market is an adaptive reuse market in north Tallinn between the city's central railway station and the residential district of Kalamaja, as shown in figure 1. The idea is to reconstruct and create a contemporary and diverse market while preserving the existing market's historic character. This enhanced the livelihood of the context area, from the railway users, locals, youth, tourists, and outsiders. This public market was designed by KOKO Architects and built-in 2017 with 25000m2. The façade of this market is made of three two-story limestones, and its new extension part of the market ideally includes a pitched roof mimicking the shape and size of the original building with a newly added function space at the underground.

The main aim and idea of the market are to convey the hustle of the city's people. The massing form has brought new and old ideas together while serving the function of a stock market – the stalls for meat, fish dairy with farmer goods, vegetables, and street food. These spaces create and combine the part in a new way to experience the Baltic Station Market. The challenge of the project is to make sure to preserve the historical features of the building without losing the market vibe and interrupting the livelihood of the vendors and visitors.

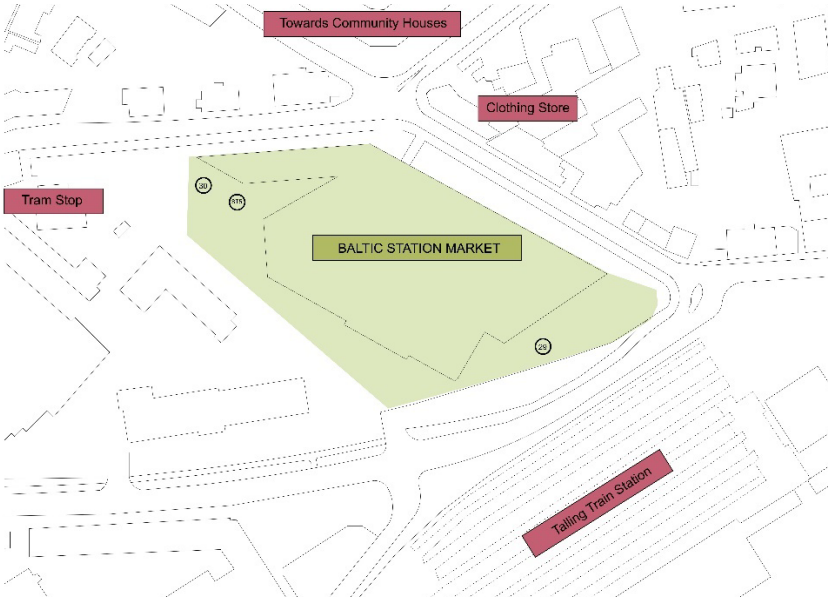

Figure 1: The redrawn site plan with context showing the location of the Baltic Station Market.

The project falls under the commercial: market, with its spaces designated majorly for the public. This building was built to create a new landmark for the city to bond the residents, locals, and tourists. Baltic Station Market is situated in the north city center of Tallinn, Estonia. It was long built and opened in 1993. The building was closed in 2016 for renovations by KOKO Architects to create a contemporary market. It was back open in May 2017, with some winning awards. The Baltic Station Market mixes conventional and modern architecture (Baltic station market. SSAB., n.d.).

3 Method

3.1 Permeability and Wayfinding

The details, floor plans, and data will be redrawn using ArchiCAD and Photoshop for better graphics usage. In addition to the methods used, this paper will use the space syntax method, where the floor plans will be needed to study the spaces in the market. The nodes will be numbered and labeled alphabetically with colors difference to initiate the different purposes, depths, types (public, semi, or private), and circulation. A justified graph will be produced from the study to see the market's permeability level and wayfinding (navigation). A literature review will be the basis of this study due to its location, far from on-site research purposes.

From Hillier et al. (1984), the first steps are by deciding the information to be extracted from the market. The spatial description will then reveal the dynamic functions that allow the justifications of the social products. These descriptions will be viewed in three levels: the identification and representation of spatial elements, the categorization of spatial relations, and the modeling of commons called the genotypical themes and patterns (Hillier et al., 1984).

By measuring space using a justified graph, every node will be plotted and labeled, and the hierarchy of the nodes will be drawn into a justified graph from 0-n. The higher the scale of spaces circulates, the increased level of depth of the areas in the building.

3.2 Justified Graph

By measuring space using a justified graph, every node will be plotted and labeled, and the hierarchy of the nodes will be drawn into a chart from 0-n. The higher the order of spaces circulates, the higher the depth of the spaces. By exploring the space syntax, plan layouts will be merged with colors that will justify the type of space, from the public to the most private spaces. Alphanumeric will define the access or entrance and other uses of the building. Therefore, ET1 as an example will mean Entrance number 1, and the sequence will follow. Building services will be labeled with B, so all equipment and service spaces will be labeled from B1, B2, B3, and the list go on. Alphabet S will define the storage spaces (S1, S2, S3, etc.), washrooms will use the alphabet W (W1, W2, W3, etc.), staircases with the alphabet ST (ST1, ST2, ST3, etc.), and Elevator will be labeled as EL (EL1, EL2, EL3, etc.). Meanwhile, numerical labels will justify the usable spaces, including the markets, stalls, retailers, restaurants, etc.

The labeled layouts are then transferred to create the data tabulation using the justified graph method. This will include the permeability and wayfinding studies based on the graph to see the flow of the spaces in the market. There are two types of lines indicated in the justified diagram, and the first is the black line to show the linkage of each node and the red dotted line that marked the vertical circulation.

The floor plan will be analyzed thoroughly to show the depth level of permeability study for the building, with every node distinguished. All nodes will be named, determined their access and depth, and differentiated using colors (Blue: public, Red: Private). Data from the justified graph will

be tabulated, in detail, to show the level of permeability and wayfinding. From the table, the hierarchy and story will be shown and understood.

4 Result

The analysis will involve the Baltic Station from the site, basement, ground floor, and first floor. The circulation within the market will be extracted as a graph to see the level of depth and permeability. As this case study is a community market, the study will emphasize the flow of the market's visitors, defined as blue color in the plan and graph and red color in a program that indicates the private users (shopkeepers and staff).

4.1 Site

Based on the plan redrawn in Figure 2, the site of the community market shows two different outdoor spaces that can be accessed towards the market. Users will have two access from 29 and 30, with both nodes being used by public and private. The justified graph in Figure 2 shows that the site plan is majorly open to the public. Both public and remote users can use the nodes, making each node easy to access and noticeable. Nodes 29 and 30 have access to vertical circulation towards the basements. This is public access so visitors can directly go towards the basement without going through the ground floor. The depth level for all nodes in the site is considered public and at a low depth level, making its wayfinding easier. The Likert scale explains, as shown in Table 1 shows the relation and function of each node.

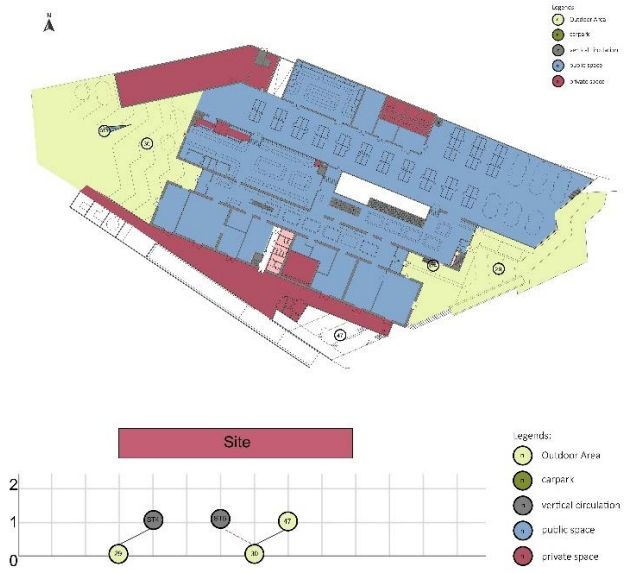

Figure 2: The redrawn site plan and justified graph of the Baltic Station Market.

Table 1: Likert Scale for Space Syntax Analysis for site plan from the justified graph.

Area	Category	Depth Level	Level of Permeability	Level of Wayfinding
ST4	Staircase	-	Public	Very Easy
ST5	Staircase	-	Public	Very Easy
29	Outdoor Area	0	Public	Very Easy
30	Outdoor Area	1	Public	Very Easy
47	Outdoor Amphitheatre	1	Public	Very Easy

4.2 Basement

Figure 3 shows the redrawn plan of the basement with its justified graph. The graph indicates the depth level of a maximum of 8 with the level of permeability being public. Although the depth level is higher (3 – 8), the community market is made to facilitate the community and general visitors; hence the nodes for this building are primarily public and semi-public. To avoid the crowd on the ground floor, this building has direct access to the basement, with significant control. The entry is made at the parking area (CP), connected from node 29 outdoor and a semi-private circulation associated at node 30 towards a mechanical and retail at 1. There is one entrance at this level, ET1, which relates to the carpark (CP).

On this floor, visitors (the public) can access retails, an open market and food market (2-7, 8-10 and, 4-28), and a fitness center that is semi-public (12). The public users can access the basement from the indicated vertical circulation marked in grey, as shown in Figure 3. The level of wayfinding is considered straightforward for public users from very easy to easy. Direct connection from the ground floor via a staircase (ST1 and ST4 – ST6), an elevator (EL1), and an escalator (ES1).

Apart from that, private access for private users is also indicated in the plan where situated near the red nodes. The remote nodes created at the basement level are the mechanical room (M1 – M6) and storage (S1 – S3). The story of wayfinding for M2 – M6 is considered easy as it is located at the CP, while M1 and S1 – S3 are located in a private area away from the public spaces. Considering the location, it can be shown in Figure 3 that the remote nodes are high depth level.

Table 2: Likert Scale for Space Syntax Analysis of basement plan from the justified graph.

Area	Category	Depth Level	Level of Permeability	Level of Wayfinding
ST1, ST4-ST6	Staircase	-	Public	Very Easy
EL1	Elevator	-	Public	Very Easy
ES1	Escalator	-	Public	Very Easy
CP	Carpark	3	Public	Easy
ET1	Entrance	4	Public	Easy
M2-M6	Mechanical	4	Private	Easy
1	Walkway	5	Public	Easy
2-7	Retail	6	Public	Easy
8-10	Open Market	6	Public	Easy
13	Food Market	7	Public	Easy
11	Fitness	7	Semi-Public	Average
14-28	Food Market	8	Public	Easy
12	Fitness	8	Semi-Public	Average
28	Open Market (Store)	8	Private	Difficult
EL2 and ST2	Elevator and Staircase	-	Private	Very Difficult
EL3 and ST3	Elevator and Staircase	-	Private	Very Difficult
M1	Mechanical	6	Private	Very Difficult
S1-S3	Storage	7-8	Private	Very Difficult

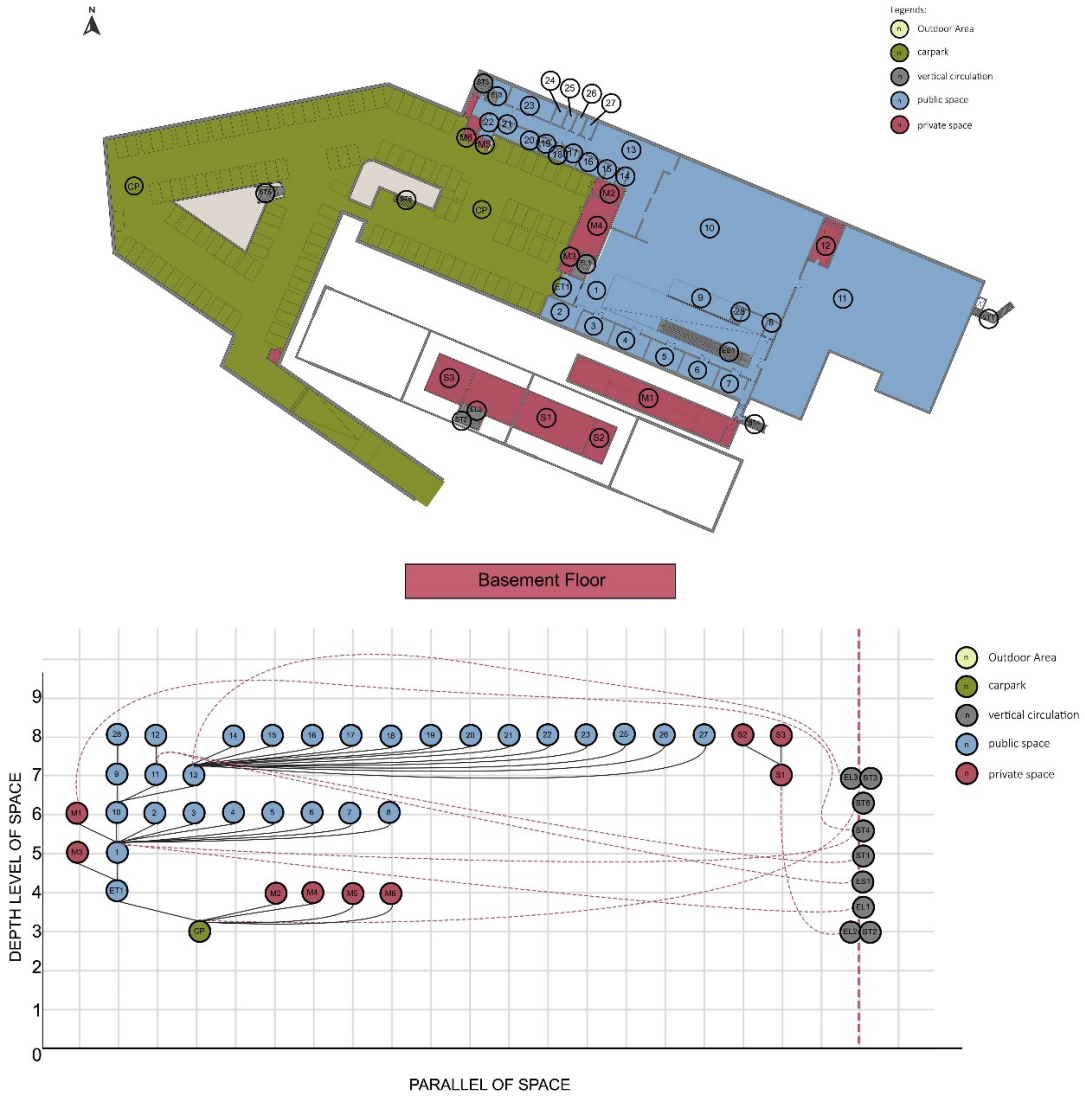

Figure 3: The redrawn basement plan and justified graph of the Baltic Station Market.

4.3 Ground Floor

The ground floor of the Baltic Station Market has the lowest depth level, as shown in Figure 4. The figure shows a plan with allocated nodes and the depth level of the justified graph for the ground level. The chart indicates that the level of permeability is public, and the level of wayfinding based on Table 3 is elementary in most spaces.

All users (public and private) can access the market through the entrances provided (ET2 – ET7). ET2 – ET4 is connected to the outside node (29), and ET5 – ET7 is connected to node number 30. The circulation, however, will cross paths at nodes number 31 and 32 except for ET6, where it is a bit closed to node number 33. Ideally, there are three main entrances at each site opening (29 and 30). Based on the redrawn plan shown in Figure 4, the ground floor is made to serve majorly for the open market, food market, retail, and some part of it as a restaurant for the public.

Two nodes are provided as private access (62 and ET8), which only the remote users can access for loading and unloading. Node 62, however, is yet located at the shallowest depth of the justified graph, where loading and unloading can be done quickly for the shopkeepers.

Nevertheless, the level of wayfinding for the ground floor is considered very easy for public users and difficult only for private users.

This floor is connected to the basement and the first floor; this floor is facilitated with many vertical circulations for easy access for public users. Staircase (ST1 and ST2, ST4 – ST9), an elevator (EL1), and an escalator (ES1 – ES3) are equipped for public users and are very easily accessible. There is also an elevator and staircase (EL2 and ST2), which are considered semi-public for the usage of private users for loading. EL3 and ST3 are dominantly private and are very difficult to access as it is located at an enclosed node.

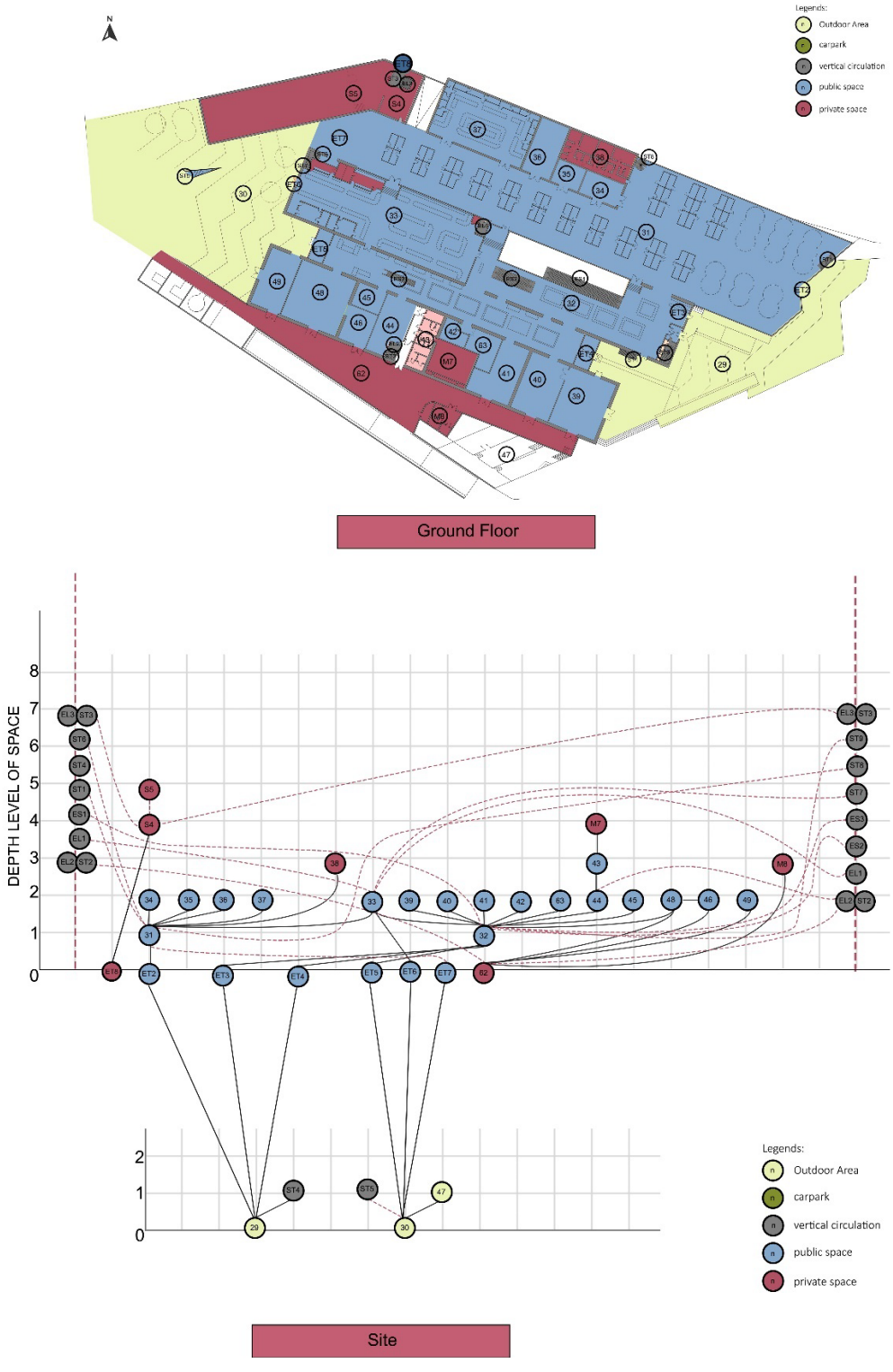

Figure 4: The redrawn ground floor plan and justified graph of the Baltic Station Market.

Table 3: Likert Scale for Space Syntax Analysis of the ground floor plan from the justified graph.

Area	Category	Depth Level	Level of Permeability	Level of Wayfinding
ST1 and ST2, ST4-ST9	Staircase	-	Public	Very Easy
EL1	Elevator	-	Public	Very Easy
ES1-ES3	Escalator	-	Public	Very Easy
29 and 30	Outdoor Area	0	Public	Very Easy
ET2-ET7	Entrance	0	Public	Very Easy
47	Outdoor Amphitheatre	0	Public	Very Easy
31	Open Market	1	Public	Very Easy
32	Food Market	1	Public	Very Easy
33	Food Market	2	Public	Very Easy
34-36	Retail	2	Public	Very Easy
37	Food Market	2	Public	Very Easy
39-42	Retail	2	Public	Very Easy
63	Retail	2	Public	Very Easy
44-46	Retail	2	Public	Very Easy
48 and 49	Restaurant	2	Public	Very Easy
62	Service	0	Private	Very Easy
43	Toilet	3	Public	Easy
EL2 and ST2	Elevator and Staircase	-	Semi-Public	Easy
ET8	Entrance	0	Private	Easy
EL3 and ST3	Elevator and Staircase	-	Private	Very Difficult
38	Staff Area	3	Private	Very Difficult
M7 and M8	Mechanical	3-4	Private	Very Difficult
S4 - S5	Storage	4-5	Private	Very Difficult

4.4 First Floor

The first floor is the top floor of this community market. Figure 5 shows the redrawn plan and the justified graph of the level, which shows that the depth is higher (from 5 to 7). However, the spaces for this top floor plan are still dominant towards public users, which cover the retail, outdoor theatre, restaurants, and antiques.

Staircase (ST7 – ST9), an elevator (EL1), and Escalator (ES2 – ES3) for this floor serve the public users while EL2 and ST2 are used as a semi-public circulation for public and private use (loading). Another private vertical circulation which is EL3 and ST3 is located on the floor mainly for personal use and is located at a remote node.

Interestingly, this floor is connected to the outdoor arena from the site (47), so the public can have direct access to the first floor from the outdoor area without going through the ground floor circulation. The level of wayfinding for this floor is straightforward for the public nodes and is linked together, as shown in Figure 5.

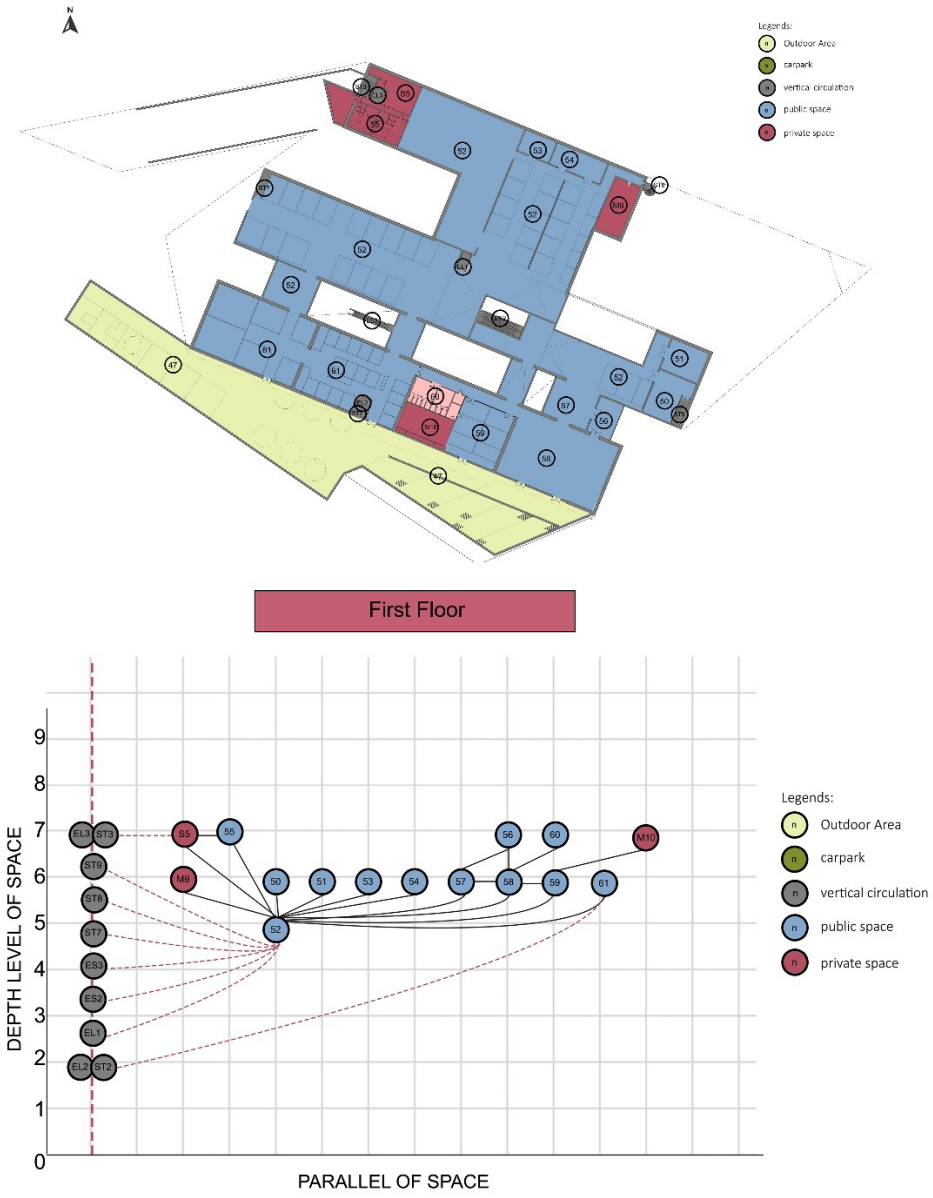

Figure 5: The redrawn first-floor plan and justified graph of the Baltic Station Market.

Table 4: Likert Scale for Space Syntax Analysis of first-floor plan from the justified graph.

Area	Category	Depth Level	Level of Permeability	Level of Wayfinding
ST7-ST9	Staircase	-	Public	Very Easy
EL1	Elevator	-	Public	Very Easy
ES2-ES3	Escalator	-	Public	Very Easy
47	Outdoor Amphitheatre	1	Public	Very Easy
50-54	Retail	6	Public	Easy
61	Antiques	6	Public	Easy
57-58	Restaurant	6	Public	Easy
M9	Mechanical	6	Private	Easy
56	Restaurant	7	Public	Easy
60	Toilet	7	Public	Easy
EL2 and ST2	Elevator and Staircase	-	Semi-Public	Easy
EL3 and ST3	Elevator and Staircase	-	Private	Very Difficult
S5	Storage	7	Private	Very Difficult
55	Staff Room	7	Private	Very Difficult

4.5 Justified Graph

Figure 6 shows the justified graph of the Baltic Station Market, Estonia. From the observation made, it is said that the ground floor act as the primary level of the market that connects and links other floors together. The wayfinding is primarily straightforward for this case study to facilitate the community and the public users. Some remote nodes within each floor are more difficult to and at a higher depth, mainly as a storage and mechanical room for private users.

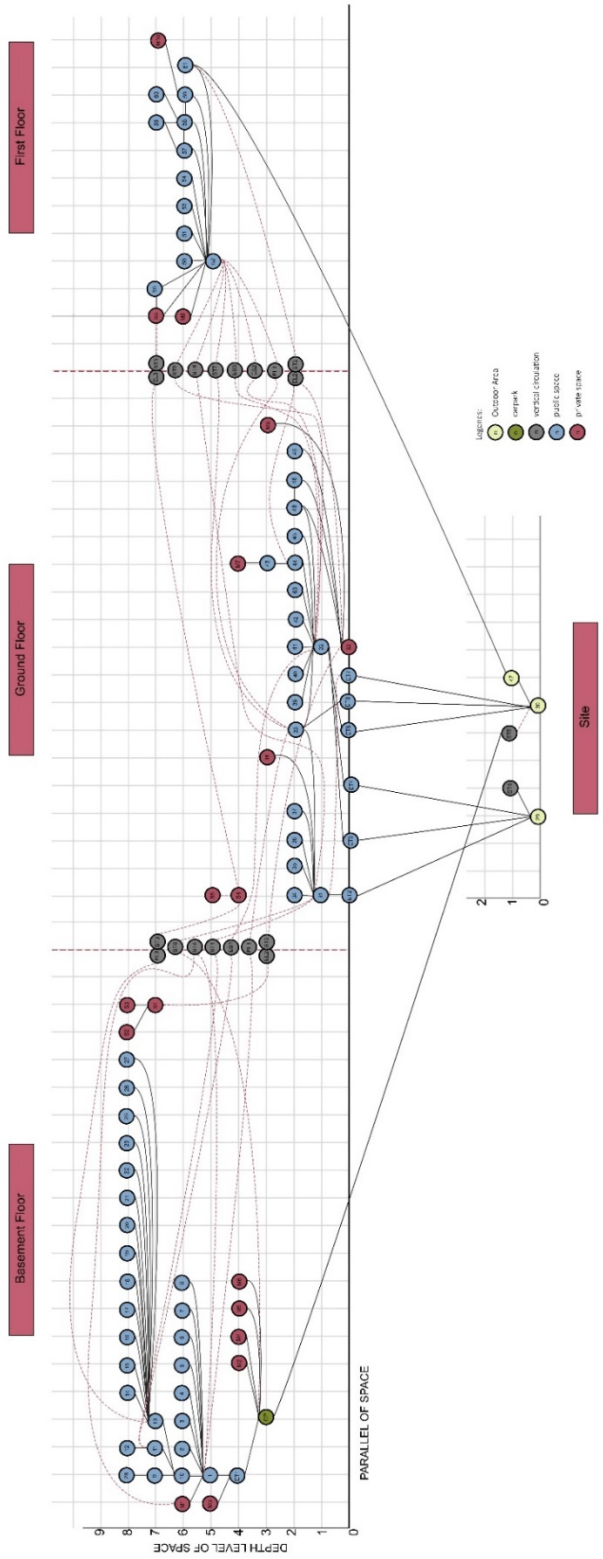

Figure 6: The whole justified graph of the Baltic Station Market.

5 Discussion

Based on the result and analysis made based on the case study, shows the aim of the building thoroughly to facilitate the community and public, hence the achievable wayfinding and wayfinding for each node. The Baltic Station Market is openly accessible not only through the ground floor, but they made it accessible to the other floors from the site (outdoor), which significantly reduces the congestion on the ground floor. More importantly, many entrances make the building accessible and welcoming without focusing on one main entrance.

The circulation of the building is very straightforward, with the vertical circulation that is said to be very easy to locate. From the analysis, the ground floor acts as the primary level that allows circulation and linkage toward other bases. With 87% of public nodes covered on the ground floor, the general users are expected to understand and predict the wayfinding very easily. Meanwhile, the circulation covers 2% of each floor.

In addition, Figure 6 shows that the ground floor has the highest level of wayfinding, with the nodes being mostly lower than the ones in the basement and first floor. This is said that, however, all three floors have mostly very straightforward and straightforward wayfinding to compare to other typologies.

The stalls are made connected to the main connecting space mostly. Only 2% of the vertical circulation is based on the analysis, covering the nodes for loading and mechanical.

6 Conclusion

The overall planning of the case study shows excellent depth of permeability and wayfinding for a community market. It is straightforward and eases the public users to circulate the building spaces without getting lost or facing unpleasant experiences. Many entrances on the ground floor make better wayfinding and lower the percentage of the areas to be congested during peak time.

However, better formation and circulation might be achieved if this case study is made without considering the adaptive reuse of the old building. This can be applied as the current flow and form are restricted to following the existing structure and walls to ensure the existing building is well appreciated. Nevertheless, the current Baltic Station Market has already made clear wayfinding and permeability to ensure public users are welcome to experience the installation.

Nevertheless, extensive research might ease the study of the space syntax of the chosen case study. More detailed data resources through interviews or site visits would help for a better and more specific result, leading to a more thorough analysis and understanding.

7 Availability of Data and Material

All information related to this paper is already accessible in this article.

8 Acknowledgement

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