Insight in access complexity for disposition decision-making

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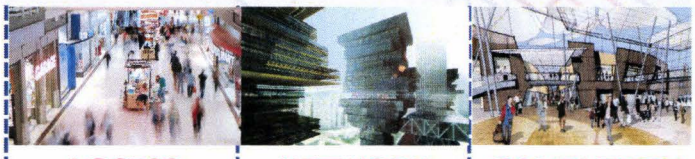

ACCESS | NETWORK | COMPLEXITY

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REAL ESTATE MANAGEMENT & DEVELOPMENT

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PREFACE

This thesis is the final product for my graduation at the MSc program Real Estate Management & Development at the Eindhoven University of Technology. For this final thesis I studied the worlds of Investment decision-making, Access complexity and real estate strategies. These subjects are not common in the curriculum and therefore, for me, very interesting. I was able to study these subjects at Multi Corporation bv; an organization with its own Retail Investment Fund and specialized in the development of retail real estate and mall management.

These are very interesting and uncertain times for Real Estate investors. The credit crunch leads to a reduction in the general availability of loans or a sudden tightening of the conditions required to obtain a loan from the banks. Strategies are changing and the relationship between credit availability and interest rates has implicitly changed and the market presents different demands. To be able to deal with these developments, investors must take a closer look at their strategies regarding their organization and especially the performance of their real estate. This is not an easy task, given the fact that financial economics is leading in this sector which is subjected to forecasted indications in this uncertain time. Few studies address the functionality of a design (access) in a shopping centre from tenant and visitor satisfaction viewpoint as investment tool. Furthermore, these findings are often general and differ from each other. This thesis therefore tries to shed some light on these subjects and analyzes and structures these developments and problems. This thesis also provides new insights into the disposition decision-making based on access and endogenous criteria.

I would like to thank Gordon Brown and Ingrid Janssen for their helpful comments and continuous support as my supervisors from the Eindhoven University of Technology. I am also very grateful to everybody at Multi Asset Management, for their comments and practical support. Furthermore, I would like to thank all who have supported me during my years of studying at Eindhoven University of technology. Finally, I would like to thank my girlfriend Magrita, my parents and brother for their support, but above all their faith in me.

Niels van Gerwen
Tilburg, July 2009

EXECUTIVE SUMMARY

Initial investment studies act as basis for financial decision-making and creates a benchmark for investors what they can expect from a retail property investment in financial terms. Although these models directly depend on forecasted criteria, which establish the disposal value of a shopping center, these financial principles don't give an explanation if a property is attractive within the established market. It's obvious, when the fund's strategy is based on developing value in the future, performance has to be related to satisfaction of its stakeholders. Yet, financial economics is focussed on satisfaction of its investor instead of visitors or tenants. Another missing variable in this financial decision-making approach, involves the thoughts to acknowledge the role of design of a retail property. We conclude that not only financial variables might lead to disposition decision-making, but also spatial characterize and configuration affecting shopping centre performance figures. Before analyzing the shape and impact of criteria, we first have to divide this research into three sections.

- Information System:
  - i. Performance criteria based on annual Centre Reports. (Chapter.3)
  - ii. Design patterns analyzed by Spatial Network Analysis. (Chapter 4)
- Criteria System:
  - i. Multiple Criteria Decision-making Matrix (MCDM). (Chapter 5)

Prior research structures an inventory of typical retail related criteria (Table A) which produce estimations of design, qualitative and functioning differences between comparable real estate. Furthermore, this approach gives an indication of the endogenous performance from visitor and tenant perspective (pyramid in table A).

Table A: Utility of property performance data.

	Design	Tenant Mix	Sales / Footfall	Income	Location
Assessments:	Size, Age, Maintenance	Vacancy, Store size, Branches	Sales, footfall	Rent, Turnover rent	Anchor tenant, Population, Market share
Spatial:	Access, Functionality				
Benchmark:			Effort Index, sales	Income	

Some of these variables are more on an abstractly base, and are not measured by the investor in property reports. These variables like Access and Functionality, needs there own analysis to provide quantitative figures to this subject.

'What is the shape of the spatial effects and which process is essential to contribute spatial performance figures?'

Design and Functionality of the interior space, becomes a more and more influential criteria when we are dealing with visitor friendliness of a shopping centre. Shaping these spatial performance figures of a retail property, needs a powerful analysis to measure how functionality is structured in the internal spatial environment of a shopping centre. Interconnected spatial areas and walking patterns can be seen as a network of a two-dimensional layout or floor plan of a centre area. This gives the starting point for analyzing spatial functionality or complexity in a shopping centre. Measuring the complexity of access, three data sets of calculations are involved: 1) the number of Nodes (Convex or lineal units), 2) the number of links, and 3) the number of nodes at each step/level in the network analysis (where the visitor would terminate entry from centre entrance into a specific shopping area). Complexity increases on the basis of

numbers of nodes and links, the relationship of nodes and links to each other and the relative location of nodes from the access origin. The data set (a virtual fund) comprehends six individual retail property developments located in various retail markets and cities in Portugal (5) and Spain (1). This approach offers us three important outcomes to measure the endogenous performance in a centre.

* The absolute and relative complexity of the access based on spatial network theories.
* Weighted average of shop entrance complexity for insight in shops configuration in a centre.
* A spatial network model as guide for complexity per levels. This information is essential for the measurement of aggregation figures of other performance indicators (Tenant mix, Rent, Effort Index and Vacancy)

Finally, we need to understand how these spatial networks produce an effect on the design and functionality of a shopping centre and in a following stage how this affects the value of a property. Concerning our overall research question, there is an expectation of a positive relationship between access complexity figures and financial performance of the shopping centre. After analyzing the access complexity profiles (see table B: analysis), intuitively some general trends for endogenous performance can be identified. Relating this indicators to the different spatial levels in the centre, explains which spatial levels guarantee better performing figures and to what degree this is corresponding to spatial network way of thinking (see table B: observations).

Table B: Results from spatial network approach.

	ANALYSIS					
Access Complexity	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Access complexity (Relative)	33.76	34.78	44.52	39.13	39.00	38.21
Weighted Average Entrance	7.83	5.15	6.81	7.86	8.01	6.76

	OBSERVATIONS					
Network analysis	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Tenant Mix	+	+	+	++	-	--
Rent	+	--	+	++	++	-
Effort Index	-	-	++	++	+	-
Vacancy	++	+	-	--	++	--

Analyzing all the shopping centres in this virtual retail fund on spatial patterns provides two approved variables (access complexity and weighted average entrance) for further research. Unfortunately, calculations for network analysis aren't applicable by the lack of missing indicators (links and connections) as an input for these calculations. These outcomes are adopted as a guide line explaining the comparison results, and provide opportunities for better performance management.

'How can we shape the spatial components to contribute future disposition decision-making for a retail investment fund?'

The Multiple Criteria Approach establishes indications of asset value/performance based on identification and analysis of actual comparable assets in a real estate investment fund. Previous research created a formation of the criteria system influencing real estate value. For every shopping centre, the mean deviation is estimated through pairwise comparison approach. The mean deviation demonstrates in which order the "real" shopping centre value, as a result of our benchmark, shows abnormality in relation to the fixed investment value per sq.m. All individual properties representing their own definite investment value because of diversity in yield, type and/or location. Results reveal that four out of six properties are performing above expectation (table C). Comparing the outcomes from financial performance based on yield calculations with our expectations from prior spatial research, results offer an investor a base for considered disposition decision-making. Addition, these calculated values doesn't representing realistic selling prices, but expresses the endogenous performance. Property 'Ag' demonstrates the highest positive percentage of 19.1% above expected value followed by property 'Am', 'Ch' and 'Mo' which all shows a positive result. Negative outcomes from these calculations refer to the properties 'To' and 'Av', which seem

to fail on spatial functionality. Summarizing the simulation approach, we will recommend the investor to purchase property 'To' immediately. Property 'Av' seems to fail on access complexity, but further spatial observations shows enough potential in the short run for continuation in the virtual fund.

Table C: Results of shopping centres multiple criteria analysis.

Criteria				Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Evaluation of the Shopping Center										
	Access Complexity (Spatial Network analysis)		-		34.78	39.00	44.52	39.13	33.76	38.36
	Space Distribution (Weighted Average)		-		5.15	8.01	6.81	7.86	7.83	6.76
Contribution to Benchmark										
	Rental income per sqm	(in %)	+		27.6%	-11.7%	6.8%	9.0%	-2.2%	-29.5%
	Sales per sqm	(in %)	+		13.8%	-41.3%	36.6%	43.2%	-17.5%	-34.9%
	Effort Index	(in %)	-		4.4%	1.7%	-3.1%	-2.8%	-0.8%	0.6%
Quantitative assessment of premises										
	Design Spatial effectiveness (GLA / Total area)	(in %)	+		58.74%	49.38%	65.90%	63.29%	44.59%	73.24%
	Size GLA *(excl. Resid. - Hyper - DIY)*	(in 000 sq.m.)	+		14.50	60.20	25.28	83.45	49.98	29.50
	Maintenance cost	(EUR sq.m/yr)	-		€ 10.39-	€ 9.43-	€ 10.17-	€ 9.60-	€ 11.53-	€ 11.56-
	Large-scale Maintenance cost	(EUR sq.m/yr)	-		€ 2.65	€ 0.71	€ 2.56	€ 0.88	€ 1.14	€ 0.27
	Age	(in years)	-		11.0	5.9	10.5	6.5	8.0	2.3
	Tenant Mix Vacancy space in sqm	(in %)	-		0.00%	2.00%	1.16%	4.42%	0.00%	8.99%
	Variance store size classes	(in 000)	+		185.2	123.1	105.5	212.1	146.3	132.7
	Number of tenant types	(quantity)	+		7	9	9	10	10	8
	Transferring Ratio number of Shops	(in %)	-		8.70%	4.67%	1.16%	14.46%	4.31%	8.99%
	Sales/Footfall Anchor tenant sales per sqm	(in Euros)	+							
	Shopping center Sales per Visitor	(in Euros)	+							
	Footfall	(per sq.m. total)	+		84.9	22.6	43.0	24.1	37.5	12.3
	Opening hours Shops	(week)	+		84	98	91	98	98	72
	Income Correlation (Rental income - Unit size)	(in %)	+		-55.10%	-55.79%	-52.53%	-43.29%	-57.14%	-49.68%
	Growth Turnover rent over 12 mth	(in %)	+		-20.9%	-17.8%	-28.9%	-9.9%	-4.0%	0.9%
	Relation Turnover / Fixed rental income	(in %)	+		3.98%	5.04%	3.69%	1.72%	7.92%	0.06%
	Location Market Share Total Area of Influence	(in %)	+		20.2%	31.5%	29.0%	8.1%	27.0%	4.5%
	Stand Alone Anchor Tenant (HYP-DIY)	(in 000 sq.m.)	+		0.0%	58.9%	0.0%	41.5%	81.2%	54.2%
	Area of Influence	(quantity)	+		416,753	208,303	91,750	167,448	69,966	148,014
Assessment of Growth performance characteristics (Dec '07-Dec. '08)										
	Total Income	(in %)	+		-2.7%	1.0%	1.2%	-4.2%	-1.0%	1.7%
	Effort Index	(in %)	+		12.5%	2.9%	2.1%	6.3%	5.4%	1.1%
	Sales	(in %)	+		2.7%	-3.8%	1.0%	-3.7%	-1.6%	2.3%
	Visitors	(in %)	+		4.0%	2.9%	1.3%	3.6%	-3.0%	10.3%
	Occupancy rate (sq.m.)	(in %)	+		0.0%	37.2%	-1.9%	-1.1%	0.0%	-1.7%

Variable	Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Value (MCDM Analysis)		€ 5,671.01	€ 3,319.33	€ 4,648.98	€ 5,088.63	€ 4,571.47	€ 2,703.39
Expectation value (Yield ass.)		€ 5,430	€ 3,184	€ 5,038	€ 4,871	€ 3,837	€ 3,271
deviation		4.4%	4.3%	-7.7%	4.5%	19.1%	-17.4%

	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"	(K_d)
"Ch"		-0.5%	-0.5%	0.0%	-0.4%	-0.8%	**-0.45%**
"Mo"	0.5%		0.0%	0.5%	0.1%	-0.2%	**0.20%**
"Av"	0.5%	0.0%		0.5%	0.1%	-0.3%	**0.18%**
"Am"	0.0%	-0.5%	-0.5%		-0.4%	-0.8%	**-0.44%**
"Ag"	0.4%	-0.1%	-0.1%	0.4%		-0.4%	**0.02%**
"To"	0.8%	0.2%	0.3%	0.8%	0.4%		**0.49%**

CONTENTS

CHAPTER 1 INTRODUCTION

1.1 MOTIVATION

An all-embracing definition of a good or a bad investment strategy is not unambiguous defended in literature. Present-day, most of the professionals only think in financial terms based on substantial or maximum total returns on their long term investments, combined with an acceptable risk. Implementation of this financial theory is still influential, although we are conscious of the reality of imperfect information, cyclicality of property markets and the fact that real estate is an infrequently traded asset class.

It's obvious that the performance of a property investment portfolio is not only depending on the scale of acquisition, but also concerns how a company is structuring his disposition policy. An investment portfolio is changing direction, not only as a result of market conditions, but also with every future acquisition or sale action. Disposition policy deserves therefore as much attention as the acquisition policy. Question remains, why would we dispose property from a performing Fund? Disposition is important for the realization of fund objectives due to risk and return profiles which result in an increase of overall fund performance. For example; the right acquisition policy during the years combined with an incomplete or not up tot date disposition policy, can lead to property an investor wouldn't develop or purchase for his fund at the moment because of failing performance figures over time.

This master thesis is focusing on the shopping centre market in the Euro zone. We know from prior research that the realization of new shopping centres influence the economic climate of an extensive retail trade area. Taking in a prominent position in an area, the centre have a change to answer the requirements from his visitors. Influential indicators that cover the requirements of the consumers to visit a shopping centre are among other: a leading and competitive location, a suitable catchment area, design and accessibility, active centre management, and a solid tenant mix. Acquisition and disposition management starts with performance related research. By analyzing performance figures of six shopping centres, this research tries to establish a proof that not only financial variables (e.g. input for IRR model) might lead to disposition decision-making, also spatial characterize and configuration affecting shopping centre changing performance figures. The most influential endogenous factors/indicators and their effects on property performance is extensive discussed in this research. The analysis that is leading during this thesis relies on simple theoretical and simulation models based on data provided by a Multi Asset Management. This will bring us to the objective for this research.

Developing a tool that is capable to measures the endogenous performance and risks for individual Shopping centres, sight to the disposition decision process within a Single-Asset Class investment portfolio. Implementation of the model contributes a decision making tool that offers an insight in performance and leads to recommendations about selling retail property within the fund.

1.2 RESEARCH QUESTION

The thesis needs to answer the demand for grounded and considered disposition recommendations by offering a tool and accompanying theory. This can be divided into a few

more research related questions forming the basis for this research design and the progression to final recommendations.

Prior research shows that there is a correlation between financial figures and historic performance of property. First part of the research covers a review of the financial models discussed in several articles, concerning there ability to forecast the future performance of real property. Furthermore, other financial models give recommendations for strategic asset mix within a property investment fund. From here, a property portfolio manager is capable to make decisions about purchase or disposition of property within the investment fund. Yet, financial models experience one basic shortcoming; there is no focus on the spatial factors that's improves the performance of a shopping centre now and in the future. Also the institutional (appraisal) economics literature gives no explanation, but accepts the different approaches for valuation based on respective, financial indicators, comparison sales or building replacement costs theories. At this point, we conclude that spatial patterns or design in relation to property performance are not mentioned within both of this investment studies. This will bring us to the first research question: 'What are the main characteristics of a shopping centre that leads to uncertainty of endogenous performance[1] of an individual retail property?' This is done through an intensive look how literature structures design and spatial patterns of a shopping centre and influences on tenants and visitors. This brings us to our second research question: 'What is the shape of the spatial effects and which process is essential to contribute spatial performance figures?' Next, we need to prepare our data sets as input for this research. When we have demonstrated that this data is capable to do the research, the next question congregate in which way can none financial input affect financial figures. We will see that spatial values like functionality of the design, configuration and tenant mix also affect the uncertainty of future performance of a shopping centre. Herewith, we find a proof that investment decision-making isn't only a financial affair. Finally, we should ask ourselves a more practical question; 'How can we shape the spatial components to contribute future disposition decision-making for a retail investment fund?'

1.3 STRUCTURE

In addressing the above questions, we are going to discuss the relevant streams of literature in Chapter 2, followed by a theoretical model of performance characteristics in chapter 3. This research part includes a theoretical background for all the variables performing as basis for the multiple criteria approach. Next, we analyze the spatial performance and configuration of the six shopping centres through evaluating the floor plans and calculations in Chapter 4. Subsequently, in Chapter 5, a comparison model is used to generate the results to the theoretical analysis. This section also provides insights on how this approach can be used in practice during the decision-making process. Bring together theory, research results and the simulation to a fictitious investment fund; we address implications and possible use to practitioners in Chapter 6. Finally, we conclude in Chapter 7.

[1] When we make mention of 'endogenous or operational' performance for a shopping centre during this thesis, this involves all the criteria which make the shopping location a interesting place for a tenant, based on the relation between the rent that is paid and incomes as a result of sales. Subsequently, generate sales is a result of tenant mix satisfaction under visitors and the spatial environment of a shopping centre.

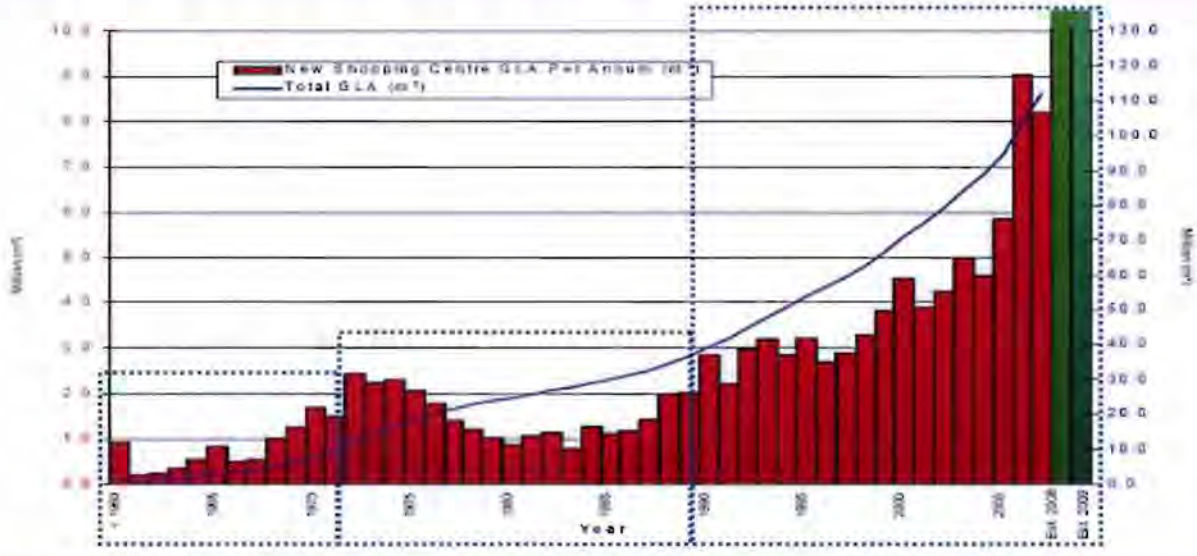
CHAPTER 2 LITERATURE

The credit crunch (Netherlands Q3 2008) has once more made clear that investment decision-making is not only related to forecasted yields, but is also involved with risk and managing the emergence risks. The property risk-return profile becomes a more important facet during the evaluation of buy, hold and sells decision making process. Judgments shouldn't be restricted on the basis of returns and the spread of those as a risk decisive factor, but has also to do with the volatility of the individual property. Furthermore, the requirement for visualization of opportunities and potentials to improve the risk-return profile and become an important indicator for performance analyses (Keeris, 2008). A working definition of performance analysis is therefore required: "the interpretation and evaluation of investment performance to support decision-making" (Morrell, 1991). Measurement is usually concerned with fixed statistics whereas analysis is more concerned with performance relatives to some form of benchmark (Keeris, 2006). Bailey (1984) formulates it as: "An organized investigation of the various indicators which affect the current and future value of a particular property and consideration of the relationship of those indicators aimed for decision-making".
To place this work in context, literature related to this research covers the different fields of retail property investment decision-making, and focuses on the application of Financial and Institutional (appraisers) economics. Property performance literature is primarily based on science from office-building viewpoint, but most of the written methods can be useful during retail research.

2.1 RETAIL FOCUS

Traditionally, offices are the most essential assets within the commercial Real Estate Investments sector in Europe for institutional investors, but retail and especially shopping centres are increasingly getting more attention. Not only the changing retail trends, but also the demand for a better spread of different real estate assets within a Real Estate Investment Fund (REIF), influence the enormous explosion (see Graph 2.1) of retail property inside European countries. The total shopping centre Gross Lettable Area (GLA) has reached almost 112 million sq.m. (Forecasted autumn 2007) and approximately 60% is located in the UK, France, Germany, Spain and Italy. In 2007 approx. 8.2 million sq.m. of space opened, of which the vast majority, over 90% comprised new shopping centre developments (C&W, May 2008).

Graph 2.1: European shopping centre growth by floor space.



Source: Cushman & Wakefield (May 2008). European Shopping Centre Development.

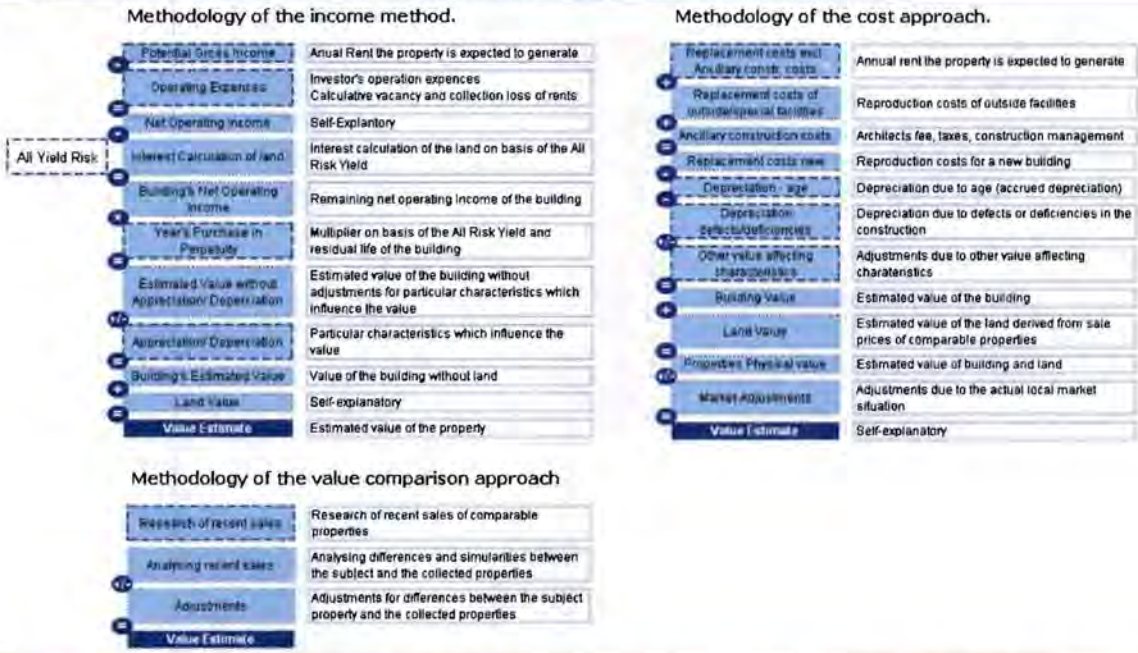
Retail property as an investment has such substantial disadvantages over a number of other investment mediums. They are susceptible to macro economics and price fluctuations, because of lease contracts all kinds of parties are involved and the bulky character of real estate makes diversity within your portfolio almost impossible (Geltner et.al., 2001). However, property also has attractive features, and for instance the growth in demand for retail proposals resulting from the increase in retail expenditure over the years reduces the risk in ownership of retail investments and so strengthens its long-term security (Millington, 1996). Moreover, the relative resilience of the retail sector to the adverse effects of the recession was reflected by the fact that retail property values were not immune to this negative economic atmosphere. This in contrast with the value like commercial, industrial, leisure and many residential properties. The inevitable need of people to purchase goods, even in a recession, tends to make retail properties a relatively good investment even in times of poor economic conditions (Millington, 1996).

Besides the different economical advantages that shows a relationship with retail property investments, also the favorable urban planning environment limits new supply and protects investors from undue competition. Limited numbers of new shopping sites and the fact that planning authorities for good urban planning reasons restrict their retail competition expansion, explain why major investors regard them as highly as investments. The competition within the trade area is esteemed as stumpy and it's suspected that there is an element of monopoly in the ownership of regional shopping centres (Newell et.al., 2007). The question remains, however, when does a planning authority permits new centre plans for augmentation of retail square meters within this fixed trade area to abolish this monopoly?

2.1.1 THE CAPITAL VALUE OF RETAIL PROPERTY

A comprehensive overview of real estate appraisal techniques can be found in the book Taxatieleer vastgoed 1 (Have et.al., 2007) and the reviews in articles in the journal of building appraisal, which covers essential concepts and analysis of appraising the value of commercial property. Real estate appraisal is seen as the practice of developing an opinion of the value of real property, usually its Market Value. Graaskamp (1972) described it as: an analytical approach to value which requires each valuation problem to be investigated from three different but related viewpoints of value. These three viewpoints reflect the market comparison approach, the income approach and the cost to replace approach to value (see Graph 2.2). This approach was confirmed within the lecture documents Waarderen van Vastgoed given by prof.ir. W.G. Keeris MRICS at the TiasNimbas Business School (2007). Although there are three methods, mainly the incomes approach is seen as the leading technique for appraising commercial real estate.
Millington (1996) also says that the value of a retail property is directly related to the anticipated utility of the property to a potential retail user. Shopping centres are valued based on an estimate of current and future cash flows, according to Eppli (1998). He follows that Cash flow estimates come from two primary sources: lease contracts and expected lease contracts. Only if a property is attractive within the established market it will have a rental value at any point in time. This makes the income approach valid (Geltner, 1995), but Rufrano (1990) makes clear that parameters within the valuation summery only make sense when analyzing in totality. No single measure of forecasted return approach like IRR, should alone dictate the pricing decision.

Graph 2.2: Overview different valuation methodologies.



Source: Steixner, D., Koch, D. & Bienert, S. (October 2008). Analysing market impacts and valuation practices. *Property Research Quarterly, 7*(3), 25-34.

There are examples, as Millington (1996) describes, of property which has considerable value to users in the past, but which now lie empty and unused because of there lack of utility at the present time (Examples in the neighborhood: Retail concept Arena / Loefplein – s'

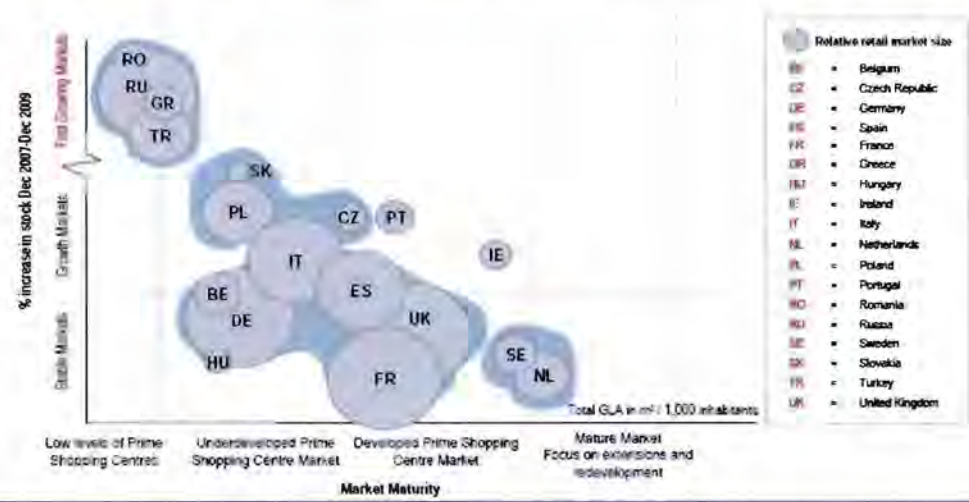
Hertogenbosch, Re-developed Outdoor Shopping Centre Woensel & Retail strip Willemstraat - Eindhoven). Here we meet the problems when you are dealing retail property. The dimension of the number tenants and there individual demands combined with the uncertainty of the future performance because of competition, physical conditions and economical factors makes the forecasted income approach unreliable. Subsequent, not the rental income from tenants are normative for performance but understanding consumer shopping patterns impacts retail property rents and therefore the value (Eppli, 1998).

The comparison approach appear to be sufficient for residential and maybe for office property within dense office districts, but because of slight marketability of retail property not sufficient as basis of value assessment. This marketability also results in a benchmark lack, pure based on retail property assessments, to obviate the smoothing and lagging effects (McAllister, 2003). Additionally, it is hard to compare retail buildings because of their individual location element and the lack of quantitative figures concerning configuration, design and tenant mix of the property in general.

2.1.2 ECONOMIC CONDITIONS AND THE MARKET FOR RETAIL PROPERTY

A sizable body of research has shown there is an obvious relationship between macroeconomics and the performance of both the retail and retail property markets. The data considered in market analysis diverge from approximated macroeconomic demand indicators such as Gross Domestic Product (GDP) growth projections to microeconomic factors, such as regional and local population and employment trends, and market specific space absorption patterns. Wincott et. al. (1995) continues with a description of a logical pattern in relationships among factors such as space absorption, vacancy rates, rental rates increases and levels and duration of future rent concessions. Fund distribution in connection with the different market indicators is realized by geographical spread. Although investors see the European shopping centre market as a single market when comparing the initial yields of current transactions, we suppose that some countries are more mature than others.

Graph 2.3: Move towards maturity European Shopping Centre market.



Source: Jones Lang Lasalle (2008, August). European Shopping Centres: One Size fits All?

Observation (interpretation based on recent reports from JLL, Cushman & Wakefield, CBRE and King Sturge) tells us there is a fast movement towards maturity across all of Europe what is demonstrated in the graph 2.3. The Graph shows us that Eastern European counties are still in a growth to catch up the more mature markets within Southern-, Western- and Northern European countries.

Considering the overall attractive risk-return profile of retail as an asset class, the next phase come down to the type of retail property which is participate within the fund. As a result of the expansion of number of shopping centres in the last 10 years and the progression of maturity levels within European cities, it became more attractive for sizable investment funds to diverse there portfolio by adding shopping centres.

Table 2.4: Performance of shopping centres, retail and office by country.

	Total Return, 2006, %			*Total Return, 3yrs, % p.a.*			*Total Return, 5yrs, % p.a.*		
	Shopping centers	*All retail*	*offices*	*Shopping centers*	*All retail*	*offices*	*Shopping centers*	*All retail*	*offices*
Austia	12.2	8.4	5.2	8.1	7.5	4.3	..	..	..
Belgium	16.4	16.4	6.5	..	..	5.5	..	..	..
Denmark	15.1	15.4	16.0	10.8	10.8	10.9	9.6	10.0	9.3
Finland	19.6	14.6	8.6	12.8	10.8	6.4	10.6	9.3	6.0
France	24.9	23.7	21.8	22.3	21.3	14.1	18.3	17.6	11.4
Germany	4.9	5.4	-0.9	4.0	4.2	-0.3	3.5	4.0	1.1
Ireland	20.5	26.8	27.6	22.9	24.1	19.4	20.3	22.6	12.1
Italy	13.0	11.5	6.3	11.4	10.5	7.6	..	..	..
Netherlands	14.7	14.9	11.5	12.3	11.5	8.0	11.1	11.5	7.5
Norway	16.6	16.4	18.2	15.5	15.6	13.8	14.5	14.6	10.4
Portugal	16.6	15.9	5.7	14.3	13.7	6.3	14.7	14.1	6.6
Spain	19.5	18.8	17.1	17.7	16.7	14.1	15.0	14.3	10.7
Sweden	18.1	18.5	15.4	15.0	14.6	10.2	11.5	11.1	5.6
Switzerland	7.8	7.7	5.6	6.5	6.6	5.1	6.7	6.9	4.9
Uk	15.6	15.2	23.0	16.2	18.2	19.4	15.2	16.8	12.7

Source: Riches, J., Canty, R., Frodsham, M., Kalyan, S. & Chiddle, E. (2007, November). European Shopping Centre Digest 2007.

Table 2.4 shows the income performance of shopping centres, retail and office property divided by country. Total return is illustrated in the graph, but when we speak about performance we have to make a distinction between income (direct) return and indirect return. Characteristic for the shopping centre sector as well as the retail sector, revenue are relatively stable. This has to do with a large number of rental contracts, how are spread over national and international tenants that produce a low variation of the rental income. Conversely, when a shopping centre is under performing and retail sales are deteriorating because of, for example competition or economical conditions, the investment value (indirect return) fluctuates violently and potential purchasers are less interested. Furthermore, planned large-scale maintenance or overdue maintenance conditions in the centre also has a negatively impact on the investment value. This has to do with the enormous dimension of these financial facilities and the negative influence on income performance that is the driver for investors in the fund. When there is insufficient capital appropriate to these costs, disposing the property might be the solution and a decrease of the investment value is accepted.

2.1.3 RETAIL PROPERTY RENT LEVELS AND MANAGEMENT.

Different works such as Newell et. al. (2007), Pryce et. al. (2006), Lee et. al. (2005), Geltner et. al. (2001), Millington (1996), Wincott et. al. (1995), Graham et. al. (1992), Morrell (1991) and Rufrano (1990) and the European shopping centre digest from CBRE/IPD (2007) all mentioned,

the same, three shopping centre market characteristics that might explain the difference of rental income within the retail location. Performance of a shopping centre differs per size, location and economical intervention. As CBRE (2007) reflects, there is a variation between European countries regarding this theory. For example, larger centres have higher returns in Sweden while opposite is the case in United Kingdom. Returns also differ by location. Within Germany, France and the United Kingdom shopping centres in larger cities performing better than provincial shopping centres, although the opposite was the case in the Netherlands, Norway and Sweden. Thus, on the basis of these facts and from theory by earlier noted actors, we know income return and also indirect return is related to retail sales. Millington (1996) wrote that a retailer's ability to pay rent is directly related to the ability to make profit from a specific retail unit, and to the level of those profits. The higher the sales income potential for the retailer in a potential retail location, the higher is the rent a retailer can offer to pay to the shopping owner. It might be clear that there are several factors which affect trading returns negative. Poor economics, increased competition from new developed and/or re-developed competing shopping areas, new methods of retailing, or competition within a specific trade in the same centre are indicators which reduce the profitability of retail sales within a trade area (Millington, 1996) and (Buckley, 1994). In the long term this will lead to dissatisfied tenants and subsequently towards vacancy within the shopping centre. Gerbich (1999), Millington (1996) and Rufrano (1990) show that a foundation of optimal combination of tenants will maximize shopping centre rental turnover by attend optimal sales profits. The tenant mix will normally include one or more Full-line anchor tenants, a variety of mall stores and food court operators. Each type of retail trade plays his independent role to improve the self-supporting level of the shopping centre by creating an individual micro retailing climate. Gatzlaff et. al. (1994) finds evidence that the role of the anchor tenant act as the initial incentive to develop new centres and in the future contributes to attract a wide variety of customers. Smaller retailers are willing to pay higher rents when an anchor tenants with a positive customer image is established in the shopping area. Gatzlaff et. al. (1994) concludes that rental rates of non-anchor tenants are estimated to decline approximately 25% in response to the loss of an anchor tenant. Poor tenant-mix as a result of one-sided objective of getting the highest possible rent for each unit might result in negative competition between retailers inside the operating centre area and in the future frequently to high vacancy rates. Important to note is Lee (2005), who argue that older shopping centres generally suffer functional or physical deficiencies and have an inappropriate tenant mix due to changing markets, and thus have less attractive power to visitors and subsequently to tenants that results in a lower investment value.

2.2 DISPOSITION

The performance of a real property investment portfolio isn't fixed like deposits, and wouldn't be definite by other persons like the stock market, but is distinguish by the quality of portfolio management strategies. McAllister (1998) emphasized that in contrast to equity managers, property investment portfolio managers are unable to anticipate immediately on positive or negative market movements by purchase or selling property. The problems of investment in direct property have been well documented. The key issue has to do with the bulky character of real property, thin market, high transaction costs and legal/tax condition what leads to time and money consuming purchase of the property. Disposition management is seen as a complex process that is dealing with market segments and locations, tenant quality and active portfolio management, and building substance. These recommendations are based on the individual characteristic of each property, but we also take advantage of market cycles by geographical diversification. This paragraph brings together the different criteria for hold / sell decision-making. Although, all the articles are based on the science from residential or office property viewpoint, conclusions and/or analysis will be useful during this thesis.

2.2.1 VARIETY OF REAL ESTATE INVESTMENT FUNDS.

Every Non-Listed European Property Investment Fund could be classified as being one of three specific fund investment styles. Indicators that differs this three types emphasize the considered results/risk profile of the portfolio. On the basis of research done by and Baum (2002) and Baum (2008) in association with INREV, the four investment styles are visualized in Graph 2.5.

Graph 2.5: Unlisted property risk styles.

Source: Baum, A. (2008). Unlisted Property Funds and the Emerging Property market.

Baum (2008) continues his paper with a description of the three different styles. A short overview of his findings is mentioned in this paragraph below.

The Core style assumes that property has to be fully let with a multitude of different tenants and long-term rental contract. Important is the focus on a relative low endogenous or operational risk, that resulting in a stable income producing property. The contribution of indirect results is subordinate to the stable annual direct income in the decision-making process. Beside a low endogenous risk, the financial risk is also lower compared to the other styles because of restricted loan capital facilities and controllable interest risks. The Value-added fund style is more focused on indirect results from increasing value of the property. Property that is representing this type of portfolios distinguishes moreover declining rental contracts or re-

development projects. The endogenous risk is considerable higher as the direct results are unsecured and depending on future performance of the property. The opportunistic style makes use of inefficiencies in the (financial) markets. This is done by 'wholesale to retail' transactions when individual property has more value than the value of the entire fund or when the Net Initial Yield is lowers than the stock market price. This fund style is also involved with the development of new property. It's obvious that endogenous risks are overwhelming and short term results arise from of the increase of value added to property. The risk-taking fund manager's preference leverage percentage up to more than 65%, which also include higher interest risks. During the credit crunch another financial risk came up. Investors has to re-negotiate there credit facilities, when financial institutes install securities to reduce their financial risks towards the leverage percentage this style of fund management is creating.

2.2.2 DISPOSITION DECISION-MAKING PROCESS

Van Gool et. al. (2001) describes disposition policy as the approach to optimize a real property investment portfolio (portfolio level) and improve returns (project level) by selling portfolio parts. Morrell (1991) identified three broader levels of performance analysis as: the portfolio, the individual property and also other research area. A number of question are involved during the decision-making process, from selecting potential properties for disposition, the analysis method that is used, how to sell the property and the negotiation strategy. Het complex part of the decision-making process contains the time to sale decision or time on market (TOM) as Pryce (2001) underlined in his article.

Fundamentals for optimal portfolio strategy explains that a property is sold before he has a negative contribution towards the entire portfolio (Geltner et.al., 2001). Theory by van Gool et. al. (2001) and Geltner et. al. (2001) explains that the moment of selling the property takes place when the market value becomes more sizable compare with the (internal) investment value of the property. The portfolio manager has to sell that part of the portfolio where the correlation between market value and investment value substantial is.

IF BUYING:	$NPV \geq 0 = V \geq P$	Where:	V = Value op property at time-zero (e.g. Based on DCF)
IF SELLING:	$NPV \geq 0 = V \leq P$		P = Selling price of property (in time-zero equivalent €)

Practical experience tells us that this is almost impossible, because it is hard to determine the investment value without using market influences (Van Gool, 2001) and (Geltner, 1993). This results in insignificant diverge between economical based market value and the investment value. Rufrano (1990), Buckley (1994) and Brueggeman et. al. (2001) are focusing in there articles on the factors that affects changes between actual and forecasted performance assumption of the property. Analyses as NPV (Net Present Value) up to more complex theories like IRR (Internal Rate of Return) and DCF (Discount Cash Flow) are all based on benefits expecting to be received over a definite period. The articles explained the most important indicators (generally financial based) that covers the input for decision-making analysis. For example, market rents are not increasing as fast as expected and reducing cash flows, or tax laws that have been negatively changes over time might lead to a mismatch between actual figures and investment objectives. Also positive changes could lead to disposition of property. Brueggeman et. al. (2001) remarked that potential equity buildup by yearly mortgage balance decrease, increase equity capital. Because of positive amortization and potential benefits associated with leverage effects, it might be that disposing

property from the fund is a wise decision. Although these financial analyses are leading during the investment decision-making process, Morrell (1991) discovers a problem concerning this theory. During his research he evaluated performance analysis and noticed that future investment strategy is often regarded as being concerned solely with the past. His paper argues that analysis of historic performance reveals invaluable information on the risk-return characteristics of a portfolio.

Throughout, fund performance emphasized two major concerns of investors, financial (yield/return) as explained above and seconds the risk environment of the portfolio. In certain circumstance from financial viewpoint, it could be attractive to purchase some of the property in the portfolio. From risk regulation viewpoint, these decisions might lead to a disruption of your strategic portfolio distribution. A comprehensive overview of the Modern Portfolio Theory (MPT) can be found in the book of Geltner et .al. (2001) and article by Stevenson (2000). Diversification is seen as a powerful medium of achieving risk reduction. If we limit our diversification analysis to the asset class real estate, then we talk about an allocation within this particular class. Markowitz developed the first mean-variance analysis in the context of selecting a portfolio of common stocks what has eventuate in theory containing a different asset types. The method is based on theory about efficient positioning of different asset classes and/or geographical spread within one investment portfolio. Basic principle of the diversification analysis is to explain the sharp ratio (optimal risk-result correlation between assets) to improve the performance of an investment fund.

This paragraph has given an overview of the analytical models that are required to evaluate performance of property within an investment fund. The next phases discuss the analysis variables that investors should consider to determine whether to sell a property or remain ownership.

2.2.3 APPLICATION OF PROPERTY INDICATORS

Over the last twenty-five years, researchers have started to apply different analyses for contribution property performance theories. Literature disadvantage for this thesis has to do with the strong monetary identity and therefore the financial related variables that attend input for theories. Prominent papers in this financial economics field have been published by Sharpe (1992). Giliberto (1994), Geltner (1995) and Geltner et. al. (2001) and consider real estate as potential future benefits that can be measured in economical terms (Geltner et. al., 2001). Rate of return calculations are frequently applied fund decision-making models as described in the papers of among others, Graaskamp (1972), Morrell (1991), van Gool (2001) and Newell (2007). Morrell (1991) shows in appendix 1 of his paper a clear summary of these methods. Primarily, the Internal Rate of Return Model (IRR), Money Weighted Return (MWR) or Time weighted Return (TWR) models are under investment managers frequently used consideration methods for making investment decisions. The rate of discount which reduces the Net Present Value (NPV) of a series cash flow to zero reflects the importance and also the timing of cash injections or outflows. This measurement probably offers the most acceptable rate when we are dealing individual property but has a serious pitfall making assumption of exit value or exit yield of the property. In practices this investment decision-making models ask for an extensive amount of variables that are interrelate with weight considerations for determining the investment value. Van Gool (2001)

gives in his book an overview of these different financial variables and to what extent they influence the output of the rate of return model.

- Discount Rate (In %) ***	- Mutation and Vacancy costs
- Operating period **	- Broker's charges in case of re-letting
- Market rent increase (in %/yr) **	- Large scale maintenance costs **
- Contract rent increase (in %/yr) *	- increase in different running costs
- Expected vacancy ***	- expected length of new rental contracts *
- Irrecoverable rental profits	- Fiscal consequence to rental contracts **
- Operating costs **	- Exit value/yield and selling expenses ***

Millington (1992) studies the impact of future valuation uncertainties. Moreover, he finds there is a little doubt that most important factor in valuation of a retail property is the ability to produce income now, and in the future. He continues with an example where he shows that it is not unrealistic that errors of more than 18.2 per cent to the expected property value occur from unfavourable small difference to the predicted key-variables of rental income and investment yield. This predicting are involved with the way investment managers deal with size, special location and design features which apply to each individual centre. Here we make a remark, because these features are not mentioned during pure financial research papers. Geltner et. al. (2001) makes a clear subdivision to this problem in his book by describing the difference between the Financial- and Institutional (appraisers) economics train of thought. The financial economics is more based on Land and place Economy and Forecasting models (IRR, NPV etc.) and Market risks theories, the institutional economics is involved with property based indicators for example; geographic (location, area, access), design (age, style, size, access), competition and competitors.

2.2.4 THE YIELD ISSUE.

Market reports quote sector benchmarks, but these are often the prime yield, which is narrowly defined for specific property with its own characteristic to rent figures, physical quality, the location and tenant covenant. Problems are related to which factors are of influence to determine the applicable yield for a specific property. Different research among others, Maliené et. al. (2002) Overbeeke et. al. (2005) and Kaklauskas et. al. (2007), explains that specific property characteristics determine the gross initial yield and that performance measurement is related to market indices or a specific benchmark. Overbeeke et. al. (2005) covers that for each sector attribution analysis could be made based on heterogeneous characteristics. For commercial real estate a inventory is made based on external sources and data within the ROZ/IPD-index.

	Present in the index	Missing data:
Building characteristics	Gross floor area, Parking standard, Year of delivery, office segment, average unit size, no. Of tenants, Land quality, Value, Indoor/outdoor	Functionality & Flexibility of the design, No.of floors Quality of building/ quality of building finish
Location	Type of location, name of city, market rent, reversionary yield, Relationship supply & demand	Accessibility, Type and presence of facilities Type of area within the city, Labour market characteristics
Management	operating costs , potential rent, vacancy, length of remaining (2002 en 2003), contract rent, initial yield,	Tenant credit rating, type of management, management costs

Overbeeke et. al. (2007) concludes in his research that it is possible with this benchmark approach to examine which factors are of influence on the initial yields.
Malienė et. al. (2002) and Kaklauskas et. al. (2007) both describes a new method that is in line with the traditional comparative value method. The method provides a more extensive multiple criteria decision-making model that is not focused on the value of the property but explains the investment value based on yields by comparing property characteristics. Therefore, they take in to account a number of different criteria, such as qualitative, quantitative aspects and market conditions. Kaklauskas et. al. (2007) explains in this research by elaborate a case study that it is possible to determine the real operational value of a property and compare this to the price that is paid for this property in the market. Subsequently, when we connect this science to the yield issue when can determine if the property is above or under performance.

2.3 RELATION TO RESEARCH QUESTION

Concluding, there are several issues kept in mind when integrating endogenous performance measurement analysis into the value of a retail property. This is confirmed by financial related theories, which suppose that property risk-return profile becomes a more important facet during the evaluation of buy, hold and sells decision process. Nevertheless, fundamentals for optimal portfolio strategy explains that a property is sold before he has a negative contribution towards the entire portfolio. Prior research has shown that return and risk profiles are not only categorized into financial and market terms, but also property related indicators like design, tenant mix and location are involved by measuring the performance of retail property. This theory also forms an important link towards the first research question; 'What are the main factors concerning uncertainty of endogenous performance for an individual retail property?'
First, there has been a focus on retail property and an explanation why shopping centres are attractive as an asset in a real estate investment fund. This has resulted in a list of endogenous performance indicators:

- The value of a retail property is directly related to the anticipated utility of the property. Not the rental *income* from tenants are normative for performance but understanding consumer shopping patterns impacts retail property rents and therefore the *value*;
- The dimension of the number *tenants* and there individual demands combined with the uncertainty of the future performance because of *competition*, *design* and *location* makes the forecasted income approach unreliable;
- The higher the *sales* income potential for the retailer in a potential retail location, the higher is the *rent* a retailer can offer to pay to the shopping owner;
- *Competition* because of a poor *tenant mix* within a specific branch trade in the same centre are indicators which reduce the profitability of retail *sales* within a *trade area* and leads on long term to *vacancy*;
- Smaller retailers are willing to pay higher rents when an *anchor tenants* with a positive customer image is established in the shopping area;
- Large-scale *maintenance* or overdue maintenance conditions in the centre has a negatively impact on the investment value;

With these results the retail market has become more transparent and more specific comparable information about performance indicators are available. This brings us to the second part of this exploration, where literature is dedicated to process and analysis issues in reference to disposition management. Additionally, it is hard to compare retail buildings because of their individual location element and the lack of quantitative figures concerning configuration, design and tenant mix of the property in general. Nevertheless, when we are able to express these figures for retail property, the multiple criteria decision-making matrix (comparative value method) provides a powerful tool which enables us to determine the real endogenous value of a property and compare this to the investment value based on market yields.

The question remains: What is the shape of the spatial effects and which process is essential to contribute performance figures? Next, we have to determine in which way none financial input can affect financial figures. Last, how can we interpret the spatial components to contribute future disposition decision-making for a retail investment fund?

CHAPTER 3 THEORETICAL MODEL

As we discussed in the literature review, the starting point for a performance analysis results from forecasted financial figures, and when we declare the optimal fund composition we even calculate with historical figures. Retail buildings congregate a specific property sector where the contribution to the fund performance for an investor primarily rest on the investment value based on income streams from tenants (direct returns). When a shopping centre is totally vacant because of failing attraction to visitors and thus retailers, the value only comprehend the price of the land and potential to attract new retailers in the future. It's obvious, when the fund's strategy is based on developing value; performance has to be related to satisfaction of the retailers (See Graph 3.1). Retail sales volumes provide a key measurement of relative performance of individual tenants and major retail properties (Ramsey, 1994). Chun (2001) analyzed the impact of retail sales increase or decrease to rental income performance of a shopping centre and demonstrates that these are related to each other. During this research we measure this relation between Rent and sales as the Effort Index. This theory forms the starting-point for this research as illustrated in graph 3.1.

Graph 3.1: Performance levels of a Shopping Centre.

Next, we have to know how to measure this property performance into quantitative figures, so we are able to make judgments about the endogenous performance, the financial performance and subsequently the investor satisfaction (where this research is focusing on). This short introduction reflects the problem set we are dealing with during this research. During the next paragraphs we concentrate on the theoretical background how this research is structured.

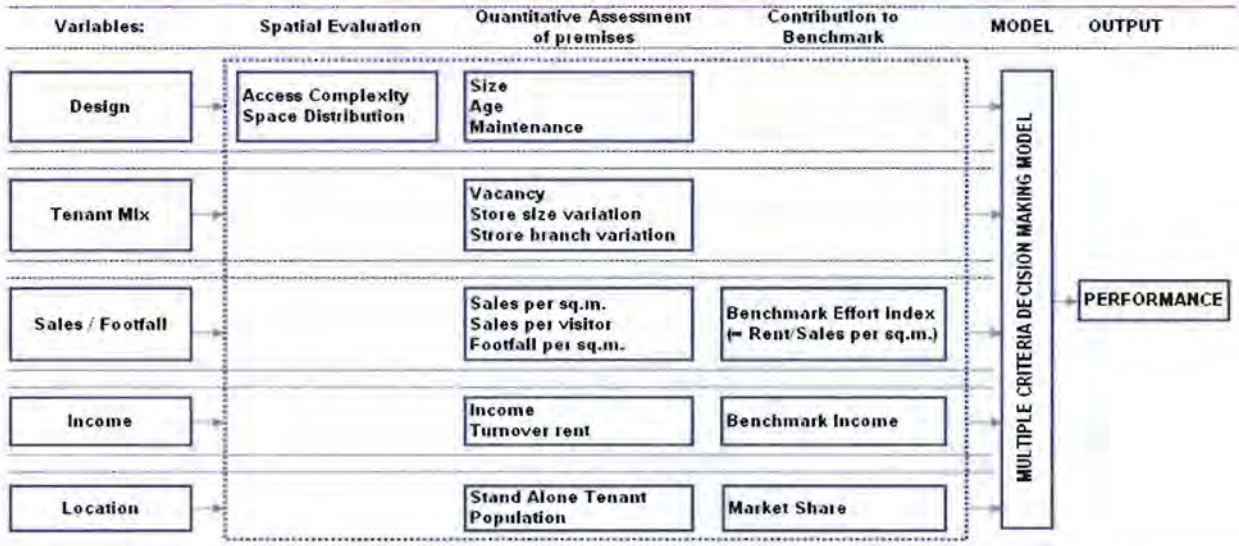
3.1 PROPERTY PERFORMANCE

Analyzing the concepts of the risk-result performance theories and real estate valuation methods used in different real estate asset classes, it is evident that current financial principles doesn't gives a explanation why or when sales is decreasing in a shopping centre. Simple reason to proof this theory, involves with the lack of sales and footfall related figures as a variable in this financial approach, which are fundamental for retailers during housing issues. Another missing variable in this decision-making approach, have to do with missing thoughts to acknowledge the role of design of a retail property. Brown (1999) proves in this article that design of a shopping

centre affects real estate value, and so might be influences the disposition decision-making results. He quoted a statement from the ninth edition of The Appraisal of Real Estate (1983) that says 'also new buildings contain various forms of functional obsolescence, such as attributable to poor design. Here we found the argumentation of comparable differences between shopping centres based on design and functionality of a shopping area.

Prior research structures an inventory of typical retail related criteria which in the application of multiple criteria decision-making (MCDM) methods allow the estimation of qualitative, functioning and market differences between comparable real estate. Most of these figures are measurable and arise from annual reports of the property. Some of these variables are more on an abstractly basis, and are not measured by the investor in property reports. These variables like design and functionality, needs there own analysis to provide quantitative figures to this subject. In Table 3.2, we have drawn a distinction between these different variables that exert influence the performance of individual shopping centres in the retail investment fund.

Table 3.2: Overview variables as input for comparison analysis.



First, there is made segmentation between five main components (research variables) that provides input for the model and are specialize to the performance of a retail property. Al these variables are divided into three groups based on the level of measurement.

1) Spatial Evaluation:

Express design and functionality of a retail property into comparable figures. Chapter 4 addresses spatial areas and walking patterns by using spatial network analysis in terms of elementary complexity theory (Brown, 1999).

2) Quantitative Assessment of premises:

Input arise from mall management reports that publish real performance figures of the different retail properties in the investment fund (Sales, footfall, tenant mix and income) or are direct related to the property (size, age and location).

3) Contribution to Benchmark:

Last part of the model emphasize market related figures by 1) intervention of figures provided from market analysis and 2) creating a fund benchmark and demonstrate that a specific property is in line with this benchmark or produce abnormality in the figures.

When benchmark figures are available for performance figures per country/city or type of shopping centre, it's recommended to use these as comparison indicators. During this research, related benchmark figures were not available.

Finalizing this segmentation and subsequently the related analysis produces the figures for the multiple criteria decision-making model. Since, we assume that value is related to these characteristics during this research, last step is to determine the figures of the test variable (value) based on yield theory.

The next paragraph involves second column of the model (graph 3.2), the actual figures and market figures derived from annual property reports provided by Multi Mall Management. These results are used for overall score per main variable (Design, Tenant mix, Sales/Footfall, Income and Location). Chapter four gives a description of the process to convert spatial patterns of the shopping centre into comparable figures based on spatial network theories. These figures contribute the main element (based on weight indicators) of multiple criteria decision-making model to determine if endogenous and/or spatial indicators influence the performance of a shopping centre.

3.2 UNDERLYING PROCESS

A decision-making matrix is prepared in order to carry out the multiple criteria decision-making of the shopping centre (Maliené, 2002). This process is divided in the following four stages as defined in the Maliené's article (2002).

1. All information about the shopping centre is collected;
2. The criteria defining the aims of the multiple criteria decision-making are determined;
3. Values, weights and units of measurement of criteria, of comparable alternatives are defined;
4. Criteria, their value and weight from the grouped decision-making matrix (coming up in Chapter 5).

Kaklauskas (2007) gives an extensive description of the theoretical part. To carry out the multiple criteria analysis of retail investments, it is necessary to collect information describing characteristics of the specific real estate sector. For evaluating competing alternatives the conceptual description of criteria and reasons for a choice of the criteria system, their measurement level and weight should all be analyzed. For analyzing the impact of criteria, we first have to divide this research into three sections (based on an information system and a criteria system).

- Information System:
  - i. Performance indicators based on annual Centre Reports. (Paragraph 3.3)
  - ii. Design patterns analyzed by Spatial Network Analysis. (Chapter 4)
- Criteria System:
  - i. Multiple Criteria Decision-making Matrix (MCDM). (Chapter 5)

The information system gives the arithmetic method to find the value of the different criteria. We have investigate which criteria are of exert influence to performance by, on the one side literature research and conversely by expert assessments. This research accepts the argumentation that visitors and subsequently retailer determine the value of performance (Graph 3.1) by analyzing design and functionality patterns (Brown, 1999). Economic figures as used in financial theories (for example the IRR method) have shifted to the background and spatial indicators become the guideline to recognize performance patterns. Chapter 4 concentrates on the method as described in the research papers by Brown (1999 & 2006) and defines an effective way to measure design and access through spatial network methodology based on complexity theory. The outcome of this analysis shows the relationship of design functionality to market value for a retail property.

We know from literature and expert assessments that, of course, not only design and the functionality patterns is critical to measure the value of a retail property. Conceptual information is needed to make more complete and accurate evaluation of the real estate alternatives considered. Other critical related figures are also analyzed and embrace the second part of the information system based on present property related information from Multi Mall Management reports as describes in paragraph 3.3.

3.3 AVAILABILITY AND UTILITY OF PROPERTY DATA

The primary purpose of this research is to explain how retail space is valued, and through this the performance of a shopping centre that's in line whit the endogenous (size of building, type of product and centre functionality or image) and exogenous (centre location and customers profile) factors. From investment decision-making perspective, it might be important to identify centre characteristics determine the performance of the shopping centres. Papers in this field have been published by Rufrano (1990), Morrell (1991), Finn (1996), Wincott (1995), Millington (1996), Eppli (1998), Overbeeke (2005), Lee (2005) and Newell (2007), on the impact of endogenous and exogenous criteria to the performance of a shopping centre. The performance of each property depends on a wide variety of criteria; collecting and validating this data at the individual property level is very time-consuming (Morrell, 1991), but supports a clear overview to reasonableness of projected rental rates, occupancy costs and the productivity of individual tenants (Ramsey, 1994). An inventory of the source-material was made in order to determine how the related data could be considered in the comparison analysis. Based on the categories and expected relationships to the performance of a retail property, figures teach us more about the structure of the shopping centre.

3.3.1 DESIGN AND PHYSICAL CRITERIA

The performance of shopping centres divers by size. Guy (1998) have made a classification of shopping centres and retail stores and describes that these classifications are essential to understanding and analyzing relationships in the retail sector. The article also proves that centre size had some significant effects on sales figures. Furthermore, property size is a practical variable that appraisers make use of by value comparison methods for office buildings. Property performance indices like IPD (Investment Property Databank) and ICSC (International Council of Shopping centres) use size variation for segmentation in the shopping centre market.

Variables related to size segmentation are expressed as:

- Size Gross Leasable Area (sq.m.):	$= \Sigma (U_{(sqm)})$	(1.1)
- Ratio space effectiveness (%):	$= D_{(G)} / D_{(L)}$	(1.2)

* Where $U_{(sq.m.)}$ represented the total surface one shop is representing in the centre. D is the dimension/size of the centre in sq.m., divided in (G) Gross Floor Area and (L) Gross Leasable area.

Planned shopping centres continuously reinvented them self through innovation. However, this type of real estate are in the mature stage in almost all European countries, the requirement for paying attention to retail trends remains. It's important to match the needs of visitors and be competitive in the area. Literature focused on the competitive stage of retail property and structures three problems that older centres have to deal with. 1) the development of new competitors in the catchment area over time, 2) it's difficult to manage tenant mix in the long term because of the retreating retailers and it's hard to focus on 'new' retail trends by attracting this retailers in a competitive retail area, and 3) reservations are made for large scale maintenance orders at the expense of total centre income.

- Age (year):	$= T_{(n)} \text{ -/- } T_{(c)}$	(1.3)

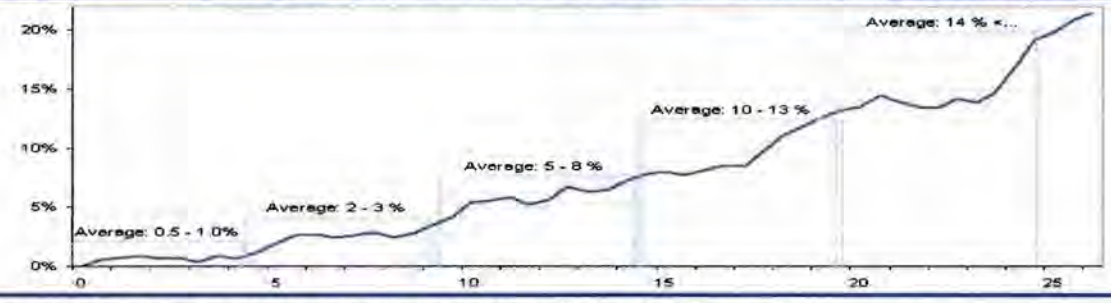
* Where $T_{(n)}$ is the present date and $T_{(c)}$ representing date of completion.

- Maintenance Costs (EUR/sq.m.):	$= Mc_{(total)} / D_{(L)}$	(1.4)
- Large-Scale Maintenance Costs (EUR/sq.m.):	$= I_{(rent)} * V_{(m)}$	(1.5)

* Where $MC_{(total)}$ is the total monthly maintenance costs the shopping centre has to structure and $D_{(L)}$ is the leasable centre area.

* $I_{(rent)}$ is the fix rental income the centre is producing per month, and $V_{(m)}$ is % of large-scale maintenance costs reservation based on the age of the centre.

Graph 3.2: Reservations in % total rental income to finance large-scale maintenance.



Source: Internal expert assessments (Mr. A. Rehorst: Multi Asset Management).

3.3.2 TENANT MIX CRITERIA

Leasing strategy is one of the most critical definitions of success in retail projects. From a marketing point of view, securing an appropriate tenant line-up is critical to attract and maintain customers as the image of a centre is largely determined by tenant mix (Kirkup, 1994). The internal design of a shopping centre in reference to tenant mix can be viewed as a two-stage problem. First, the strategy to the number, size and type of stores that a centre will classify, and which is expensive to change in the future, is analyzed. Then, it's important to establish the position of the various shops (Brueckner, 1993).

Variables related to diversity, variation and segmentation of tenant mix in a centre is expressed as:

- Number of tenant types (quantity): $= \sum_{i=1}^{n} B_{type}$ (2.1)

* Where B represented the type of branch located in the shopping centre.

Branch mix is one of the most important indicators why customers choose to visit a shopping centre. When we are dealing with a national or regional oriented centre, it's important that this mix of tenants supplies a sizable body of different branches. Appendix 1 gives an overview of branch categorization for shopping centre based on the papers of Bruwer (1997) and Guy (1998). Eppli (1993) argued that superior image and tenant mix of planned centres contributes performance improvement and can destabilize existing retail communities.

- Variance unit size (quantity): $= VAR(U_1 + U_2, ..., U_n)$ (2.2)

- Transferring Ratio shops (in %): $= \frac{U_{(transfer)}}{\sum_{i=1}^{n} U_n}$ (2.3)

* $U_{(n)}$ the total surface (in sq.m.) one shop is representing in the centre, and $U_{(trans)}$ the total number of shops that changes retailer is the centre in one year.
* Transferring Ratio is the number of shops that changing from tenant in one year.

Furthermore, a positive size variance of individual units could lead to a better mix of tenant types. We conclude from prior research that higher variance figures in general leads to better subdivision of tenants because of different demands. A last criterion is focused on the ratio that units in a centre change tenant. The higher this percentage emphasize, the more difficult it's for a centre manager to manage tenant mix.
Vacancies lead to lost of rental- and service charge income, but more important to dissatisfaction under tenants because of worse attractiveness to their visitors. The value of a retail property is to a certain extent based on the potential of a shopping centre in the future and an increase of vacant units in a centre affects the selling price negative.

- Vacant space in a centre (sq.m.): $= \sum_{i=1}^{n} U_{(vacant)}$ (2.4)

* $U_{(vacant)}$ represent the surface of a vacant unit in the centre.

3.3.3 SALES AND FOOTFALL CRITERIA

The image of a shopping centre may also impact the sales and footfall level. It results from consumer's perception of anchor tenants, shopping centre size and configuration, as well as the quality of goods and services offered. It's plausible to assume that better sales and footfall figures provide better the retail property performs.

- Shopping Centre Sales (sq.m.):	$=\frac{\sum_{i=1}^{n} S_t}{D_L}$	(3.2)
- Shopping centre Sales (per visitor):	$=\frac{\sum_{i=1}^{n} S_t}{V_t}$	(3.3)
- Anchor tenant Sales (sq.m.):	$=\frac{\sum_{i=1}^{n} S_{t(\text{Anchor})}}{D_t}$	(3.4)

* Where $S_{(t)}$ is the total of sales per retailer in the centre per month, and $S_{(anchor)}$ sales figures representing Anchor tenants per month.

Models produced in footfall related research papers showing the correlation between footfall and rental levels (Kirkup, 1996 & www.footfall.com). This demonstrated there is a relationship between the number of people visiting a shopping centre and the rent that tenants are prepared to pay.

- Footfall (sq.m.):	$=\frac{\sum_{i=1}^{n} F_t}{D_L}$	(3.5)
- Opening hours relate to footfall (hour):	$=T$	(3.6)

* Where $F_{(t)}$ is the total of visitors in the centre per month.

3.3.4 CASH FLOW CRITERIA

Investors consider the purchase or disposition of a retail property by estimating the rental returns they can expect immediately and in the future. Comparing income standard to other investment opportunities gives an explanation of economical performance of a retail property, but gives no guaranty for future performance. The rental income criteria that are involved with this research are:

- Rental Income (EUR/Gross floor area sq.m.):	$=\frac{\sum_{i=1}^{n} I_t}{D_G}$	(4.2)
- Relation Turnover/Fixed rental income (%):	$=\frac{\sum_{i=1}^{n} I_t}{\sum_{i=1}^{n} I_t^{(turnover)}}$	(4.3)

- Growth Turnover rent over 12 mth (%)

$$= \frac{\sum_{i=1}^{n} I_t^{(turnover)}}{\sum_{i=1}^{n} I_{t-1}^{(turnover)}} \qquad (4.4)$$

* Where I is the total rental income the centre is receiving per month, and $I^{(turnover)}$ the rent derive from sales figures from tenants per month. Turnover growth formula includes variable t, which represents the present turnover incomes and T-1 the incomes a year ago.

Last, Eppli (1993) observed that anchor tenants pays far lower rents per sq.m. compare to mall stores and food court operators. From here, we know there is a negative correlation between the rental income and the size of the unit. Anchor tenants contribute a positive image to a centre. Gatzlaff (1994) concludes in his research that losing anchor tenant declines the rental rate of non anchor tenants to approximately 25%. Higher negative correlation figures for a shopping centre emphasize a better affair between unit rent and unit size. Opposite, smaller retailers are willing to pay a rental premium for a shopping centre that's contributing high-order retailer customer attractiveness.

- Correlation Rental income-Unit size: $= CORREL(I_1, I_2, ..., I_N; U_1, U_2, ..., U_N)$ (4.5)

* Where $I_{(n)}$ is the rental income of a unit, and $U_{(n)}$ represents the dimension of a unit in the centre.

3.3.5 LOCATION CRITERIA

Doing this research, it's important to recognize why retailers are prepared to rent a unit in a shopping centre. Although, there are several techniques of location analysis retailers are able to use, most retailers traditionally relying on intuition guided by experience (Hernandez, 2000). Facing the location characteristics for retails forms a starting point for comparative models and performance valuation.

The location of each shopping centre is categorized according to the following definitions:

- Primary centre
- Major centre
- Metropolitan town/regional town/urban centre
- Local/rural centre
- Out of town regional mall
- Purpose built district centre

The choice of anchor tenants is therefore vital to the success of the overall tenant mix. The location of anchors within the centre creates pedestrian flows. By careful management, these can maximize sales potential and therefore rental income from the available floor space, by attracting shoppers to all areas of the centre. (5.2)

Catchment population (5.3) is the number of people living within the defined area of the town in which each shopping centre is located. Larger catchment populations are typically associated with better sales figures and so higher rents, although this is never undisputed proven by research. Shopping population calculates the number of people within the defined catchment

area (5.4) of a town that actually shop within that town; this is based on modeled data. Larger shopping populations (5.5) tend to generate also higher rents. The dominance of market share (5.6) of the shopping centre is determined by measuring its relative size in comparison to total retail floor space within the catchment area. Again, more dominant centres tend to be associated with higher rents.

3.3.6 ASSESSMENT OF GROWTH PERFORMANCE

The assessment of growth is an important performance measure, based on the positive or negative contribution of a shopping centre to a retail fund. Poor growth is a common side-effect of many spatial and local conditions and its identification acts as a useful early warning of a possible problem. In addition, disorders directly affecting growth, for example, the decline of sales figures could be the result of a new shopping centre in the area and might lead to dissatisfaction under tenants in the centre. The process of growth assessment involves the present and historical figures of multiple performance indicators. This research is restricted to the characteristics;

Variables:

- Total Income; Incomes received from fixed and turnover rent per sq.m.
- Effort Index; Shop performance ratio, expresses the relation between rental income and sales in the centre in percentage.

	Green	Yellow	
Hypermarket	< 4	4 - 6	
DIY	< 6	6 - 7	
Electronics	< 5	5 - 7	
All Others	< 12	12 - 20	

The lower the effort index the better a tenant is performing (formula Effort index = (Total Fixed income) / (Total Sales) per mth). [Example => rent of 40 and a sales of 100 gives a Effort index of 40%, although a rent of 80 and sales of 200 leads through a Effort index of 40% that is]

- Sales;
- Visitors;
- Occupancy rate; Equal to the percentage of all rental units are occupied or rented at a given time.

The most general model specification for our assessment of growth figures is:

- Growth (positive or negative)	$=(\frac{V_{(t)}}{V_{(t-1)}})-1$	(6.1)

* Where V(t), *represents* present annual figures for the variable under assessment and subsequently V(t-1) the historical (-1 year) figures.

3.4 ASSET BENCHMARK

Performance analysis is creating a benchmark. The issue of benchmarks is important making judgments of performance to a relative in the benchmark (McAllister, 1998). Thus, finding the explanation why the performance divers between portfolios or in this case between assets in a specific portfolio. More input from various retail properties means a better and more reliable benchmark. This research provides a benchmark based on six retail properties, but could be more extensive in the future. The current analysis measures how far one individual property characteristic contributes to its sector benchmark. This is done by difference analysis, which provides coefficients between each pair of variables listed. The benchmark is created by measuring the average for all the properties in fund segmented by the variables Rent, Sales and Effort Index (Table 3.4).

Table 3.4: Benchmark virtual Retail fund.

Relation Anchor / MSU / Shop			
Type SQ *Size*		RENT	SALES
Anchor	*(< 1.000 sq.m.)*	€ 23.50	€ 320.66
MSU	*(200 - 1.000 sq.m.)*	€ 38.41	€ 393.58
Shop	*(> 200 sq.m.)*	€ 60.98	€ 555.48

Relation Effort Index	
Average	15.30%

* RENT: Average expresses the iteration of fixed rental incomes for owner per sq.m, and not the average per individual store.
* SALES: Average expresses the iteration of sales incomes for tenants per sq.m, and not the average per individual store.
*EFFORT INDEX: Average expresses the ratio fixed rental income divided by sales income per individual shop situated in the centre.

Difference between the benchmark and a shopping centre can tell us if there is a relationship between the benchmark figures and property figures and how a shopping centre is performing. These figures give an explanation in with way a property is underperformance or performing better in reference to the benchmark. Because of diverge in rent and sales between types of shops we have drawn a distinction between Anchor, Midsize units (MSU) and shops. Herewith, the difference in shop surface contribution of the different retail properties is intercepted. The expected measure of contribution to benchmark is expressed as:

Table 3.5: Calculation Contribution to Benchmark (Rent and Sales).

Relation Anchor / MSU / Shop						
Type SQ *Size*		Benchmark	Property A	Calculation:		
Anchor	*(< 1.000 sq.m.)*	A_B	$A_{P(a)}$	$= (A_{p(a)} / A_b) - 1$	=>	$D_{(A\%)}$
MSU	*(200 - 1.000 sq.m.)*	M_B	$M_{P(a)}$	$= (M_{p(a)} / M_b) - 1$	=>	$D_{(m\%)}$
Shop	*(> 200 sq.m.)*	S_B	$S_{P(a)}$	$= (S_{p(a)} / S_b) - 1$	=>	$D_{(s\%)}$
				Contribution to benchmark is (+/-) Average $D_{(\%)}$		

3.5 LIMITATIONS OF THE THEORETICAL MODEL

Conclusions are, of course, subject to several limitations. First, the present performance model doesn't underlie modern financial economics. The starting point of this analysis is to recognize settled endogenous property performance based on real annual figures and not by forecasting cash flows (unsecured by future circumstance). Traditionally, financial models are applied by property forecasting net cash flows and discounting those cash flows at a constant discount rate. This model is not capable to measure expected return (IRR) to an investment (see Geltner, 1995). In practice, conclusions only based on this published analysis should not be sufficient for making disposition decisions, but gives a clear statement of the current property performance. Still, there is a need for applying supportive financial models for reliable disposition decision-making.

Second, the variables we measure are at a point in time (December 2008) and have a restricted time-scoop because of possible unexpected future changes. This implies that conclusions concentrate on present performance and there is a need for implementing new figures when they are available.

Third, this model gives no explanation to indirect return on equity, because of the lack of related figures. Nevertheless, we assume that selling price depends on the performance of the property (Income approach paragraph 2.1.2).

Fourth, accessibility is of course one of an important exogenous criterion to discover endogenous property performance. Disadvantage for this research has to do with the large-scale dimension of applicable analysis to produce accessibility figures. That's the reason why there is chosen not to implement this criteria into the analysis.

Fifth, determine the expected yield of the different properties is done through market figures, published by most important estate agents' organizations. Real comparable figures from recent traded retail property aren't available.

Furthermore, the figures are not for publication so dummy variables represent this real figures provided by Multi Corporation.

CHAPTER 4 SPATIAL NETWORK ANALYSIS

Design and Functionality of the interior space, becomes a more and more influential criteria when we are dealing with visitor friendliness of a shopping centre (Brown, 1996). The conceptual process of a new retail development, comprehend an important stage of investment decision-making because investors are only interested in functional centres, which are attractive to visitors. It's remarkable that, when the preliminary stage of a development is completed and the centre is functioning, these design related criteria becomes irrelevant to measure endogenous performance and financial figures are leading in the decision-making process. Real estate professionals don't have the tools to identify functionality problems of shopping centres, also because they only focus on financial criteria when measuring performance. Evaluating this design or functionality isn't simple, deduce from the exceptionally few published research articles that address these problems. Brown (1999) introduced one of the first papers that test the implications of spatial network analysis to prove there is a relationship between Spatial Design and the Value of a property. His analysis implies a field experiment that shows, through the interior spatial layout, how access complexity to and from individual shops in a centre affect their functionality and consumer friendliness.

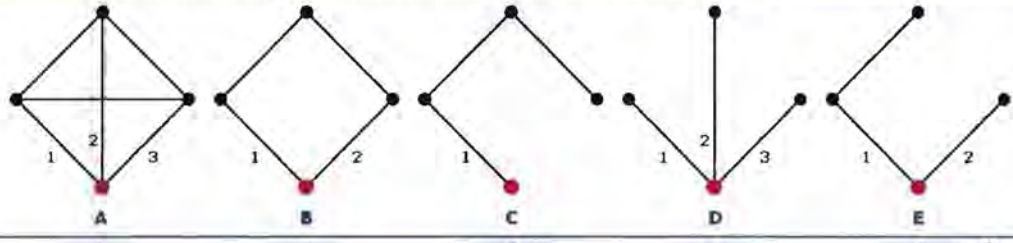
Shaping spatial performance figures of a retail property, needs a powerful analysis to measure how functionality is structured in the internal spatial environment of a specific shopping centre. One of the objectives doing this research is to measure units of relative space in a shopping centre by consulting a numeric index of the interface network. Brown (ND) first established the idea of viewing the fundamentals of relative space, which means space constitutions through spatial intervals or bounded by materials. In this paper 'How to measure access and its impact on value (1999)' he introduced access and discussed that is often confused with accessibility. Access contains the all-embracing use of an area, and is more extensive that only accessibility which concern only the part of moving from one place to another location (Brown, 1999). Access says something over the Functionality, Configuration and Facilitation of a specific retail property. This chapter describes the procedures for applying spatial network methodology as criteria for disposition decision-making. Next, this research demonstrates the spatial efficiency of the retail property under valuation based on network methodology.

4.1 SPATIAL NETWORK THEORY

"Describing space in the context of the way it is designed and used is a representation problem of natural verbal forms and traditional geometric forms of representation"(Brown, 1999). Brown (ND) reflects in his unpublished book manuscript how internal networks or an access interface can be generated that represents spatial units and lineal connections in a shopping area. Interconnected spatial areas and walking patterns can be seen as a network of a two-dimensional layout or floor plan of a centre area. This gives the starting point for analyzing spatial functionality or complexity in a shopping centre. Developing a network model that measures complexity, three data sets of calculation are involved. First, we need to know de number of nodes (space areas) and lineal units (walking patterns) in the shopping centre. This has to be done by field research and analyzing

shopping patterns of visitors. Second, the number of links between the mutual nodes and lineal units are fixed by using a network analysis. Last, determine the number of levels a visitor must go through from entrance to farthest spatial area in the centre. Figure 4.1 shows networks of four nodes with five ways of linking them. The bottom (red colored) node can be considered as the access starting point (Brown, ND & Brown, 2006))

Figure 4.1: Networks showing nodes linked several different ways.



	A	B	C	D	E
NODES	4	4	4	4	4
LINKS	6	4	3	3	3
CONFIGURATION	3	2	1	3	2

Source: Brown, M.G. (ND), Access in Urban Space: Property, Pattern, Paradigm, unpublished book manuscript.

Without analyzing these figures by mathematical calculations we see that figure A and D have the same configuration as network (three connections from the red node). Nevertheless, when we speak about complexity a visitor has considered more patterns in figure A (six links) than figure D (3 links) so the figure D has to perform better on access complexity. The same we say about figure C and E. Here we have the same amount of nodes and links but figure E has a better configuration as network (2 for Figure E and only 1 for C). Again, we explain why access complexity for figure E has to be lower compare with C and also lower than Figure B that has more links so more patterns. In the next paragraph these judgments are substantiate by mathematical calculations.

Brown (1999) concludes in this paper that more partial takings (or levels) of access, makes it more difficult for considered movements through an area and makes the floor plan more complex. The in Brown's (1999) paper published case study between to nearly identical (size and location) centres supports this theory. The experiment compares a successful operating centre with an economical failing centre (control unit) and demonstrates that complexity levels of the common public space of the failed centre are much higher (Brown, ND). It's obviously that more sizeable centres are complex and less functional compare to smaller centres, because visitor's possibilities to move into the spatial surrounding are more extensive. Here we establish a problem doing this analysis. The real estate under valuation fluctuates in dimension and it's only possible to compare retail properties that are of 'similarly' size. Neutralizing area dimension isn't discussed in the articles but logically we may assume that there is a connection between size and the number of nodes (individual spatial areas). When we analyze the percentage of these nodes in a floor plan instead of analyzing the quantity of nodes we are able to nullify this shortcoming.

Now we have collected this data, simple calculations (counts, ratios and weighted average) develop measures that originate the complexity patterns (Brown, ND). Next paragraph shows the process we have to go through before making judgments on access complicity for the property under valuation.

4.2 PROCESS AND ANALYSIS APPROACH

The empirical analysis mentioned in the articles by Brown (ND, 1999 and 2006) of access complexity in a panel of individual shopping centre developments, should allow us to identify whether the investment manager deals with healthy or problematic operating retail property in his portfolio.

1) Developing an accurate floor plan that represents actual space conditions of the interior spatial areas (Appendix 2).

The information is based on floor plans provided by Multi Mall management and where made practical for doing research by checking them on spatial and lineal patterns. These adapted layouts representing shopping space which visitors actually move within, demarcated with elements such as furniture, planters, fountains, play equipment and store entry threshold modifications (brown, 1999). Brown (1999) describes that these actual layouts changes the space arrangement and consequent traffic movements in subtle but significant way to the physical conditions. Appendix 2 reflects the actual layout of the six shopping centre under valuation.

2) Applying the spatial convex and lineal patterns to the actual floor plans (appendix 2).

Brown (1999) declares in this paper the importance of convex (bounded space) and lineal (pedestrian patterns) units in a shopping centre. "Convex units identify the extent of spatial decomposition and usually correspond with privatization and localization of space. Lineal units (unbroken straight visual/ walking lines) identify the extent of special continuity from the entrance through the shopping system and usually correspond with flows and globalization of space" (brown, 1999).

First we regionalize the individual spaces in a shopping centre, starting from space number 1 that is located at the centre entrance or access origin. From orientation viewpoint, a visitor should have a clear picture of the layout when entering a shopping centre and moving forward. Next, the biggest convex spaces are indentified in the centre, that's the largest unobstructed free space within 360° radius from a central point. From here the remaining smaller spaces (intervening spatial areas) are indicate till all the floor space is divided into individual spatial areas. Second, the same process most be realized for lineal units. During this process all the areas and entrances are reachable for visitors, also starting from centre entrance.

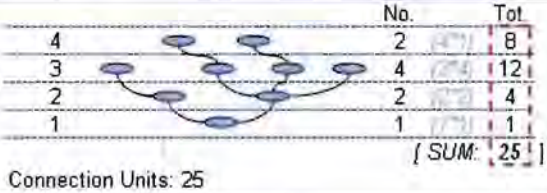
3) Constructing a network by linking the convex and lineal units using them as nodes (next paragraph).

Next step in the process comprehends a network analysis that is generated by connecting the individual convex units with each other. The resulting convex network supports us to convert the spatial patterns into measurable units. This entire process contains three steps. 1) Marking the convex units as individual nodes, 2) linking this nodes to show connections (done by identify all adjacent nodes per individual node), and 3) Coordinating the nodes stepwise from the entrance space to farthest convex unit in the shopping centre (Brown, ND). The same process is applicable for lineal units. The result of this interface network tells us how the centre is structured as a convex and/or lineal network, and the number of spatial levels from entrance to a specific destinations / shop entrances. Figure 4.1 gives five simple examples of network analyses. These networks provide us handles to transform spatial floor plans into measurable figures to prove pronounces made in paragraph 4.1.

4) Applying a network measuring process (Spatial network analysis) that generates numeric outcomes for complexity of access in a shopping centre (Brown, 1999).

"To measure the complexity of access, as Brown (2006) describes in his article, three data sets of calculations are involved: 1) the number of Nodes (Convex or lineal units), 2) the number of links, and 3) the number of nodes at each step/level in the network analysis (where the visitor would terminate entry from entrance into a specific area in the shopping centre)". Complexity increases on the basis of numbers of nodes and links, the relationship of nodes and links to each other and the relative location of nodes from the access origin. A network with more nodes are more differentiated in contrast with a network with fewer links and closer to the entrance that is more integrated.

First formula of the numeric measures of access complexity involves the weighted average (WA) of nodes. This first measure will indicate whether there are relative more nodes close to or further from the entrance (Brown, 2006). The closer the weighted average is to 1, the more nodes are close to the entrance.
Before we are able to make calculations on Weighted Average, we first have to fix the Connections Convex and Lineal Units. From our network we know the number of Convex and Lineal Units per spatial level. These numbers of units per level are multiplied with the level of complexity (spatial level), as demonstrated in the example below.



Connection Units: 25

$$\text{Connections Units} = \sum_{i=1}^{n} n_i$$

From here, the weighted average for Convex (WA_c) and Lineal (WA_l) unit is measured as:

$$WA_C = \frac{\sum_{i=1}^{n} n_i}{n} \quad \& \quad WA_L = \frac{\sum_{i=1}^{n} n_i}{n} \qquad (1)$$

* Where x = the terminus of the access; n = the number of nodes; and i = the ordinal step level. (Brown, 2006)

Brown (ND) developed two measures of complexity, a measure of absolute complexity which shows the non-linear nature of access differences. "The absolute complexity of the access is the product of the product of the number of nodes multiplied by the number of links multiplied by the product of the quotient of the sum of nodes and links divided by the number of possible simple links multiplied by the weighted average measure" (Brown, ND & Brown, 2006).

$$AC_A = ((N_c * L_c)/2) * \left(\frac{(N_c + L_c)}{((N_c * (N_c - 1))/2} * WA_C\right) + ((N_l * L_l)/2) * \left(\frac{(N_l + L_l)}{((N_l * (N_l - 1))/2} * WA_L\right) \qquad (2)$$

* Where AC_A = absolute access complexity; N_c = the number of convex unit nodes; L_c = the number of convex unit links; N_l = the number of lineal unit nodes; L_l = the number of lineal unit links; WA_{xc} = the weighted average for convex units from x; WA_{xc} = the weighted average for lineal units from and including x. (Brown, 2006)

Because it's hard to compare shopping centres with diverge shopping areas (logical fact: the more square meters retail area the more convex and lineal units and subsequently more complexity), we remodel this formula subordinate to retail dimensions. The Nodes ($N_{(C-L)}$) and the Links ($L_{(C-L)}$) are substituted for autonomous measures that reflect the number of Nodes or Links per sq.m. in a shopping centre. This transformation results in suchlike small figures that it's recommended to multiple this outcomes with a factor 1000. Now we know the nodes and links per 1000 (K+) sq.m. retail area. Therefore, we apply the following adjustments in the formula given in the article of Brown (1999).

$$WA_X = \frac{\sum_{i=1}^{n} n_i}{\left(\left(\frac{\sum_{i=1}^{n} n_i}{D_L}\right)*1000\right)} \Big/ \left(\left(\frac{n}{D_L}\right)*1000\right) \qquad \text{(A)}$$

* Where $D_{(L)}$ = Leasable retail area in sq.m. in a shopping Centre; And the multiplier (*1000) for the acquirement of getting positive output figures (numbers >1). The formula provided by Brown (2006) isn't practicable by using figures under <1.

Likewise, transformation is involved with the formula to establish the Absolute Access Complexity (AC_A). Here, the N_c, N_l, L_c and L_l are transformed into autonomous figures representing the number of Nodes and Links per K+ sq.m. in the centre.

$$N^{(a)}{}_c = \left(\frac{N_c}{D_l}\right)*1000 \qquad L^{(a)}{}_c = \left(\frac{L_c}{D_l}\right)*1000$$

$$N^{(a)}{}_l = \left(\frac{N_l}{D_l}\right)*1000 \qquad L^{(a)}{}_l = \left(\frac{L_l}{D_l}\right)*1000 \qquad \text{(B)}$$

Next, the following formula in the process to measure access complexity is similar to formula (2) but here the Nodes, Links and Weighted Average are substituted by variables from formula (A) and (B) above.

By applying these adjustments, we are able to compare complexity measurements of different size shopping centres as proven in the example (Table 4.2). The utilized figures are comparatively to each other. This means that 75 (nodes) : 5.000 (sq.m) is equivalent to 1.500 (nodes) : 100.000 (sq.m), namely factor 20. When we are using the autonomous measurers (Nodes or links per sq.m.) we see in the example that there is a relationship and so the outcome is equal.

Table 4.2: Comparing different size Retail properties in two ways.

NETWORK			A1	A2	B1	B2
			<Multiplier ("20 times bigger center) >			
	SQM		5,000		100,000	
	Level		# Nodes	# Nodes/SQM	# Nodes	# Nodes/SQM
Convex Units	Nodes	(N_C)	75	15	1500	15
	Links	(L_C)	100	20	2000	20
Lineal Units	Nodes	(N_L)	50	10	1000	10
	Links	(L_L)	80	16	1600	16
Connections Convex Units			*450*	*90*	*9000*	*90*
Connections Lineal Units			*200*	*40*	*4000*	*40*
Weighted Average	Convex	(W_C)	6	6	6	6
	Lineal	(W_L)	2	2	2	2
Absolute Access Complexity			1843.41	392.44	36347.01	392.44
Relative Access Complexity			140.21	51.38	869.45	51.38

* A1 and A2 represents a 5.000 sq.m. Shopping centre, and B1 and B2 a 100.000 Sq.m. The multiplier 20 is used to determine the Convex and Lineal units for the larger retail property.

Furthermore, Brown (ND) describes that's "in order to linearise the relationships, a measure of relative access complexity using the $\log_{(10)}$ and the square root of the former". The formula that is involved with the relative access complexity is demonstrated below.

$$AC_R = (\log_{10} * (AC_A)) * (\sqrt{AC_A}) \qquad (3)$$

* where AC_R = relative access complexity.

Based on this mathematical theory (see formula 1 and 2), now we are able to clarify the access complexity of the networks as shown in Figure 4.1. Common sense explains us that network A was the most complex network because of his number of links (6), which is supported by using mathematical method of approach. Network B, C and E were lesser complex compared with network A, because there is a shortage of choices for pedestrians to move in the area. We consider network D as least complex as shown in Table 4.3.

Table 4.3: The numeric measures of access complexity for each of the five networks (see Figure 4.1).

NETWORK	A	B	C	D	E
Level	*# Nodes*	*# Nodes*	*# Nodes*	*# Nodes*	*# Nodes*
4			1		
3		1	1		1
2	3	2	1	3	2
1	1	1	1	1	1
Weighted Average	1.75	2	2.5	1.75	2
# Nodes	4	4	4	4	4
# Links	6	4	3	3	3
Absolute Access Complexity	35.00	21.33	17.50	12.25	14.00
Relative Access Complexity	9.13	6.14	5.20	3.81	4.29

Source: Brown, M.G. (ND), Access in Urban Space: Property, Pattern, Paradigm, unpublished book manuscript.

Besides results, this approach offers another tool for analyzing the performance of a shopping centre. As shown in Graph 4.3, all the networks are involved with a number of levels. These levels gives an explanation of the number of steps a visitor has to take before reaching the farthest node in a shopping centre. Literature explains that more steps/levels a centre is involved with, the higher the number of access complexity for comparable real estate. We explain this by Weighted Average figures for the properties. Input for these calculations is based on the number of nodes

multiplied with the level of complexity. In graph 4.3 we see that network C has the highest number of complexity levels (WA = [1 node * level 1 + 1 node * level 2 + 1 node * level 3 + 1 node * level 4] / 4 nodes = 2.5). From here we understand that shop entrances located at higher complexity levels is harder to reach for visitors, so rental prices / sales figures are lower at those levels or there are more vacant units.

When analyzing the spatial areas in the centre, we are also able to analyze the Weighted Average of shopping entrances in the centre. From prior access complexity research we know in which spatial area (node) a shop entrances is situated, and subsequently the complexity level this entrance is connected with. The nodes in formula (1) are replaced for the number of shop entrances and Connections Shop units is the iteration of complexity levels multiplied with the number of shops at a specific level. Once more, the closer the weighted average is to 1, the more entrances are close to the entrance.

This paragraph explains common methodology of the network modeling approach to compare the access complexity of different retail properties. These Shopping Centres under valuation are evaluated according to the theory based on articles from Brown (ND)

4.3 DATA DESCRIPTION

The data set comprehends six individual retail property developments located in various retail markets and cities in Portugal (5) and Spain (1). As reflected in Chapter 3, the information per shopping centre is very detailed, and makes it possible to compare the shopping centres with each other based on qualitative performance figures. Next, we have to extract the property layout in three parts. 1) by visual inspection of the convex (space allocation) and lineal patterns; 2) by convert the visual outcome into numerical convex and lineal indicators; 3) mathematical analysis of this network indicators.

Appendix 2 shows the first step in data generation consists of developing a precise representation of the floor plan. These edit layouts emphasize the convex and lineal units overlaid on the visitor common areas (Brown, ND). As we see in the floor plans of the different retail property it's important to determine the position of the larges nodes in the centre. Subsequently, we assign the smaller nodes until all the space in represented. The same procedure is applicable to the lineal units in the centre. The aggregate measures, summarized in Table 4.4, are based in the number of convex and lineal units on each floor.

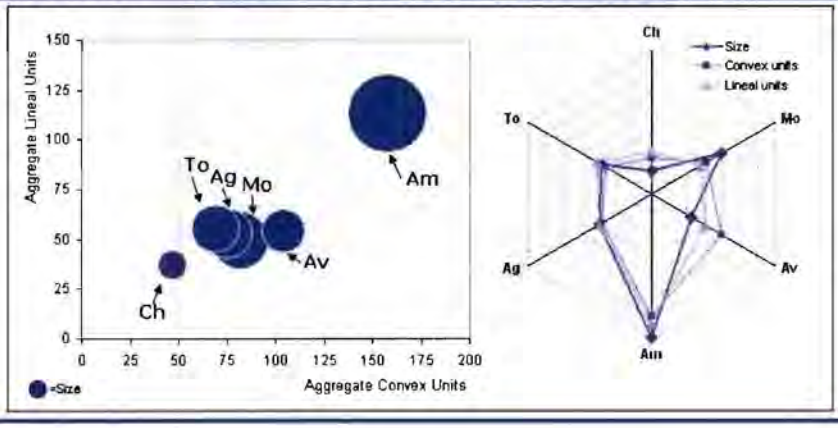
Table 4.4: Aggregate spatial measures.

PROPERTY	Ch	Mo	Av	Am	Ag	To
Convex units – total*	**47**	**82**	**104**	**158**	**75**	**69**
Convex units – level 1	*1*	*44*	*72*	*68*	*57*	*13*
Convex units – level 2	*12*	*38*	*32*	*52*	*18*	*34*
Convex units – level 3	*20*			*38*		*22*
Convex units – level 4	*14*					
Lineal units – total*	**37**	**49**	**54**	**113**	**53**	**55**
Lineal units – level 1	*2*	*28*	*39*	*61*	*40*	*15*
Lineal units – level 2	*13*	*21*	*15*	*31*	*13*	*27*
Lineal units – level 3	*18*			*21*		*13*
Lineal units – level 4	*14*					
Convex/lineal ratio – Normal	**1.3:1**	**1.7:1**	**1.9:1**	**1.4:1**	**1.4:1**	**1.3:1**
Convex/lineal ratio – Relative	**3.9:1**	**1.4:1**	**2.9:1**	**0.7:1**	**1.6:1**	**1.5:1**
Store entrances/convex unit						
Level 1	*1.00*	*2.00*	*0.67*	*1.88*	*1.39*	*1.85*
Level 2	*1.17*	*1.66*	*1.19*	*1.71*	*2.06*	*1.21*
Level 3	*0.95*			*0.87*		*1.14*
Level 4	*0.86*					
total	**0.98**	**1.84**	**0.83**	**1.58**	**1.55**	**1.30**
Store entrances/lineal unit						
Level 1	*0.50*	*3.14*	*1.23*	*2.10*	*1.98*	*1.60*
Level 2	*1.08*	*3.00*	*2.53*	*2.87*	*2.85*	*1.52*
Level 3	*1.06*			*1.57*		*1.92*
Level 4	*0.86*					
total	**1.24**	**3.08**	**1.59**	**2.21**	**2.19**	**1.64**
Convex unit (Sqm) / Net leasable area	5.52	2.76	6.24	2.99	3.37	3.19
Lineal unit (Sqm) / Net leasable area	4.34	1.65	3.24	2.14	2.38	2.55

* Stair, escalator and elevator connections are assigned to the lowest level they are connected with.

Important measures originate from this graph, are the number of convex and lineal units a centre symbolizes. Brown (ND) describes in his paper that; "the greater number of convex units indicates a larger wall or vertical surface area in a shopping centre". In other words, the more sizable the number of convex units (more intervening areas) in a centre, the more a visitors experience awkwardness. But as mentioned in paragraph 4.2 it isn't possible to compare property 'Ch' (8K sq.m) and 'Am" (52K sq.m). Therefore we make use of the amount of convex and lineal units divided by Net leasable area that accomplish a ratio of the area in sq.m - one convex or lineal unit stands for (K+). Graph 4.5 shows the influence that property dimension has on the number of convex and lineal units.

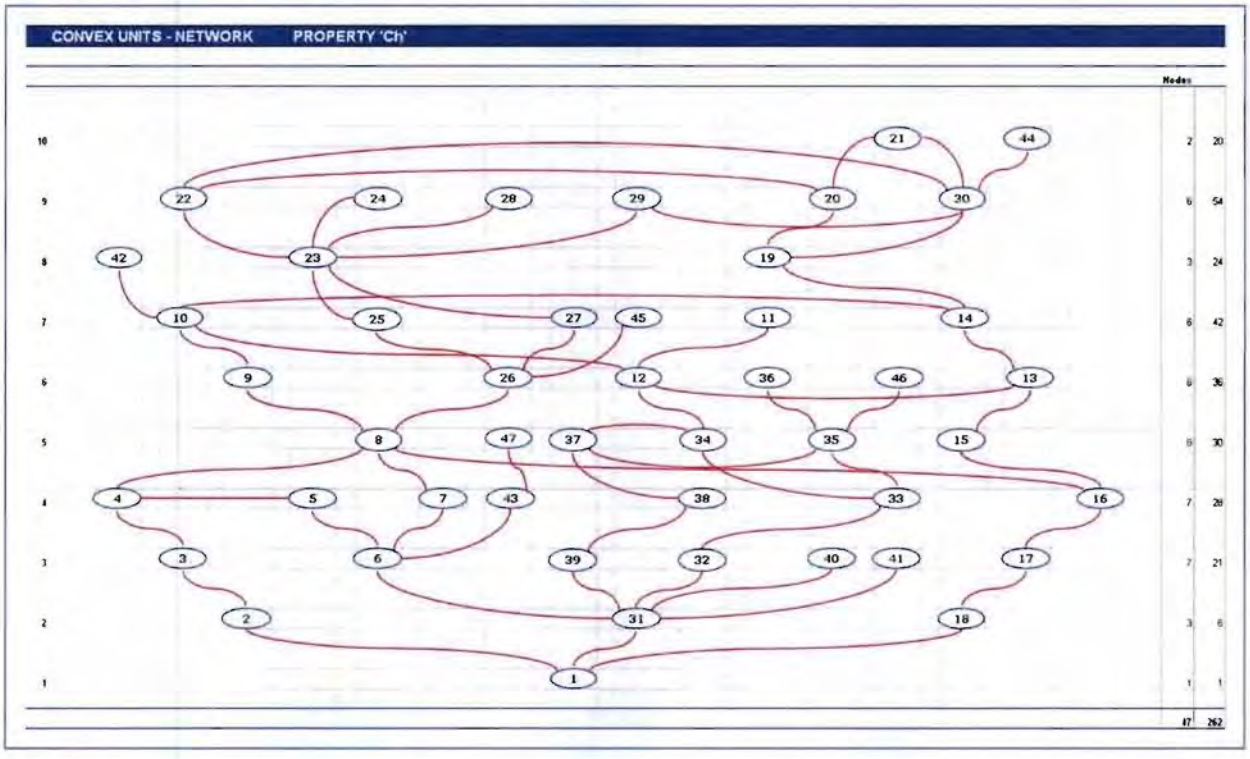
Figure 4.5: The influence of size and spatial complexity.

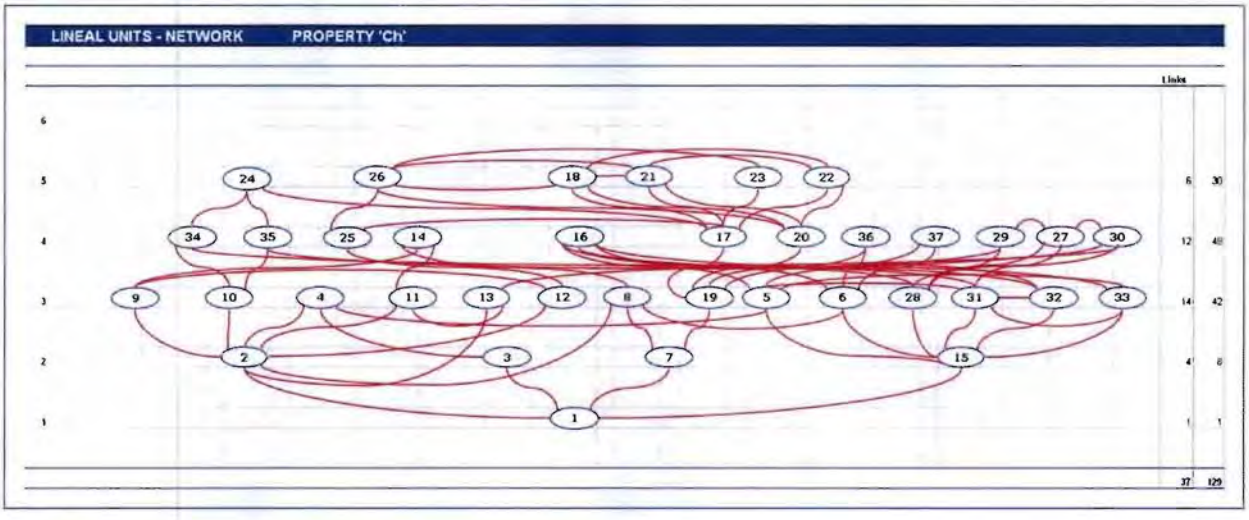


Furthermore, we specify the number of store entrances and related these figures to the convex and lineal patterns in a centre. The differences focus on the quantity of store entrances per convex and lineal unit. Thus, more shop entrances per units gives a visitor more viewpoints and so increase shopping experience. Remark on this measurement; these figures can't be seen as a leading measurement in access complexity theory. A property with an I-shaped floor plan or shopping strip have fewer passageways compared to oval- or T-shaped plans, and subsequently produces in general better store entrance / -units figures. This is a result of the lineal and convex units in this I-shaped plan are direct related to shop entrances. It's not obvious to accept that these I-shape plans are always lesser complex and more functional compared to oval- or T-shaped shopping patterns, actually it's the opposite. Before pronouncing judgments, it's important to analyze the centre's shopping pattern, practical passageways and superfluous intervening spatial areas.
Last part of step 2, we demonstrate the convex/lineal ratio that shows how many convex units are linked by one lineal unit. Same as the quantity of units, this ratio is not equal to size differences. Therefore we have made exchange rate based on the size of the property that is illustrated as Convex/lineal ratio - Relative.

Section three of data description shows the network graphs of the six properties under valuation. After evaluating the position of the convex and lineal units we are able to create a network overview (next six pages). These two networks show us the number of spatial steps and the number of spaces at each level as a chain from the main entrances in the mall. First graph represents the distribution of convex units; second graph is based on lineal units.

1) Property 'Ch': NETWORK ANALYSIS.

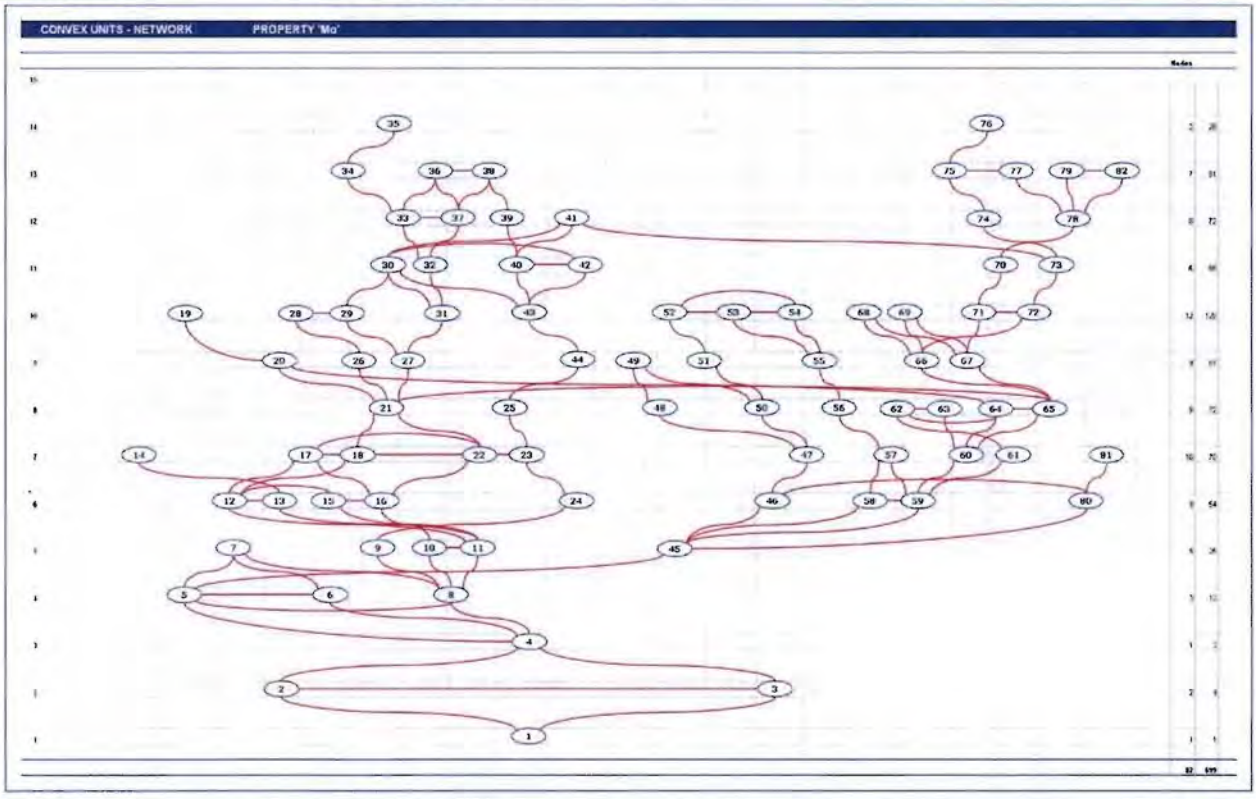




CONVEX UNITS - NETWORK	
Connections	262
Nodes	47
Links	59
Weighted Average	5.57

LINEAL UNITS - NETWORK	
Connections	129
Nodes	37
Links	73
Weighted Average	3.49

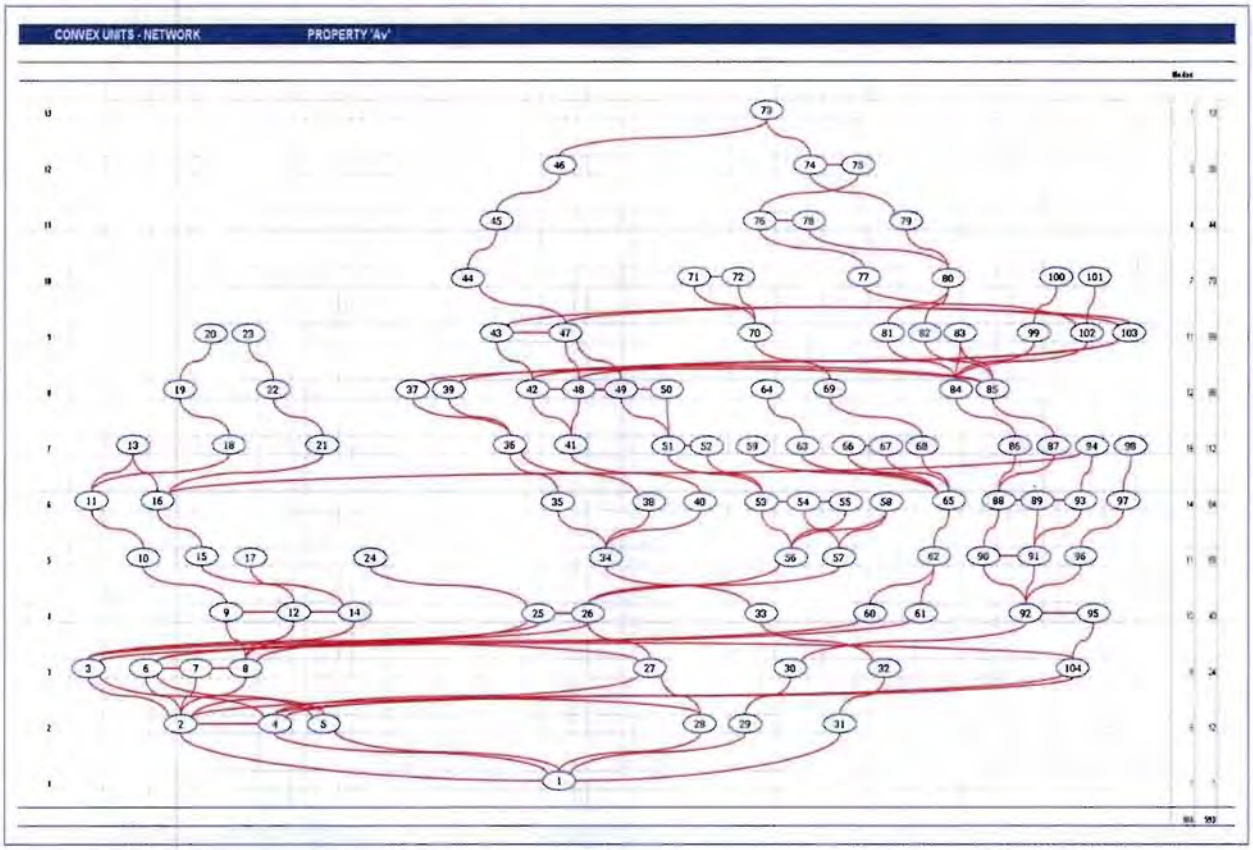
2) Property 'Mo': NETWORK ANALYSIS.

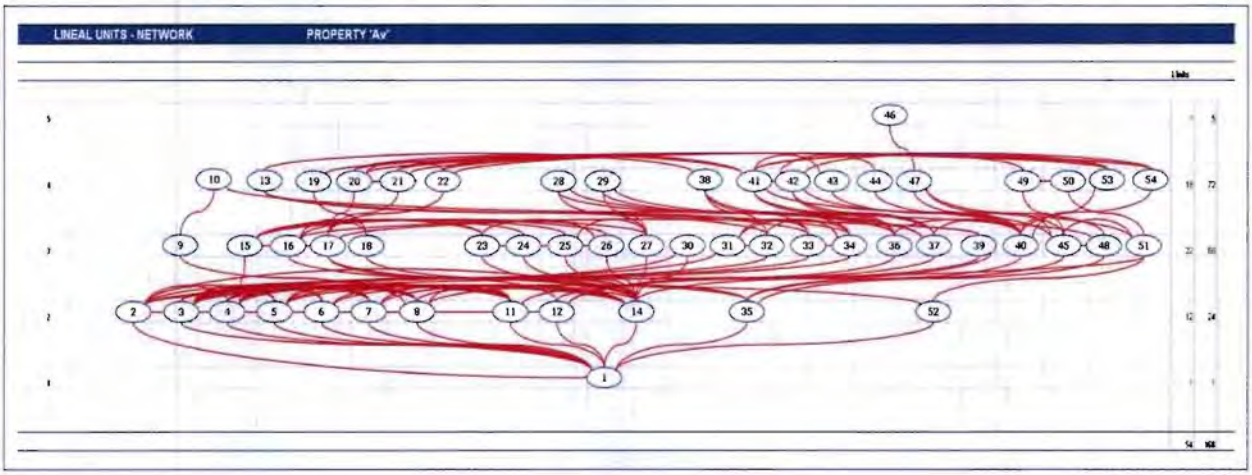


CONVEX UNITS - NETWORK	
Connections	699
Nodes	82
Links	125
Weighted Average	8.52

LINEAL UNITS - NETWORK	
Connections	198
Nodes	49
Links	108
Weighted Average	4.04

3) Property 'Av': NETWORK ANALYSIS.

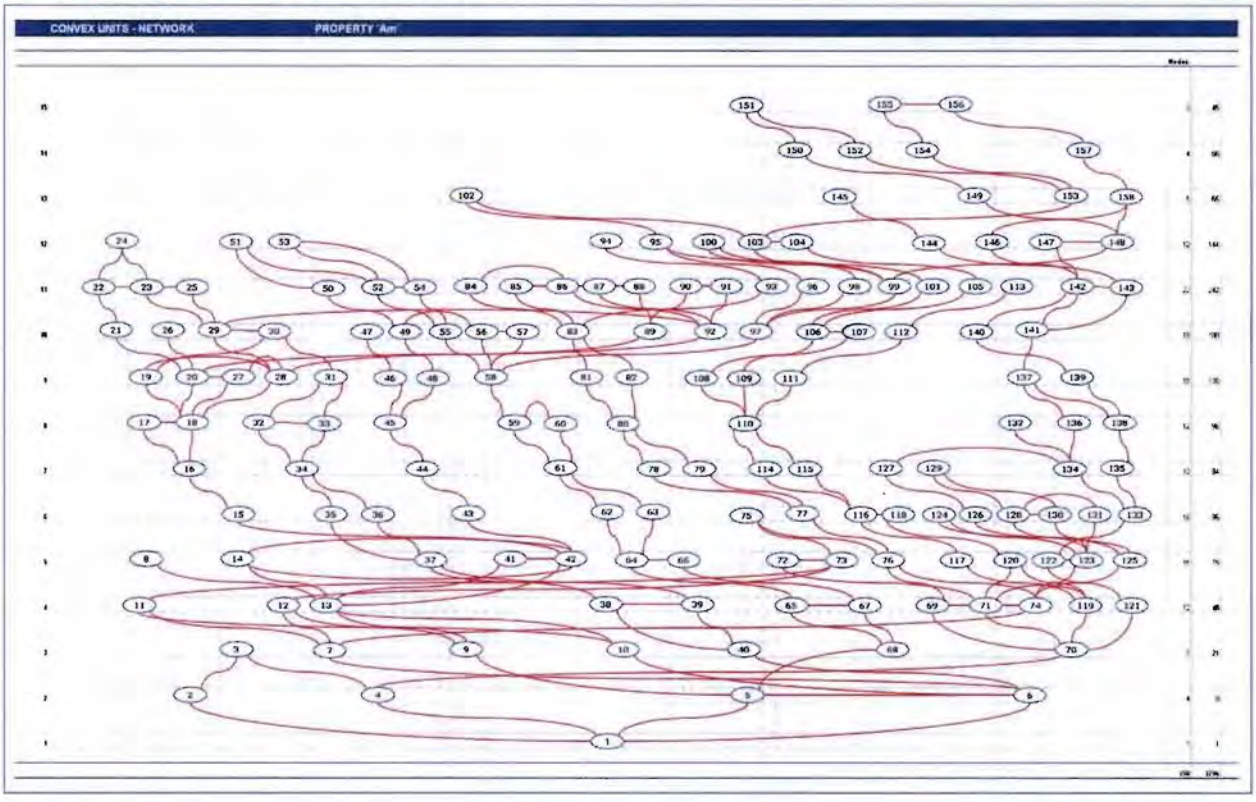




CONVEX UNITS - NETWORK	
Connections	686
Nodes	104
Links	149
Weighted Average	6.60

LINEAL UNITS - NETWORK	
Connections	168
Nodes	54
Links	146
Weighted Average	3.11

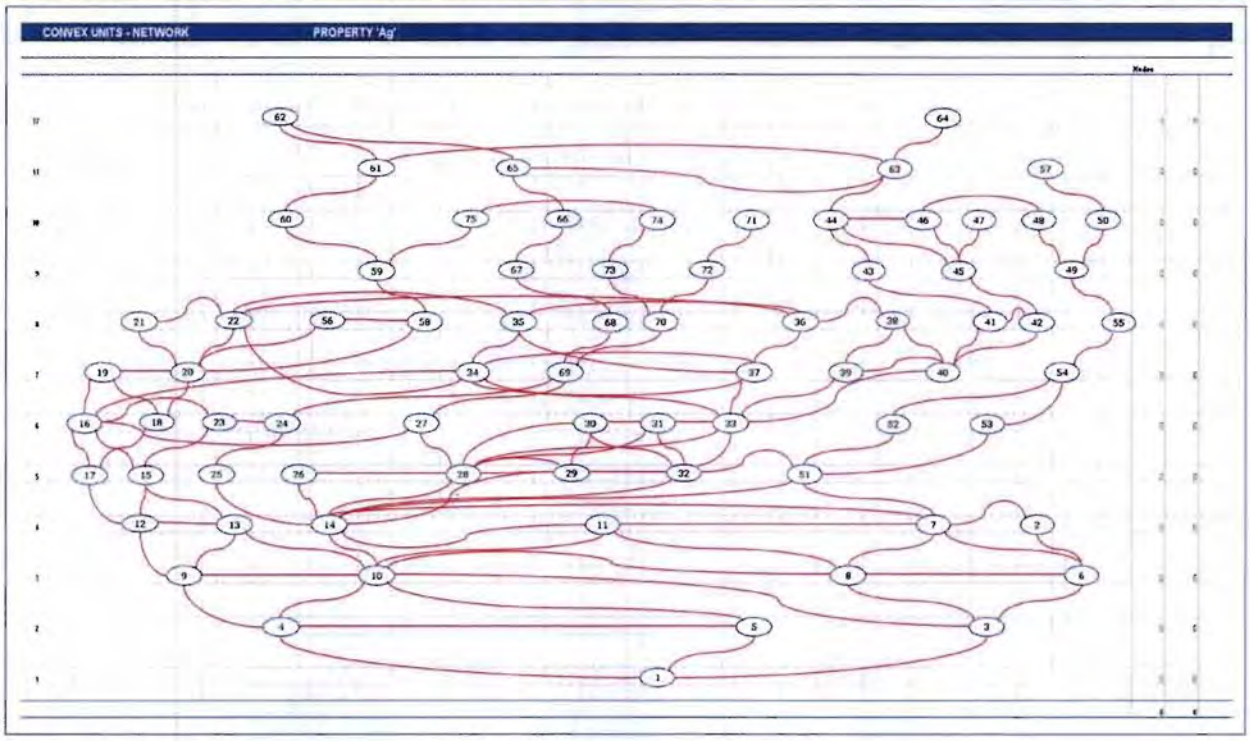
4) Property 'Am': NETWORK ANALYSIS.



CONVEX UNITS - NETWORK	
Connections	1296
Nodes	158
Links	224
Weighted Average	8.20

LINEAL UNITS - NETWORK	
Connections	462
Nodes	113
Links	273
Weighted Average	4.09

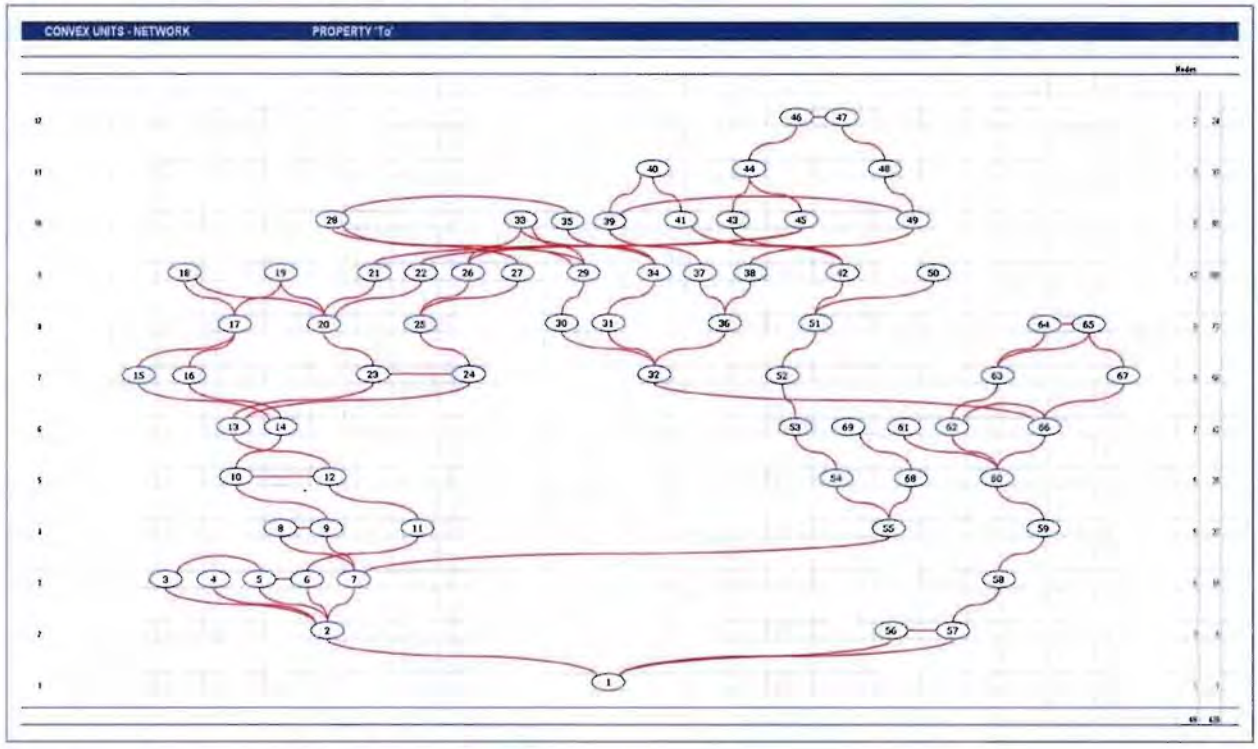
5) Property 'Ag': NETWORK ANALYSIS.

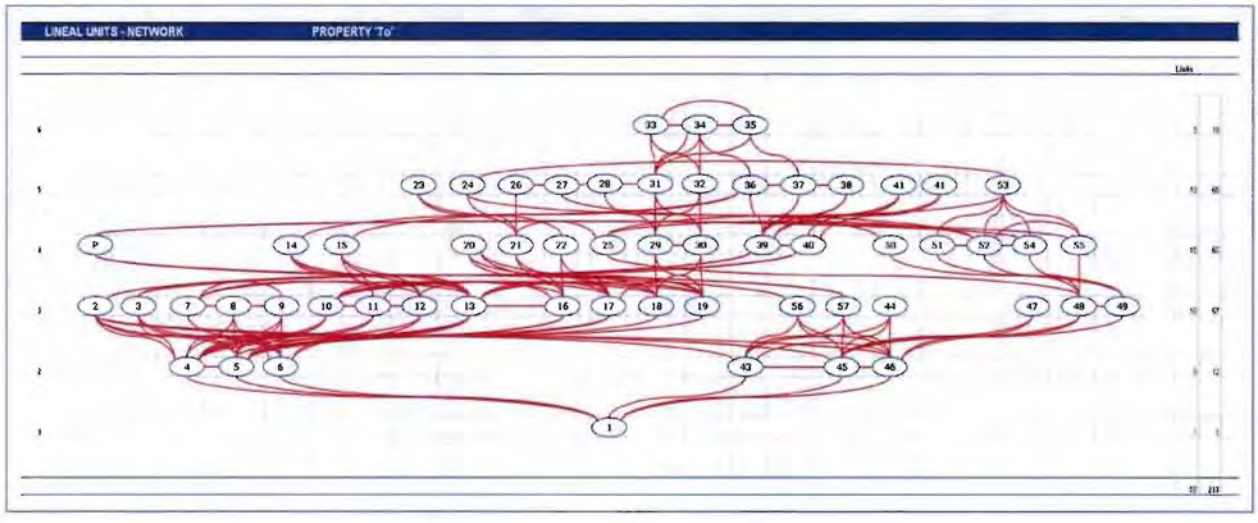


CONVEX UNITS - NETWORK	
Connections	526
Nodes	75
Links	127
Weighted Average	7.01

LINEAL UNITS - NETWORK	
Connections	228
Nodes	53
Links	73
Weighted Average	4.30

6) Property 'To': NETWORK ANALYSIS.





CONVEX UNITS - NETWORK	
Connections	485
Nodes	69
Links	90
Weighted Average	7.03

LINEAL UNITS - NETWORK	
Connections	213
Nodes	57
Links	153
Weighted Average	3.74

After completing the network analysis we are able to determine the position of each shop unit in the spatial environment. This information is essential for the measurement of aggregation figures of other performance indicators (Units, Branches, Effort Index and Rental income) that we associate with access complexity analysis theory, as discussed in the last part of paragraph 4.2. An overview of shop unit configuration is reflected in appendix 3.

4.4 SPATIAL OUTPUT AND RESULTS

Last part of the spatial network analysis process contains access complexity measurements of the six retail properties under valuation. The complexity parameter, which combines the elements of aggregate (see Table 4.3) and network analysis, are used to measure the access interface to quantify the access network. Our fixed models, allows us to draw several conclusion about access complexity of the retail properties. Concerning our overall research question there is an expectation of a positive relationship between access complexity figures and financial performance of the shopping centre. Therefore, we need to understand the parameters of weighted average and access complexity.

Table 4.6: Indications from the aggregate and network measures.

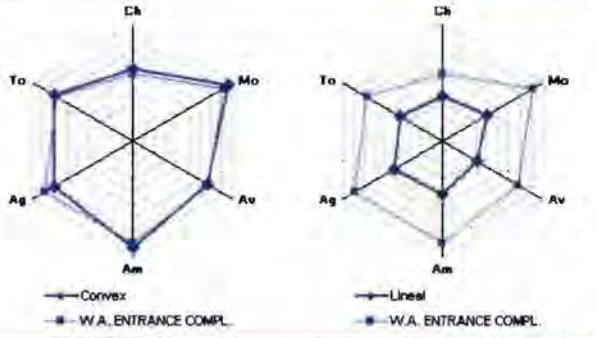
PROPERTY	Ch		Mo		Av		Am		Ag		To	
	Real	#/sqm.	Real	#/sqm.	Real	#/sqm.	Real	#/sqm.	Real	#/sqm.	Real	#/sqm.
Net Leasable Area	8,518		29,065		16,495		49,390		22,288		20,961	
Convex Units												
Nodes	47	5.52	82	2.76	104	6.24	158	2.99	75	3.37	69	3.19
Links	59	6.93	125	4.19	149	8.94	224	4.24	127	5.70	90	4.17
Connections	*262*		*699*		*686*		*1296*		*526*		*485*	
Lineal Units												
Nodes	37	4.34	49	1.65	54	3.24	113	2.14	53	2.38	55	2.55
Links	73	8.57	108	3.63	146	8.76	273	5.17	73	3.28	149	6.87
Connections	*129*		*198*		*168*		*462*		*228*		*203*	
Weighted Average												
Convex		5.57		8.52		6.60		8.20		7.01		7.03
Lineal		3.49		4.04		3.11		4.09		4.30		3.69
Store entrances/convex unit		0.98		1.84		0.83		1.58		1.55		1.30
Store entrances/lineal unit		1.24		3.08		1.59		2.21		2.19		1.64
ACCESS COMPLEXITY												
Absolute		220.36		260.62		316.93		261.89		210.95		252.82
Relative		34.78		39.00		44.52		39.13		33.76		38.21
ENTRANCE COMPL.												
Shops	46		150		86		249		115		89	
Connections	237		1,201		586		1,958		901		602	
Weighted Average		5.15		8.01		6.81		7.86		7.83		6.76

Graph 4.6 summarized the access complexity measures observe from the main entrance through each shopping centre. The absolute access complexity measures vary from 210.95 to 316.93. We conclude that property 'Ag' is in absolute way 1.5 times less complex as property 'Av'. Relative outcomes show us a difference of 1.3x between highest and lowest figures. It's easily to see from this overview, that some patterns become visible from the spatial output. Of course, there is a clear relationship between relative and absolute access complexity figures. More strikingly is the relationship between weighted average (WA) Convex and the weighted average Entrance Complexity (see graph 4.7), that indicates the strength and direction of a linear relationship between two measures. Apparently, this has to do with the corresponding spatial levels as input

for connections calculations. We conclude that there are only positive coherences between the different measures, which mean that both variables increase or decrease together.

Table 4.7: Relationship access complexity results.

PROPERTY	Ch	Mo	Av	Am	Ag	To
Weighted Average						
Convex	5.57	8.52	6.60	8.20	7.01	7.03
Lineal	3.49	4.04	3.11	4.09	4.30	3.69
ACCESS COMPLEXITY	34.78	39.00	44.52	39.13	33.76	38.21
W.A. ENTRANCE COMPL.	5.15	8.01	6.81	7.86	7.83	6.76



As written in paragraph 4.2, the more close this WA measure is to 1, the more convex units and/or shop entrances are located near to the entrance. Property 'Ag' and 'Ch" has the best complexity performance of all retail properties under valuation. Remarkable is the poor access complexity measure of property 'Av' because the WA figures tell us that convex and lineal units are located close to the access origin. We explain this on the basis of the sizable number of (intervening-) convex units and lineal units in the shopping area (see graph 4.6) how are mainly located in the lower spatial levels (see network analysis of property 'Av'). Nevertheless, a visitor has to move through almost 1.5 as must convex areas in the centre compared to other centres with comparable size.

Last, the impact on access is seen as the measure of store entrances per spatial convex and lineal units (Table 4.6). The summery shows that there is no clear relation between Store entrances/Spatial unit and Access complexity results. Best spatial performing property 'Ag' shows average Store entrance/spatial unit figures. Conversely, we conclude that the more shop entrance per convex or lineal unit creates a more orderly and functional shopping pattern for visitors, and subsequently less spatial movements to reach a specific shop in a shopping centre. Especially, property 'Mo' (convex:1.84 - lineal: 3.08), "Am' (convex: 1.58 - lineal: 2.21) are well performing to this store entrance analysis but seem to fail to access complexity (proportionally, 39.00 and 39.13). Conversely, Property 'Ch' and 'Ag' showing the largest difference in access complexity results, but produces likeness to Store entrance/spatial unit analysis. Therefore we exclude this Store entrance/spatial unit calculation in the comparison model, and only focus on the weighted average: Store entrance complexity as a measure for shop segmentation in the shopping centre.

Spatial patterns are reflected in the floor plans as convex and lineal units (Paragraph 4.3), followed by network analysis as an index for spatial levels in a shopping centre. In this paragraph the spatial input is converted into measurable results as presented in Table 4.6. The next chapter 'Conclusion' is committed to recognize the different spatial patterns as a result of previous paragraphs. This is not only done for the individual retail properties, but there will also be a link to other performance figures from spatial levels viewpoint.

4.5 CONCLUSION

This chapter make use of network modelling approach to compare the access networks of the common public space of six enclosed shopping centres and identified how the complexity of the access network related to indicators of physical environments (Brown, ND). Before analyzing the results per specific retail property, we are aware of the need to establish a proof of concept for the theory that the financial performance of shopping centres is partially depending on spatial environment of the centre. Therefore we need to test the variables Size, Vacancy, Sales and Income and relate these variables to the spatial levels as a result from network analysis. Although I'm not authorized to publish real financial figures, I'm able to describe the most important relationships as a result of this spatial network method. Finally, we need to understand how these spatial networks produce an effect on the design and functionality of a shopping centre and in a following stage how this affects the value of a property.

4.5.1 SPATIAL COMPLEXITY:

Figures reflected in this paragraph are recoverable in Tables 4.6, 4.7 and/or spatial network graphs of the properties under valuation.

Property "Ch" has not only the lowest amount of sq.m. leasable area of all retail properties, but with its four levels this centre is also by far the smallest per floor plan. The floor plans are characterized by ovals with several cross connections and two escalators on both sides. Based on access complexity analysis (Relative: 34.78) this is the most functional and orderly shopping centre of all, and with a spatial network of only 10 convex network levels (most convex units are located in the lower levels) and 5 lineal network levels, people experience this centre as very pleasant and easy to go through. This property scores also best of the six centres on weighted average for shop entrance complexity, what means that most shops are located close to the access origin. Another reason involves the frequencies of intervening space between one and another core space area. Property 'Ch' covers a large extent high spatial area and almost none intervening space in this floor plans that makes the shopping area more interconnected for visitors.
Second property, centre **'Mo'** shows serious shortcomings on weighted average for as well as convex units (8.52 against an average of 7.14) as entrance complexity (8.01 against an average of 7.07). This two level retail property is set up by two large shopping strips (I-shape) with three crossings to connect the main strip with the hypermarket strip. All three the 'crossings' contain an elevator and stairway or escalator, so the vertical routing through the building is not complex for visitors. Access complexity problems are a result of the constructional and/or intervening barriers situated in the shopping centre. The majority of convex units located in the higher spatial network levels contribute a high connection unit's - addition sum of 699 and subsequently a higher complexity measure. Second, the entrance complexity measure of this centre is highest of all properties. Similar to convex units connections measure (of 699), the entrances of shops are also located in the higher spatial network levels (more difficult to reach for visitors), which creates an entrance connections figure of 1.201 against an average of 915. Positive is the relationship Store entrances - convex and lineal units. Although this measurement isn't involved in access complexity theory, it tells us how efficient a convex or lineal unit is. The more store entrances per units gives a visitor more viewpoints and so increase shopping experience, as formerly noticed. Next, the restricted number of needless intervening spatial areas (besides the spaces from

constructional barriers) gives the indication that this shopping centre isn't failing at all on access complexity.

Third retail property, centre **'Av'** with a relative access complexity figure of 44.52 seems to fail on functionality and environmental design, but when analyzing the floor plan of this centre we conclude that the horizontal shopping space is functioning very well with a minimum of needless intervening spaces. Failing access complexity has to do with a very complex (vertical) stairway patterns and a disorder in the location and the number of these vertical lineal units in the floor plan. This eight vertical lineal units, which represents together 30 convex units (compared to seven convex units for property 'Mo" and 11 for property 'Ag' which are equivalent to spatial dimensions and there two levels structure), creates this sizable access complexity figure. Next, analyzing the convex and lineal weighted average of this shopping centre, we produce the evidence that this property is performing better compared to other properties (see Table 4.6) and most of the convex and lineal units are allocated to the lower spatial network levels. Summery, this property creates a pleasant shopping environment on both floor plans for visitors but shows serious shortcomings in vertical lineal unit's patterns, which lead to a very high number of convex units and lineal units in proportion to his 16+K sq.m.

Fourth shopping centre (**'Am'**) is by far the biggest of al centres under valuation. The drawings shows two shopping strips (half oval and hypermarket) how are connected in both corners of the centre, and in the middle by a cross connections. All three the connections between two strips are provided with an escalator, stairway or elevator, so visitors experience vertical moving patterns as well ordered and functional. Just like the vertical convex and lineal units, the horizontal floor plans seem to be functional and orderly through his convex and lineal patterns. Unnecessary intervening areas are avoided in the left side and centre of the retail property, but by applying a circuit (O-shape) without crossings at the right side of the retail property, problems with access complexity reveals. Possible reason for the relative high access complexity figures could be assigned towards the relative high number of lineal nodes and links in the shopping centre. Another opinion involves the weighted average convex units of 8.20 what is far above average WA.

Best spatial performing property is **'Ag'**. This is not surprising; analyzing the floor plans tells us that a multitude of spatial areas are prime spatial areas and intervening areas are almost not present in the plans. This interconnected shopping environment results in a low number of convex nodes, one of the core inputs for access complexity analysis.

Furthermore, most of the nodes are located in the lower spatial network levels, followed by lower connections unit figures as a positive contribution towards complexity measures. Figures of graph 4.6 shows that the weighted average of shop entrance is relatively high compared with the other results of spatial analysis. Alough there are less intervening spatial areas, almost all the shop entrances are situated next to a spatial strip as a result of constructional facilities for second floor covering. Second shopping level (O-shape) is maybe failing on crossing facilities, but is nevertheless functioning through his three strategic vertical lineal units.

Last property, the three floors counting shopping centre **'To'**, showing on every access complexity calculation average numbers to this virtual retail fund. Analyzing the convex unit's connections, the network shows that more than 50% (37 of 69) of the convex units is a part of levels 7 till 10. The desired lower spatial levels are underexposed in the design and visitors have to pass a couple of barriers before they are able to shop. The property is characterized by a shopping strip on the first hypermarket level and compared with first floor totally dissimilar floor plans on the upper two levels. Looking at the complexity results and the spatial drawings, striking is the relative high

number of lineal nodes and links. This is resulting into failing walking patterns and indistinctness under visitors. Positive is the extreme low number of intervening spatial areas on all three the floor plans, resulting in a very good performing entrance complexity weighted average figure. Furthermore, the vertical lineal units are located on two remote corners and hidden from view on most of the spatial areas in the centre. This leads to more complex walking patterns but on the other side forces visitors to make longer distances in the shopping centre.

At this moment we have analyzed all the shopping centres by observing convex and lineal units and their contribution in the spatial network analysis. Results from this part of observing research are applied into access complexity calculations and eventuate in judgments about design and functionality of a retail property. As mentioned in the previous paragraph, the structure of the spatial network shows spatial patterns of visitors moving through the shopping centre. We have already used the structure of the spatial networks for determine the store entrance weighted average. A weighted average calculation for the financial variables isn't applicable by the lack of missing indicators as links and connections as an input for these calculations. Nevertheless, we are convinced of the fact that there are connections between spatial levels and the financial performance of individual shops in the shopping centre. From spatial analysis of the individual shopping centre we recognize the number of spatial levels in the centres and from annual reports we know the performance figures (effort index, rent and vacancy) of the shops in the centre. Linking these characteristics in a network overview makes it possible to compare the different properties, and after that evaluate if there is a relation between spatial levels and these indicators.

4.5.2 SHOPS, TENANT MIX AND COMPLEXITY.

Theory explains the optimal distribution of shops in a shopping centre. First, the anchor tenant rent rates are lower than that paid by smaller shops, and next, smaller or midsized units (MSU) are willing to pay extra rent for a strategic location in the lower spatial levels. The attractiveness of anchor tenants on visitors is influential and people are prepared to walk through more spatial levels to reach this specific anchor shop. Table 4.8 shows the performance on tenant mix in the six shopping centres.

Table 4.8: Shops complexity as a result of a spatial network.

(A)

PROPERTY		Ch		Mo		Av		Am		Ag		To	
		Real	%	Real	%	Real	%	Real	%	Real	%	Real	%
Level	15							824					
Level	14							316					
Level	13			297				931					
Level	12			1,914		1,242		5,872		316		522	
Level	11			1,586		2,079		4,882		1,209		1,962	
Level	10			2,296		275		7,870		3,230		375	
Level	9	509		7,936		1,164		3,244		8,245		1,471	
Level	8	309		5,740		1,362		3,660		2,766		1,591	
Level	7	670		2,473		3,269		11,101		431		2,300	
Level	6	595		2,212		2,866		5,822		820		6,040	
Level	5	452		1,766		982		5,150		1,864		3,967	
Level	4	358		872		1,058		2,456		1,864		301	
Level	3	2,659		2,637		1,934		1,313		19		1,486	
Level	2	2,928		-		429		18		1,410		969	
Level	1	38		-		-		-		124		622	
Total		8,518		29,728		16,659		53,369		22,265		21,806	

(B)

PROPERTY		Ch		Mo		Av		Am		Ag		To	
		Real	%	Real	%	Real	%	Real	%	Real	%	Real	%
Level	15							6					
Level	14							4					
Level	13			3				5					
Level	12			6		2		8		2		2	
Level	11			6		11		28		11		8	
Level	10			17		2		26		31		4	
Level	9	5		34		7		26		17		9	
Level	8	1		28		6		23		10		6	
Level	7	8		19		17		33		8		11	
Level	6	7		19		13		34		5		20	
Level	5	6		11		12		23		14		19	
Level	4	6		1		9		16		12		4	
Level	3	8		6		3		16		1		2	
Level	2	3		-		4		1		2		3	
Level	1	2		-		-		-		2		1	
Total		46		150		86		249		115		99	

(C)

PROPERTY		Ch		Mo		Av		Am		Ag		To	
		Real		Real		Real		Real		Real		Real	
Level	15							137					
Level	14							79					
Level	13			99				186					
Level	12			319		621		734		158		261	
Level	11			264		189		174		110		245	
Level	10			136		138		303		104		94	
Level	9	102		239		166		125		485		163	
Level	8	309		205		227		155		277		265	
Level	7	84		130		192		336		54		209	
Level	6	86		116		220		171		164		302	
Level	5	75		161		82		224		133		209	
Level	4	60		872		118		154		155		75	
Level	3	332		440		645		82		19		743	
Level	2	976				107		18		705		323	
Level	1	19								62		622	
Total		195		195		194		214		194		243	

Table (A) =Total Leasable area per level

Table (B) =Total number of shops per level

Table (C) =Average shop sq.m per level

=Average or Mid-segment

=Concentration

[RED] = Negative influence

[GREEN] = Positive influence

Where: Table A reflects the total sq.m. leasable retail area per spatial level, Table B the number of shops, and finally Table C Average leasable of all the shops per spatial level.

In ideal Shopping centres, anchor tenants are situated in the higher spatial levels because of stimulation pedestrian's movements from centre entrance through all the spatial levels. Tenant mix structure of all properties is also reflected in appendix 3 and 4. This appendix provides a more extensive description of spatial level per unit and sizes of individual shops.

'Ch' Store size figures are a little distorted. Both anchor tenants are situated in the second and third spatial level and argues away that this type of anchors influences pedestrians streams. A dominant MSU (restaurant) is located in the 8 spatial level what is positive. Moreover, most of the shops are located in the spatial mid-segment and through passing 5 spatial levels, 50% of all the shops are within reach.

'Mo' Analyzing the anchor tenants, most (except one in level2) anchor tenants are located in the 8 and 9 spatial level what is seen as positive (see Appendix 4). Smaller units, we find in spatial levels 5-6-7. Problem with this shopping centre is the number of levels before reaching the first shop, what's revealing in a high entrance complexity number.

'Av' Except for spatial level three, we see a positive structure of store size variety. Most dominant anchor tenant is located in the highest spatial level (12) and most of the MSU are divided in the upper and mid-segment levels. Negative Access complexity figures are not confirmed at all through analyzing shop location structure.

'Am' Because this is by far the biggest centre of all, with almost more than 20 shops per level, analyzing on average basis from Table 4.8 is hard to do. Appendix 4 shows us that there is no real relation between higher en lower spatial levels. Almost every level has at one's disposal over an anchor tenant and smaller shops are also located in the higher spatial levels. Real positive is the dominant branch type (restaurants) that is located in the higher levels and branches like fashion, accessory and selective goods are mainly situated in the lower and middle levels.

'Ag' This property is characterized by a high density of shops in the highest 4 spatial levels (54%). Visitors have to pass sizable number of spatial convex units before reaching shops, that could lead to disordered experiences under these visitors. Positive is the amount of fashion and accessory shops in the lower levels, and restaurants, service and electronic shops in the higher levels. There is no strategic pattern perceived to the positioning of anchor tenants in the centre.

'To' Anchor tenants are mainly situated in the lower spatial levels that disrupt influences on pedestrian movements through the different spatial levels. Another important finding concerns branch mix in the centre. Tenant types who have an interest in dominant positions in the shopping centre like fashion, selective goods and accessory shops are situated in higher spatial levels, what is suggesting that this centre is failing to strategic tenant mix.

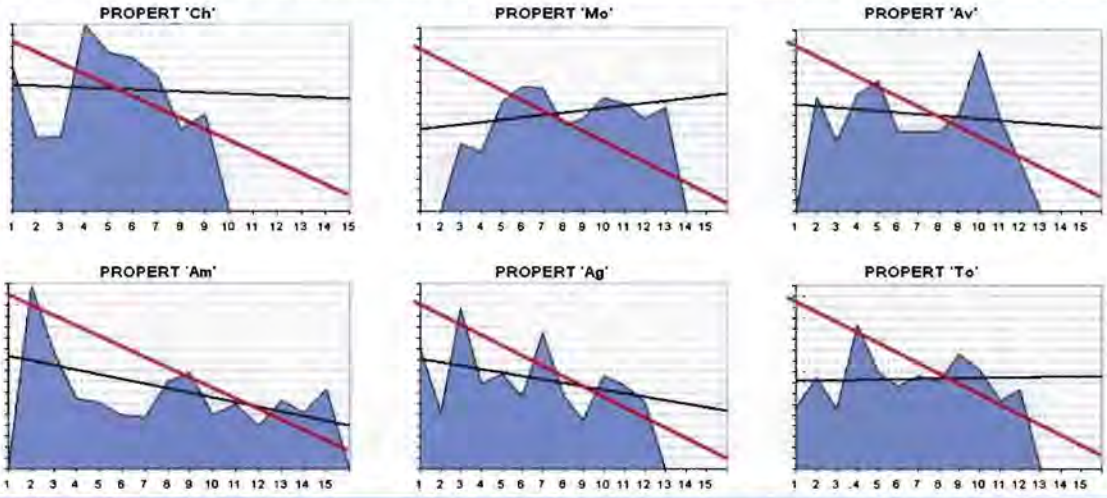
Conclusion - Shops, tenant mix and Complexity:

PERFORMANCE:	*Functioning* ← → *Failing*					
PROPERTY	"Am"	"Av"	"Mo"	"Ch"	"Ag"	"To"

4.5.3 RENT AND COMPLEXITY.

Second, Shops and Midsize units (MSU) are willing to pay more rent when they are located on strategic positions. We assume that these strategic locations are near to access origin, in the lower spatial network levels and in the high density spatial areas next to anchor tenants. Graph 4.9 shows the average rents per spatial network level in a shopping centre. Normally we assume that higher rents are situated in the more in the lower spatial levels (close to entrance) or next to anchor tenants.

Graph 4.9: Rent in relation with complexity as a result of a spatial network.



* Where the red line represents the ideal rental fall based on the theory as spatial levels become higher shops are less attractive to tenants, and the black line is the real lineal trend line of rental figures.

The overview doesn't give us the undisputed evidence that this rental theory is applicable for spatial network way of thinking. Nevertheless, the overview reflects that most of the retail properties are characterized by relatively higher rents in the lower spatial levels and lower rent prices in the higher spatial segments. This is showed by the declining black lineal in the charts, with the exception of property 'Mo' and 'Av'. Mainly the properties 'Ch', 'Am' and 'Ag' shows (in accordance with our theory) decreasing rents, whereas property 'Am' has a clear constructive pattern in the lower levels. Property 'Mo' shows no similarity at all to our assumptions because lowest rents are in the lower segment and higher rents in the higher levels. Properties 'Av' and 'To' gives no unambiguous segmentation on rents and spatial levels. Reason therefore is written in the previous paragraph, and has to do with a small variance of shops between the different spatial levels.

Conclusion - Rents and Complexity

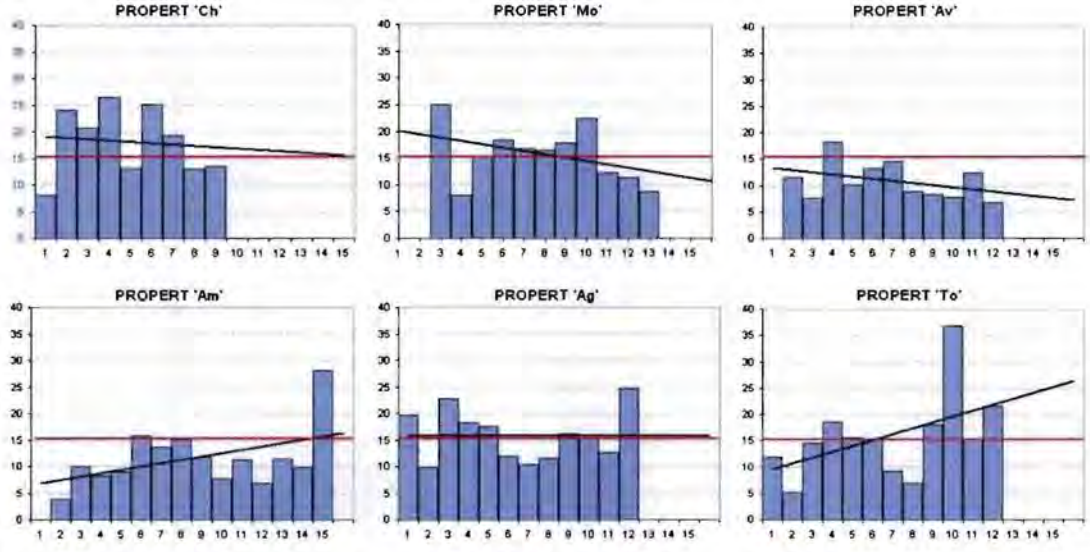
PERFORMANCE:	*Functioning* ← → *Failing*					
PROPERTY	"Am"	"Ag"	"Av"	"Ch"	"To"	"Mo"

4.5.4 EFFORT INDEX, VACANCY AND COMPLEXITY.

Last part of this spatial network theory accepts satisfaction indicators under tenants by analyzing the effort index and vacancy figures. Relating this indicators to the different spatial levels in the centre, explains which spatial levels guarantee better performing figures and to what degree this is corresponding to spatial network way of thinking. Principle, shops in the lower spatial levels or next to anchor tenants produces better sales figures compared with shops in the higher spatial levels. Nevertheless, higher sales figures imply higher rents for tenants. Paying attention to vacancy problems and satisfaction under tenants, an investor's intention is a practically equate Effort Index in almost every spatial level. A summary of Effort Index and vacancy figures is given in the overview below.

Graph 4.10: Effort index and vacancy in relation with complexity theory.

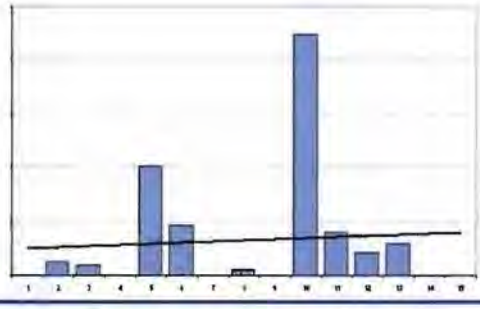
A) Average Effort index per spatial network level (in %).



B) Vacancy per spatial network level (in sq.m.).

PROPERTY VACANCY	Ch	Mo	Av	Am	Ag	To
Level 15						
Level 14				128		
Level 13		98				
Level 12						
Level 11			164	731		120
Level 10		267		141		53
Level 9						
Level 8						49
Level 7						
Level 6				1,973		259
Level 5				236		164
Level 4				213		
Level 3		288				
Level 2						
Level 1						
Total % GLA	0.0%	2.2%	1.0%	6.5%	0.0%	3.0%

Anchor shop



A) Where the red line represents the the average Effort Index (from Benchmark), and the black line is the real lineal trendline of Effort Index per shopping centre.

B) The Graph shows total vacant sq.m. of all the centre per spatial level.

Analyzing the Effort Index summery, we are aware of the direction that leads to a better satisfaction under tenants. Higher effort index figures means a dissatisfaction under store owner. As mentioned, we assume that the relationship rent and sales is almost equal through the entire shopping centre. Sizable variety in effort index between the different spatial levels indicate incorrect proportion, created by rents who are to high or low in relation with the sales made in the shops. The red line in the graphs shows the average Effort Index (benchmark) for this virtual retail fund. We analyzed the properties in two stages. First we make a comparison with the benchmark. Second we analyze the variation between the levels that could lead to dissatisfaction.

Property 'Av' and 'Am' comply with both the criteria and shows the best performance in this fund based on Effort Index. Corresponding with results presented in graph 4.8 (size and complexity), this property 'Am' and 'Av' shows a effective and structured tenant mix in the lower as well as the higher levels in the centre. Negative is the remarkable high effort index in spatial level 15 of 'Am" that could lead to vacancy in the future. Attention to this observation is recommended.

Failing properties are the centres 'Ch' and 'To'. A logical result of the location of property 'Ch', a prime retail location in the centre of a major city, higher rents are in accordance with this type of

shopping centres, and suppresses the relation rent and sales. Serious failing to Effort index is shopping centre 'To" where sales figures seem to fail in the higher spatial levels.
The lineal trend line of property 'Ag' is almost equal to the average effort index and also the variation is restricted that indicates an average performing retail property. Last property, "Mo' shows shortcomings in the lower spatial levels where the rents are proportionally high and in the higher spatial levels rents are probably to low.
Striking peaks in the charts suggest a failing spatial level that could lead to dissatisfaction under tenants. A better proportion of rent in relation with sales figures is recommended in these levels, what is applicable to property 'Mo' (level 3), 'Am' (level 15) and 'To' (level 10).

Conclusion -Effort Index and Complexity

PERFORMANCE:	*Functioning* ← → *Failing*					
PROPERTY	"Av"	"Am"	"Ag"	"Mo"	"Ch"	"To"

Analyzing the Effort Index per spatial level gives an explanation where we expect vacant units in the future. Property 'Mo' shows shortcomings on Effort Index in the spatial levels 3 and 10, followed by Graph 4.10B where we see that exact these levels show vacancy problems in this shopping centre. The same conclusion is applicable to property 'Av' where spatial level 11 indicated a lower satisfaction under tenants. Nevertheless, this spatial level is still below average and vacancy is scarce in the centre, so we suppose that this unit is temporality vacant.
Property 'Am' and 'To' (respectively, 6,5% and 3.0%) have to deal with serious vacancy problems. Shopping centre 'Am' fails in the spatial levels 4 till 6, 10 and 11, in contrast with charts in graph 4.10 that demonstrates a positive Effort Index within these levels. Main problem is the vacant anchor unit (1.972 sq.m.) situated on the third floor. Analyzing this surroundings, far-off corner at the right side when entering floor 3, explains that adjoining units also fail on Effort Index. Although these areas are allocated to spatial level 5 and 6, people automatically are moving to the food corner at the left side. This "out-of-the-way spot" only performs when an anchor tenant is located at this place.
The effort Index Chart of Shopping centre 'To' provides no clear reason why vacancy is involved in several spatial levels. A possible explanation could be found in graph 4.8A, which reflects a sizable number of shops located in these levels. A higher concentration of shops in one spatial level increases the chance of vacancy.

Conclusion - Vacancy and Complexity

PERFORMANCE:	*Functioning* ← → *Failing*					
PROPERTY	"Ch"	"Ag"	"Av"	"Mo"	"To"	"Am"

At this point we have analyzed all the shopping centres in this virtual retail fund on spatial level standards. Not only are the calculations as a result of complexity theory valuable as input for the Multiple Criteria approach, understanding spatial patterns and imperfection of layout provides opportunities that leads to a better performance and/or competitive situation in the future.

CHAPTER 5 MULTIPLE CRITERIA APPROACH

The Multiple Criteria Approach establishes an indication of asset value/performance through the identification and analysis of actual comparable assets in a real estate investment fund. Main theory is based on a dissension of endogenous performance characteristics that provides the information how a retail property is performing compared with other retail property. These required characteristics are discussed in the preceding chapters, and gives the essential foundations of the possibility to compare the selected retail properties. During this stage, we have to structure these criteria into a standard comparison model. Therefore, we utilize the theories as mentioned in the articles by Maliené (2002) and Kaklauskas (2006).

5.1 METHOD OF MULTIPLE CRITERIA DECISION-MAKING

The method described in literature is mostly used to make estimations of the market value of the given property and determine which price will make a valuated property comparative in the market. In this research the market environment is replaced by the portfolio under valuation, so measure the competition between the assets is seen as the result. The data for the analysis of retail properties are presented as a grouped decision matrix that involves a set of characteristics (Kaklauskas, 2006).

Before applying the Multiple Criteria Decision-making (MCDM) analysis, we first have to make a formation of the criteria system influencing the real estate value (Maliené, 2002). Criteria affecting real estate performance are established on a market decision-making basis as reflected in chapter 3.3 'Availability and utility of property data' and 4.4 'Spatial output and results'. Next, we have to determine the values, weight (expert assessments) and measuring units of criteria expressed in standard measuring units. The weights In the MCDM-analysis are achieved by expert assessment from real estate professional working at Multi Corporation (paragraph 5.3.1).

The essence of the method of multiple criteria decision-making in estimating real estate performance is composed of a total of 5 stages. The article by Maliené (2002) describes the process as follows.

1) Transforming the retail property performance values into dimensionless weighted values (d_{ij}). In Table 5.1 demonstrates the construction of the matrix and the different variables that are involved with this type of research. The dimensionless weighted value (d_{ij}) is calculated as:

$$d_{ij} = \frac{x_{ij} * q_i}{\sum_{j=1}^{n} x_{ij}} \qquad (1)$$

Where: X_{ij} is the real value, and q is the weight.

Table 5.1: Structure of the MCDM-analysis of real estate.

Criteria	*	Weights	Real estate to be valued and comparable real estates					
			a_1	a_2	...	a_j	...	a_n
X_1	z_1	q_1	d_{11}	d_{12}	...	d_{1j}	...	d_{1n}
X_2	z_2	q_2	d_{21}	d_{22}	...	d_{2j}	...	d_{2n}
...	...	...	...	...	...	...	...	...
X_i	z_i	q_i	d_{i1}	d_{i2}	...	d_{ij}	...	d_{in}
...	...	...	...	...	...	...	...	...
X_t	z_t	q_t	d_{t1}	d_{t2}	...	d_{tj}	...	d_{tn}
...	...	...	...	...	...	...	...	...
X_{t+1}	z_{t+1}	q_{t+1}	$d_{t+1,1}$	$d_{t+1,2}$	...	$d_{t+1,j}$	...	$d_{t+1,n}$
X_{t+2}	z_{t+2}	q_{t+2}	$d_{t+2,1}$	$d_{t+2,2}$	...	$d_{t+2,j}$	...	$d_{t+2,n}$
...	...	...	...	...	...	...	...	...
X_k	z_k	q_k	d_{k1}	d_{k2}	...	d_{kj}	...	d_{kn}
...	...	...	...	...	...	...	...	...
X_m	z_m	q_m	d_{m1}	d_{m2}	...	d_{mj}	...	d_{mn}
The sums of weighted normalized maximizing indices of the real estate			S_{+1}	S_{+2}	...	S_{+j}	...	S_{+n}
The sums of weighted normalized minimizing indices of the real estate			S_{-1}	S_{-2}	...	S_{-j}	...	S_{-n}
Significance of the real estate			Q_1	Q_2	...	Q_j	...	Q_n
Real estate's priorities			Pr_1	Pr_2		Pr_j		Pr_n
Real estate's utility degree (%)			N_1	N_2	...	N_j	...	N_n

* - The sign z_i (+ (-)) indicates that a greater/lesser criterion value corresponds to a greater weight for a client

Source: Kaklauskas, A., Zavadskas, E.& Banaitis, A. (2007). Defining the utility and market value of real estate: A multiple criteria approach.

2) When the dimensionless values of the indexes are established, calculations of the sum of maximizing (S_{+j}) and minimizing (S_{-j}) indexes describing the positive and negative contribution to the value of a property. In this case, the value S_{+j} (the greater is this value, the more satisfied are interested parties) and S_{-j} (the lower this value the better contribution towards satisfaction) expresses the degree of performance goals attained in each alternative.

$$S_{+j} = \sum_{i=1}^{m} d_{+ij} \quad ; \quad S_{-j} = \sum_{i=1}^{m} d_{-ij} \tag{2}$$

Next, the sums of "plusses" S_{+j} and 'minuses' S_{-j} of all alternatives forms a essential basis for the calculation of significance in phase 3.

$$S_{\sum plus} = \sum_{j=1}^{n} S_{+j} = \sum_{i=1}^{m} \sum_{j=1}^{n} d_{+ij}$$
$$S_{\sum \min} = \sum_{j=1}^{n} S_{-j} = \sum_{i=1}^{m} \sum_{j=1}^{n} d_{-ij} \tag{3}$$

3) The relative weight (effectiveness) of shopping centres being compared is determined in accordance with positive (+) S_{+j} and negative (-) S_{-j} qualities that characterize these properties (Maliené, 2002). These figures give an indication of performance contribution in the comparison matrix. The relative weight Q_i of each alternative is defined as:

$$Q_j = S_{+j} + \left(\frac{(S_{\sum \min})^2}{S_{-j} * \sum_{j=1}^{n} \frac{S_{\sum \min}}{S_{-j}}}\right) \quad (4)$$

From here, the degree of utility N_j (in %) of a alternative shopping centre is determined according to the following formula:

$$N_j = \left(\frac{Q_j}{Q_{\max}}\right) * 100\% \quad (5)$$

Where: Q_j is the relative weight value of a specific property, and Q_{max} is the highest weight indicator of al retail property under valuation. Logically we say that the best performing property has a N_j of 100%.

At this stage, all formulas for discovering the different variables for table 5.1 are given. We have determined in such way the ratio of degree of utility in the market value (or for this research performance). There is given a clear clarity where performance is related to for the properties under valuation and outcome provides us making choices in efficiency degree of investments. From here we are able to transform these figures into real values that are representing the performance based on market price. This is done by following the last phase of the MCDM process.

4) Calculations of the mean deviation k_x of the utility degree E_{xj} based on performance value shows how many percent a specific property is better or worse performing compared to the other properties. Graph 5.2 gives the model with the required variables for determining the real property value.

Graph 5.2: Calculations of mean deviations of real estate untility degrees.

Real estate considered	Utility degree deviation of the real estate analyzed compared to other real estate, %					Mean deviation k_x of utility degree N_j of the real estate a_i compared to other $(n-1)$ real estates, %
	a_1	a_2	a_3	...	a_n	
a_1	0	E_{12}	E_{13}	...	E_{1n}	k_1
a_2	E_{21}	0	E_{23}	...	E_{2n}	k_2
a_3	E_{31}	E_{32}	0	...	E_{3n}	k_3
...	...	...	...	...	...	...
a_i	E_{i1}	E_{i2}	E_{i3}	...	E_{in}	k_i
...	...	...	...	...	...	...
a_n	E_{n1}	E_{n2}	E_{n3}	...	0	k_n

Source: Kaklauskas, A., Zavadskas, E.& Banaitis, A. (2007). Defining the utility and market value of real estate: A multiple criteria approach.

This efficiency degree (E_{xj}) is based on the difference between two properties. When we calculate the difference between property a1 and a1, it's being obvious that the result is 0 as expressed in graph 5.2. The efficiency degree is calculated by using the following comparison:

$$E_{xj} = N_x - N_j \quad (5)$$

Next, the mean deviation k_x of the utility degree N_j for the specific property is calculated as follows:

$$k_X = \frac{\sum_{i=1}^{n} E_{xj}}{(n-1)} \qquad (6)$$

This outcome gives an explanation to what degree there is a abnormality compared to the other properties under valuation. Maliené (2002) describes is his paper that a lower K_x, gives a more accurate approach of the real value. We aim for an 'Absolute' $|K_x|$ that is located between 1% and -1% as optimal condition to determine the property value.

5) As described, all the values and weights of criteria relating to other real estate are known. The next problem is stated as follows: what market value X_{v-m} of the valuated retail property will make it equally competitive on the market with comparison standard representing other properties (Maliené, 2002). Here we make a distinction between V_x (Present) and V_{x_m} (Market) value. The formula below gives the present value based on the real mean deviation (K_x):

$$V_x = C_{average} * (1 + (k_X)) \qquad (7)$$

Where: $C_{average}$ represents the average performance value of all the other properties in the decision matrix. Thus, excluding the value of the property under valuation.

As we mentioned in stage 4, when the formula isn't satisfying our expectations of a mean deviation k_x between 1% and -1% further calculations are required. Therefore we reiterate the stages 6 and 7 by substitute the performance value k_j (see table 5.1) into the outcome V_x, till the mean deviation k_x is satisfying the conditions of $|K_x| < 1\%$.

The Method of Multiple Criteria decision-making, in real estate valuation allows for the estimation of not only the market value of retail property but also other values, which are based on market principles (Maliené, 2002).

5.2 INVESTIGATION PROCESS AND SUMMERY OF RESULTS

5.2.1 ASSESSMENT OF INFLUENTIAL CRITERIA

Regarding the main characteristics of Evaluation of Design, Benchmarks, Quantitative assessments and Growth indicators of the shopping centres under valuation, a grouped decision-making matrix based on graph 5.1 is formed for this fictitious retail fund. The fixed effects for this matrix are described in the previous chapters. Before we elaborate the matrix, weights of the criteria, defining the influence of the utilized values, are estimated by the application of expert assessments. This expert assessment is divided into three parts;

1) Three questions based on 'why retailers are willing to lease space in a specific shopping centre'. Central issues: Design, Tenant Mix and Effort Index.
2) Five questions based on the property qualifications in relation with improving financial indicators over a year and satisfaction under visitors. Central issue: What are the critical motives for an investor before investing in retail properties.
3) Twelve questions of property characterize that influence future performance of a shopping centre. Central issues: Statements from income, sales, footfall, vacancy and location related criteria's.

These twenty questions provide us to compare the importance of all the different criteria's from the decision matrix. The outcomes from this assessment are analyzed by expert choice, based on analytic hierarchy. We suppose that pessimistic experts give relative lower judgments compared to more positive reasoning expert, and by this affecting the results in a negative way. Advantage of expert choice involves the elimination of personal sentiments by using an approach based on "pairwise comparison" to discover prioritize competing initiatives instead of scale. The results are published in Appendix 5. Relevant remarks to this research; evaluation of the shopping centre represents as a group a total weigh of 1.0, which represents an influence of 42% to the market value. The criteria investment value is representing an equivalent influence on market value like the SUM of criteria minus evaluation of the shopping centre (0.683).

Finally, when the calculations are performed in accordance with the weight scale, the values of the criteria can be expressed in a certain number of points. Criteria can be estimated according to the increase or decrease of the valuation scale as reflected in the decision matrix (see the column + or -).

5.2.2 MODEL DETAILS

Table 5.3 illustrates the initial data for multiple criteria decision-making of all six the shopping centres. The original figures in the matrix are replaced by dummy variables which are in proportion to the real figures from Multi Mall Management because we are not authorized to publication these.

Table 5.3: Initial data for multiple criteria decision-making.

Criteria				Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Evaluation of the Shopping Center										
	Access Complexity (Spatial Network analysis)		+		34.78	39.00	44.52	39.13	33.76	38.36
	Space Distribution (Weighted Average)		-		5.15	8.01	6.81	7.86	7.83	6.76
Contribution to Benchmark										
	Rental income per sqm	(in %)	+		27.6%	-11.7%	6.8%	9.0%	-2.2%	-29.5%
	Sales per sqm	(in %)	+		13.8%	-41.3%	36.6%	43.2%	-17.5%	-34.9%
	Effort Index	(in %)	-		4.4%	1.7%	-3.1%	-2.8%	-0.8%	0.6%
Quantitative assessment of premises										
Design	Spatial effectiveness (GLA / Total area)	(in %)	+		58.74%	49.38%	65.90%	63.29%	44.59%	73.24%
	Size GLA *(excl. Resid. - Hyper - DIY)*	(in 000 sq.m.)	+		14.50	60.20	25.28	83.45	49.98	29.50
	Maintenance cost	(EUR sq.m/yr)	-		€ 10.39-	€ 9.43-	€ 10.17-	€ 9.60-	€ 11.53-	€ 11.56-
	Large-scale Maintenance cost	(EUR sq.m/yr)	-		€ 2.85	€ 0.71	€ 2.56	€ 0.88	€ 1.14	€ 0.27
	Age	(in years)	-		11.0	5.9	10.5	6.5	8.0	2.3
Tenant Mix	Vacancy space in sqm	(in %)	-		0.00%	2.00%	1.16%	4.42%	0.00%	8.99%
	Variance store size classes	(in 000)	+		185.2	123.1	105.5	212.1	146.3	132.7
	Number of tenant types	(quantity)	+		7	9	9	10	10	8
	Transferring Ratio number of Shops	(in %)	-		8.70%	4.67%	1.16%	14.46%	4.31%	8.99%
Sales/Footfall	Anchor tenant sales per sqm.	(in Euros)	+							
	Shopping center Sales per Visitor	(in Euros)	+							
	Footfall	(per sq.m. total)	+		84.9	22.6	43.0	24.1	37.5	12.3
	Opening hours Shops	(week)	+		84	98	91	98	98	72
Income	Correlation (Rental income - Unit size)	(in %)	+		-55.10%	-55.79%	-52.53%	-43.29%	-57.14%	-49.68%
	Growth Turnover rent over 12 mth	(in %)	+		-20.9%	-17.8%	-28.9%	-9.9%	-4.0%	0.9%
	Relation Turnover / Fixed rental income	(in %)	+		3.98%	5.04%	3.69%	1.72%	7.92%	0.06%
Location	Market Share Total Area of Influence	(in %)	+		20.2%	31.5%	29.0%	8.1%	27.0%	4.5%
	Stand Alone Anchor Tenant (HYP-DIY)	(in 000 sq.m.)	+		0.0%	58.9%	0.0%	41.5%	81.2%	54.2%
	Area of Influence	(quantity)	+		416,753	208,303	91,750	167,448	69,966	148,014
Assessment of Growth performance characteristics (Dec '07-Dec. '08)										
	Total Income	(in %)	+		-2.7%	1.0%	1.2%	-4.2%	-1.0%	1.7%
	Effort Index	(in %)	+		12.5%	2.9%	2.1%	6.3%	5.4%	1.1%
	Sales	(in %)	+		2.7%	-3.8%	1.0%	-3.7%	-1.6%	2.3%
	Visitors	(in %)	+		4.0%	2.9%	1.3%	3.6%	-3.0%	10.3%
	Occupancy rate (sq.m.)	(in %)	+		0.0%	37.2%	-1.9%	-1.1%	0.0%	-1.7%

To enforce an optimal comparison, the Investment value is settled as an equal rate for all the properties under valuation in the matrix. This value represents the average investment price per sq.m. from yield calculations of all six the centres under valuation. The net yield is seen as a financial instrument to compare different investments with each other in a specific market place. Per centre a yield is fixed based on market reports (Q42008) from CB Richard Ellis, Cushman & Wakefield, Jones Lang LaSalle, Collier and King Sturge. Table 5.4 gives a summery of the investment value as input for multiple criteria calculations.

Table 5.4: Investment value shopping centres under valuation.

		Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Investment Value							
Total Contracted Rent (yr) / Yield	*(per sq.m.)*	€ 5,430.00	€ 3,183.51	€ 5,038.39	€ 4,871.20	€ 3,837.47	€ 3,270.92
Average Value	*(per sq.m.)*	€ 4,258.37					

5.2.3 SIMULATION RESULTS

All criteria are transformed into dimensionless values as represented in Table 5.5. From here we are able to estimate the "real" investment value of all shopping centres based on multiple criteria approach, following step 6 and 7 from paragraph 5.2.

Table 5.5: Results of shopping centres multiple criteria analysis (1).

Criteria			Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Evaluation of the Shopping Center									
1	Access Complexity (Spatial Network analysis)		-	0.1266	0.1420	0.1621	0.1425	0.1229	0.1397
2	Space Distribution (Weighted Average)		-	0.0200	0.0310	0.0264	0.0304	0.0303	0.0262
Contribution to Benchmark									
3	Rental income per sqm	*(in %)*	+	0.0351	0.0109	0.0223	0.0237	0.0168	-
4	Sales per sqm	*(in %)*	+	0.0214	-	0.0303	0.0328	0.0092	0.0025
5	Effort Index	*(in %)*	-	0.0349	0.0224	-	0.0014	0.0107	0.0175
Quantitative assessment of premises									
6	*Design* Spatial effectiveness (GLA / Total area)	*(in %)*	+	0.0036	0.0031	0.0041	0.0039	0.0028	0.0045
7	Size GLA *(excl. Resid. - Hyper - DIY)*	*(in 000 sq.m.)*	+	0.0009	0.0039	0.0016	0.0054	0.0032	0.0019
8	Maintenance cost	*(EUR sq.m/yr)*	-	0.0024	0.0022	0.0024	0.0022	0.0027	0.0027
9	Large-scale Maintenance cost	*(EUR sq.m/yr)*	-	0.0049	0.0012	0.0044	0.0015	0.0019	0.0005
10	Age	*(in years)*	-	0.0022	0.0012	0.0021	0.0013	0.0016	0.0005
11	*Tenant Mix* Vacancy space in sqm	*(in %)*	-	-	0.0023	0.0013	0.0051	-	0.0103
12	Variance store size classes	*(in 000)*	+	0.0036	0.0024	0.0021	0.0041	0.0029	0.0026
13	Number of tenant types	*(quantity)*	+	0.0020	0.0025	0.0025	0.0028	0.0028	0.0023
14	Transferring Ratio number of Shops	*(in %)*	-	0.0028	0.0015	0.0004	0.0047	0.0014	0.0029
15	*Sales/Footfall* Anchor tenant sales per sqm.	*(in Euros)*	+	0.0032	0.0017	0.0037	0.0038	0.0022	0.0017
16	Shopping center Sales per Visitor	*(in Euros)*	+	0.0011	0.0022	0.0025	0.0046	0.0017	0.0040
17	Footfall	*(per sq.m. total)*	+	0.0053	0.0014	0.0027	0.0015	0.0024	0.0008
18	Opening hours Shops	*(week)*	+	0.0013	0.0015	0.0014	0.0015	0.0015	0.0011
19	*Income* Correlation (Rental income - Unit size)	*(in %)*	+	0.0033	0.0034	0.0032	0.0026	0.0035	0.0030
20	Growth Turnover rent over 12 mth	*(in %)*	+	0.0046	0.0040	0.0063	0.0023	0.0010	-
21	Relation Turnover / Fixed rental income	*(in %)*	+	0.0019	0.0024	0.0018	0.0006	0.0038	0.0000
22	*Location* Market Share Total Area of Influence	*(in %)*	+	0.0028	0.0043	0.0040	0.0011	0.0037	0.0006
23	Stand Alone Anchor Tenant (HYP-DIY)	*(in 000 sq.m.)*	+	-	0.0032	-	0.0023	0.0045	0.0030
24	Area of Influence	*(quantity)*	+	0.0027	0.0014	0.0006	0.0011	0.0005	0.0010
Assessment of Growth performance characteristics (Dec '07-Dec. '08)									
25	Total Income	*(in %)*	+	0.0020	0.0068	0.0071	-	0.0042	0.0077
26	Effort Index	*(in %)*	+	0.0132	0.0021	0.0012	0.0060	0.0050	-
27	Sales	*(in %)*	+	0.0071	-	0.0052	0.0001	0.0024	0.0066
28	Visitors	*(in %)*	+	0.0031	0.0027	0.0019	0.0030	-	0.0060
29	Occupancy rate (sq.m.)	*(in %)*	+	0.0007	0.0145	-	0.0003	0.0007	0.0001
			SUM						
Investment Value			+	0.1139	0.1139	0.1139	0.1139	0.1139	0.1139
	S+j			0.233	0.188	0.218	0.218	0.189	0.163
	S-j			0.194	0.204	0.199	0.189	0.172	0.200
	Qj			42.4%	37.0%	40.5%	41.4%	40.5%	34.9%
	Nj (%)			100.0%	87.3%	95.4%	97.5%	95.4%	82.1%
	Priority			6	2	4	5	3	1
	Expectation investment value (from Yield assessment)			€ 5,430	€ 3,184	€ 5,038	€ 4,871	€ 3,837	€ 3,271

	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"	(K_x)
"Ch"		12.7%	4.6%	2.5%	4.6%	17.9%	8.47%
"Mo"	-12.7%		-8.1%	-10.2%	-8.1%	5.1%	-6.81%
"Av"	-4.6%	8.1%		-2.1%	0.0%	13.2%	2.92%
"Am"	-2.5%	10.2%	2.1%		2.1%	15.4%	5.48%
"Ag"	-4.6%	8.1%	0.0%	-2.1%		13.2%	2.91%
"To"	-17.9%	-5.1%	-13.2%	-15.4%	-13.2%		-12.97%

For every shopping centre, the mean deviation (K_x) is estimated through pairwise comparison approach. The mean deviation demonstrates in which order the "real" shopping centre investment value shows abnormality in relation to the average portfolio value per sq.m. Results from graph 5.5 reveal that four out of six properties are performing above portfolio average. Although this seems to be positive in a certain way, results give no explanation in which direction a property is performing. As mentioned, this mean deviation expresses the starting point for performance calculations on average basis. All individual properties representing their own definite investment value (Graph 5.4) and should not follow the example of average figures as a performance measure because of diversity in type and/or location. Finally, comparing these yield based investment values with multiple criteria results should lead to performance identification. Graphs below summarizing the number of cycles per shopping centre under valuation, before satisfying the condition of $|K_x| < 1\%$ (column 3). Finally, this approach shows through a number of cycles the effects on the 'real' investment value resulting in the Market value (column 4). Column 5 reflects the investment value as settles by yield calculations (Graph

5.4). A positive or negative deviation between market value and investment tells us in which direction and to what degree a property is over or under performance.

'Ch'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= 8.47%		€ 5,430.00
2	€ 4,619.18	k_2= 6.43%		
3	€ 4,916.42	k_3= 4.84%		
4	€ 5,154.33	k_4= 3.61%		
5	€ 5,340.53	k_5= 2.68%		
6	€ 5,483.77	k_6= 1.98%		
7	€ 5,592.54	k_7= 1.46%		
8	€ 5,674.32	k_8= 1.08%		
9	€ 5,735.38	k_9= 0.79%		Positive deviation
		0.58%	€ 5,780.72	6.46%

'Mo'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= -6.81%		€ 3,183.51
2	€ 3,968.19	k_2= -5.09%		
3	€ 3,766.15	k_3= -3.81%		
4	€ 3,622.83	k_4= -2.85%		
5	€ 3,519.73	k_5= -2.13%		
6	€ 3,444.76	k_6= -1.59%		
7	€ 3,389.83	k_7= -1.19%		
8	€ 3,349.33	k_8= -0.90%		Positive deviation
		-0.67%	€ 3,319.33	4.27%

'Av'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= 2.92%		€ 5,038.39
2	€ 4,382.50	k_2= 2.18%		
3	€ 4,478.08	k_3= 1.63%		
4	€ 4,551.17	k_4= 1.22%		
5	€ 4,606.80	k_5= 0.92%		Negative deviation
		0.69%	€ 4,648.98	-7.73%

'Am'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= 5.48%		€ 4,871.20
2	€ 4,491.88	k_2= 4.00%		
3	€ 4,671.67	k_3= 2.93%		
4	€ 4,808.37	k_4= 2.14%		
5	€ 4,911.38	k_5= 1.57%		
6	€ 4,988.50	k_6= 1.15%		
7	€ 5,045.96	k_7= 0.85%		Positive deviation
		0.62%	€ 5,088.63	4.46%

'Ag'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= 2.91%		€ 3,837.47
2	€ 4,382.23	k_2= 1.98%		
3	€ 4,469.11	k_3= 1.35%		
4	€ 4,529.59	k_4= 0.92%		Positive deviation
		0.63%	€ 4,571.47	19.13%

'To'

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 4,258.37	k_1= -12.97%		€ 3,270.92
2	€ 3,706.22	k_2= -9.49%		
3	€ 3,354.36	k_3= -6.96%		
4	€ 3,120.75	k_4= -5.12%		
5	€ 2,960.86	k_5= -3.78%		
6	€ 2,848.94	k_6= -2.80%		
7	€ 2,769.30	k_7= -2.07%		
8	€ 2,711.94	k_8= -1.54%		
9	€ 2,670.25	k_9= -1.14%		
10	€ 2,639.74	k_{10}= -0.85%		Negative deviation
		-0.63%	€ 2,617.32	-19.98%

Subsequently in the matrix, the average investment values (from graph 5.5) are replaced by the market values as a result of the above represented calculations (column 4). This leads to the final comparison model as shown in Table 5.6.

Table 5.6: Results of shopping centres multiple criteria analysis (2).

Variable	Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Value (MCDM Analysis)	0.6836	**€ 5,780.72**	**€ 3,319.33**	**€ 4,648.98**	**€ 5,088.63**	**€ 4,571.47**	**€ 2,617.32**
S+j		0.233	0.188	0.218	0.218	0.189	0.163
∑variables		0.080	0.090	0.085	0.075	0.058	0.086
S-value		0.192	0.087	0.122	0.134	0.120	0.069
S-j	1.155	0.232	0.177	0.207	0.209	0.178	0.155
Qj		39.1%	39.5%	39.5%	39.3%	39.4%	39.9%
Nj (%)		97.9%	98.9%	98.9%	98.4%	98.8%	100.0%
Priority							
Expectation value (Yield ass.)		*€ 5,430.00*	*€ 3,183.51*	*€ 5,038.39*	*€ 4,871.20*	*€ 3,837.47*	*€ 3,270.92*
deviation:		6.5%	4.3%	-7.7%	4.5%	19.1%	-20.0%

	"Ch"	*"Mo"*	*"Av"*	*"Am"*	*"Ag"*	*"To"*	*(K_x)*
"Ch"		-1.0%	-1.0%	-0.5%	-0.9%	-2.1%	**-1.10%**
"Mo"	1.0%		0.0%	0.5%	0.1%	-1.1%	**0.12%**
"Av"	1.0%	0.0%		0.5%	0.1%	-1.1%	**0.12%**
"Am"	0.5%	-0.5%	-0.5%		-0.4%	-1.6%	**-0.50%**
"Ag"	0.9%	-0.1%	-0.1%	0.4%		-1.2%	**-0.05%**
"To"	2.1%	1.1%	1.1%	1.6%	1.2%		**1.42%**

"Ch"

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 5,780.72	k_1= -1.10%		€ 5,430.00
2	€ 5,717.32	k_2= -0.81%		Positive deviation
		-0.45%	€ 5,671.01	4.44%

"To"

Cycle of Approximation	The corrected value (V_x) (EUR sq.m/yr)	Accurancy ($\|K_x\|$ < 1%.)	Market Value (MCDM Approach)	Investment Value (Contracted Rent (yr) / Yield)
1	€ 2,617.32	k_1= 1.42%		€ 3,270.92
2	€ 2,654.41	k_2= 1.05%		
2	€ 2,682.41	k_3= 0.78%		Negative deviation
		0.49%	€ 2,703.39	-17.35%

Still, this model isn't satisfying the fixed conditions. Property 'Ch' and 'To' shows a mean deviation of respectively -1.10 and 1.45%, that is above the criteria of $|K_x| < 1\%$. Another cycle of approximation is recommended for these properties, till the mean deviation is satisfying our expectations. This is resulting in a market value of € 5,671.01 ($k_x = -0.45$) for property 'Ch', and € 2,716.89 ($k_x = +0.49$) for property 'To'

5.2.4 CONCLUSIONS

Eventually, the model is satisfying our fixed conditions and overviews of the results are reflected in Table 5.7. Evaluating these results on performance measure basis leads to recommendations if a property is still attractive to maintain in a retail investment fund.

Table 5.6: Results of shopping centres multiple criteria analysis (3).

Variable	Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Value (MCDM Analysis)		€ 5,671.01	€ 3,319.33	€ 4,648.98	€ 5,088.63	€ 4,571.47	€ 2,703.39
S+j		0.233	0.188	0.218	0.218	0.189	0.163
∑variables							
S-value							
S-j		0.229	0.177	0.207	0.209	0.178	0.157
Qj		39.3%	39.5%	39.5%	39.3%	39.5%	39.6%
Nj (%)		99.2%	99.8%	99.7%	99.2%	99.6%	100.0%
Priority							
Expectation value (Yield ass.)		€ 5,430	€ 3,184	€ 5,038	€ 4,871	€ 3,837	€ 3,271
deviation:		4.4%	4.3%	-7.7%	4.5%	19.1%	-17.4%

	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"	(K_x)
"Ch"		-0.5%	-0.5%	0.0%	-0.4%	-0.8%	**-0.45%**
"Mo"	0.5%		0.0%	0.5%	0.1%	-0.2%	**0.20%**
"Av"	0.5%	0.0%		0.5%	0.1%	-0.3%	**0.18%**
"Am"	0.0%	-0.5%	-0.5%		-0.4%	-0.8%	**-0.44%**
"Ag"	0.4%	-0.1%	-0.1%	0.4%		-0.4%	**0.02%**
"To"	0.8%	0.2%	0.3%	0.8%	0.4%		**0.49%**

First, this summery of results confirm that all properties satisfying a mean deviation (k_x) < 1%. From here we suppose that the values, this overview is representing, are valid for further recommendations. Second, the difference between the value as a result from multiple criteria approach and the expectation value (or investment value from yield calculations), in percentage, provides a measure of performance per shopping centre. A positive percentage symbolizes a higher market value, and in lines with this a better competing shopping centre. A negative outcome suggests that this shopping centre shows serious shortcomings, which could indicate failings in design (contribution of 42%) or disproportion in contracted rents (contribution of 29%) as indicator for investment calculations.

It's obvious that the value from multiple criteria approach isn't representing real achievable disposal value of each shopping centre. Nevertheless, results from table 5.6 tell us that 4 of the six shopping centres are performing above expectation in this fictitious retail property investment fund. Property 'Ag' demonstrates the highest positive percentage of 19.1% above

expected value followed by property 'Am', 'Ch' and 'Mo' which all shows a positive result. Negative outcomes from these calculations refer to the properties 'To' and 'Av', which seem to failing on spatial functionality. The multiple criteria approach provides a review in the process and from here recognize patterns that lead to satisfaction or dissatisfaction under stakeholder in a shopping centre. In chapter six 'managerial implications' we analysis this process from the start, and make some recommendations on disposition management for all six the retail properties under valuation.

5.3 LIMITATIONS OF THE SIMULATIONS

This method allows one to carry out a complex decision-making of the real estate including not only market conditions, but especially in this case the influence of design and functionality as an indicator of performance. Although the proposed method is flexible and can be made practicable for different applications as proven by Maliené (2002) and Kaklauskas (2006), several limitations influence the results of our research.

- It's not the intention to measure the real achievable disposal value of each shopping centre. The value, as an output from multiple criteria calculations, is representing the endogenous performance based on functional characteristics. Comparing the expected value from yield calculation (financial analysis) and the criteria value (endogenous), gives an indication in which way there is a difference between the financial and the endogenous performance.

- Literature gives a clear description of yield calculations. Nevertheless, limitations of this approach represent the reliability of the investment values by a deficiency in actual yields. We assume that investment managers have at one's disposal over actual figures when they make use of this approach. Furthermore, we think that the adopted investment value gives an adequate reflection of the reality.

- The number and weight of these criteria can be easily changed when applying the suggested methods. Nevertheless, weight and criteria adopted in this research is a result of the availability of information and is not leading. Next, the weights of criteria are a result of expert assessment under professionals working at Multi Corporation, but should actually be based on an overall branch representation.

- Inflexibility of forward-looking simulation model limits this model and recommendations as a result of calculations are only effective within a restricted time-scoop. After all we have to realize that this model is very time consuming.

- Risks are not implemented in this multiple criteria approach, which may make model specification more difficult to rely on and in a certain way subjective.

CHAPTER 6 MANAGERIAL IMPLICATIONS

6.1 HOW TO IDENTIFY SPATIAL POTENTIAL

Initial investment studies act as basis for financial decision-making and creates a benchmark for investors what they can expect from a retail property investment in financial terms. This approach provides answers to e.g. costs, location, market circumstances or achievable disposal values, but doesn't offer a clear indication in which way a shopping centre is performing in operational terms. Graph 6.1 makes a distinction between three performance indictors. First the investment value or financial performance based on cash flow, location and growth criteria, as often used nowadays for investment decision-making. The upper two, more operational, levels are allocated to the endogenous performance from visitors and retailer's perspectives, and measures endogenous criteria like design, tenant mix, sales and footfall. This thesis suggests a broader spectrum of property characteristics besides the financial considerations, by measuring the spatial potential in a shopping centre. Theory assumes that feasibility addresses various fields beyond immediate financial considerations, as reflected in graph 6.1.

Graph 6.1: Potentials of a Shopping Centre.

1. Design and Physical criteria;
2. Tenant mix criteria;
3. Sales and Footfall criteria;
4. Cash flow criteria;
5. Location criteria;

Each of these criteria may be refined iteratively on the importance for a particular retail project. However, many investors tend to mainly focus on the investment value through financial analysis and not by considering possible scenarios from the other research areas to their full extent. An explicit investment value is only possible if the investor is able to identify none-base-case opportunities of the property in terms of functionality, connection with potential visitors or consumers and last but not less the potential to perform in the future in this specific catchment area. A spatial network analysis helps the investor to simulate and understand circumstances and combinations of spatial patterns in relation with rental incomes, sales and vacancy.

6.2 IMPLEMENTATION OF SPATIAL EFFECTS AS A PERFORMANCE MEASURE

With the spatial network approach in the back of our mind we propose the next steps for simulation-enhanced endogenous performance of a shopping centre. This starts with the identification of characteristics and should lead to recommendations of disposition policy in a retail fund.

1. Identification, definition and undoing tracking of spatial and financial potential.
2. Creating functional layouts and attributing convex and lineal units as a measure of spatial indicators.
3. Learning from spatial network results as an indicator for endogenous performance in a shopping centre.
4. Comparing results from spatial analysis and selected property characteristics using a multiple criteria matrix and understanding the output based on the importance of spatial patterns, individual property characteristics and competitive advantages.
5. Linking results with disposition decision-making: Which shopping centres are creating potential value for the future from tenant and visitor viewpoint?

STEP 1 - IDENTIFICATION: The investment manager needs to recognize potentials that influence the performance of a shopping centre from retailers and customer viewpoint. This is done through spatial analysis and valuating other characteristics as reflected in graph 6.1.

STEP 2 - CREATION OF SPATIAL LAYOUTS: The importance of convex (bounded space) and lineal (pedestrian patterns) unit distribution in a shopping centre identify the extent of special continuity from the entrance through the shopping system and usually correspond with flows and globalization of space. Starting point for a first performance analysis is based on considerations of spatial uncertainty, which can be managerial when analyzing the 'endogenous' performance of a shopping centre. Differently, spatial complexity is seen as leading indicator sight to the attractiveness to its visitors and subsequently there tenants. In order to evaluate complexity we recommend that a value should be considered as a direction or shape rather than a number.
Critical observations in step two involve the creation of a spatial benchmark and recognizing spatial patterns in shopping centres. Therefore we need to analyze spatial complexity not only for convex and lineal units, but assess the relation of this 'shape' to endogenous performance indicators as we suggest in step 3.

STEP 3 - LEARNING FROM SPATIAL PATTERNS: We know the shape of spatial complexity from the number of network levels and complexity calculations as demonstrated in chapter 4. More import, but unfortunately not measurable (left out of consideration in a comparison matrix), is the influence that spatial level patterns have on sales, rental and vacancy figures per spatial level. Prior chapters established a proof that in this case, sales and rents are higher and the vacancy rate is lesser in the lower spatial levels or next to anchor tenants. Next, attention to stimulation of pedestrian's movements from access origin through all the spatial levels is recommended. Conclusions, as described in paragraph 4.4, are reproduced in the table below. Here we draw a distinction between best performing centre (weight 6) and the worst performing (weight 1) within the spatial network benchmark.

Table 6.2: Spatial complexity per shopping centre.

	Spatial Complexity									
	Access Compl.		W.A. Entrance		Tenant Mix	Rent	Effort Index	Vacancy	Average	
Property "Ag"	6	33.76	3	7.83	2	5	4	6	4.3	6
Property "Ch"	5	34.78	6	5.15	3	3	2	6	4.2	5
Property "Av"	1	44.52	4	6.81	5	4	6	4	4.0	4
Property "Am"	2	39.13	2	7.86	6	6	5	1	3.7	3
Property "Mo"	3	39.00	1	8.01	4	1	3	3	2.5	2
Property "To"	4	38.21	5	6.76	1	2	1	2	2.5	1

The information facilities (see paragraph 4.4 and drawings in the appendices) for this overview provide us a clear explanation per characteristic for further recommendations. Analyzing results, a first remark concerning the low number of Access complexity for property 'Av' in contrast with the other criteria which have scores far above average. Attention is required because we know that access complexity influence the multiple criteria analysis for 42%. Although this shopping centre seems to fail to access complixity, the other indicators (mainly W.A. entrance, effort index and tenant mix) proof the potential of this retail property. From here we conclude that when we are concentrating too much on access as indicator of value, we lose sight with the overall endogenous performance. Nevertheless, constructive calculations are not feasible. Second and most important remark in step 3, is the overall failing of property 'To'. Analyzing the network outcomes from paragraph 4.4 gives us a clear sign that there is a well-defined relation with financial figures from mall reports and spatial analyses, although this is not qualitative demonstrate by the number of involved centres. The same conclusion is applicable to the best performing shopping centres "Ch' and 'Ag'. Recognizing these patterns and relations from investment viewpoint provides a motivation for further investigations in step 4.

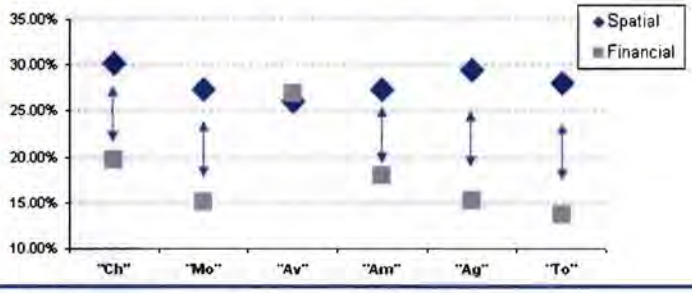
STEP 4 - Comparing results: Valuable information to proof the relation between spatial complexity and the influence on financial performance of a shopping centre arise from analyzing the individual contribution of these characteristics from MCDM approach (Table 6.3). As one knows, an ideal situation to proof this relation is when as all shopping centres are moving in the same direction. The overview gives the suggestion that spatial and financial results are moving in four out of six cases in the same direction. Subsequently, five out of six centres shows a financial deviance in the ranch of 9.37% till 14.35% below the spatial results, which supports our thoughts of spatial complexity influences financial performance. Once more, analyzing more shopping centres in this research provides more possibilities for qualitative argumentations.

Table 6.3: Spatial complexity (chapter 4) vs. Financial output matrix (table 5.6)

SPATIAL CRITERIA	*	Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Evaluation of the Shopping Center								
Access Complexity (Spatial Network -			0.1266	0.1420	0.1621	0.1425	0.1229	0.1397
Space Distribution (Weighted Averag -			0.0200	0.0310	0.0264	0.0304	0.0303	0.0262
Investment Value	+		0.1139	0.1139	0.1139	0.1139	0.1139	0.1139
PERFORMANCE (in %)			30.2%	27.3%	26.0%	27.3%	29.4%	28.0%

FINANCIAL CRITERIA		*	Weight	Shopping Centers "Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Contribution to Benchmark									
Rental income per sqm	*(in %)*	+		0.0351	0.0109	0.0223	0.0237	0.0168	-
Sales per sqm	*(in %)*	+		0.0214	-	0.0303	0.0328	0.0092	0.0025
Effort Index	*(in %)*	-		0.0349	0.0224	-	0.0014	0.0107	0.0175
Assessment of Growth performance characteristics (Dec '07-Dec. '08)									
Total Income	*(in %)*	+		0.0020	0.0068	0.0071	-	0.0042	0.0077
Effort Index	*(in %)*	+		0.0132	0.0021	0.0012	0.0060	0.0050	-
Sales	*(in %)*	+		0.0071	-	0.0052	0.0001	0.0024	0.0066
Visitors	*(in %)*	+		0.0031	0.0027	0.0019	0.0030	-	0.0060
Occupancy rate (sq.m.)	*(in %)*	+		0.0007	0.0145	-	0.0003	0.0007	0.0001
Location	*Yield*								
Investment Value		+		0.1139	0.1139	0.1139	0.1139	0.1139	0.1139
PERFORMANCE (in %)				19.6%	15.1%	26.9%	18.0%	15.2%	13.7%

	Spatial *Output*	Financial *Output*	DIFF.
"Ch"	30.21%	19.65%	10.56%
"Mo"	27.34%	15.09%	12.25%
"Av"	26.03%	26.89%	-0.86%
"Am"	27.35%	17.98%	9.37%
"Ag"	29.40%	15.22%	14.18%
"To"	28.03%	13.68%	14.35%



* Performance (in %) calculations are based on identical actions as written in paragraph 5.1 (indicated as Q_j).

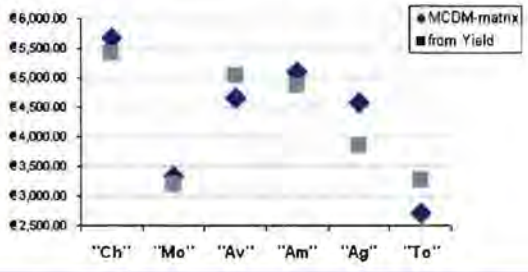
Critical comments in step 4, involves shortcomings to the number of shopping centres under valuation in this thesis. When we have at one's disposal over a larger number of comparable retail properties in Europe, this overview is more reliable for recommendations on investment decision-making. Nevertheless, outcomes from chapter 5 (table 5.5) are based on realistic spatial results, financial figures and accepted theories, and therefore useful for analyzing performance. When management is able tie together these spatial patterns and financial results, this allows comparisons between endogenous from MCDM matrix and financial performance from yield calculations to establish disposition recommendations.

STEP 5 - DISPOSITION DECISION-MAKING: Fundamentals for optimal portfolio strategy explains that a property is sold before it has a negative contribution towards the entire portfolio. This theory is considered from financial train of thoughts, as mentioned in the chapter literature, and in general based on forecasted financial figures. Forecast errors may follow in a certain pattern and variety fields of feasibility studies (market, competitive, design, legal analysis) which act as basis for development and/or investment expectations from a project development, are left out of consideration when a property is on the market. A theory from Brown (ND) gives an

explanation why some running shopping centres are well performing, and others seem to fail in a competitive retail area. So, creating a fictitious competitive benchmark (Multiple Criteria Decision-making matrix) with the most influent indicators for performance of shopping centres (Graph 6.1), could give us a good indication which centres have this essential potential and which seems to fail in the future. Last stage of this research involves an assessment between our measures from chapter five based on spatial complexity and operational figures, and the investment value as most important criterion for disposition decision-making. An overview is given in Table 6.4.

Table 6.4: Comparison analysis of MCDM and Yield measures.

	INVESTMENT VALUE /sq.m		DIFF.	
	MCDM-matrix	from Yield	€/sq.m	in %
"Ch"	€ 5,671.01	€ 5,430.00	€ 241.01	4.44%
"Mo"	€ 3,319.33	€ 3,183.51	€ 135.82	4.27%
"Av"	€ 4,648.98	€ 5,038.39	€ 389.42-	-7.73%
"Am"	€ 5,088.63	€ 4,871.20	€ 217.43	4.46%
"Ag"	€ 4,571.47	€ 3,837.47	€ 734.00	19.13%
"To"	€ 2,703.39	€ 3,270.92	€ 567.52-	-17.35%



Important information arrives from the difference between MCDM and yield investment value. Common sense explains that performing shopping centres satisfies the visitors through a considered tenant mix within a functional and well shaped shopping environment. Followed by the knowledge that potential sales in relation to the rents are seen as a key driver for the extension of rental contracts, and so the contentment from these tenants. Rental incomes are the leading variable in yield calculations and from here we suppose that the difference between the value from MCDM analysis and these Yield calculations tells us if a shopping centre is over- or underperformance. A positive difference means, in this case, that a shopping centre has more potential compared to its rental incomes. The opposite is applicable to negative differences which indicate dissatisfaction in the operational level (visitors and tenants). Critical observations concerning the awareness of these outcomes by investment managers to see rental incomes for yield calculations in context.

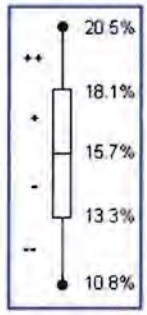
6.3 LET'S TALK BUSINESS NOW!

Let us construct a short, stylized example, based on the fictitious retail portfolio figures as applied in this research. An investor, advised by us, is concerned if the retail investments in his Single-Asset class fund creates potential in the near future. In other words this investor is afraid of losing tenants that could lead to higher vacancy figures and a declining investment value from failing spatial design. Without utilizing the internal rate of return (IRR), this research approach established a proof of concepts for the theory that endogenous characteristics or spatial design possess indication for financial performance of shopping centres. Uncertainty is an important driver of future project value but, what's about to happen, this doesn't affect the flexibility of more or less functionality of access. When analyzing the distributional characteristics from spatial complexity analysis, we assign performance potential to all six shopping centres. Leading for portfolio recommendations is in this case a summery of the results from paragraph 4.4 (Table 6.5).

Table 6.5: Summery of Access complexity and Financial/Quantitative results.

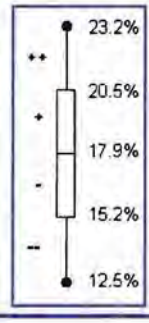
A)

Access Complexity	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Spatial complexity	++	+	-	+	++	+
Shop distribution	++	--	+	--	-	+
Store entrances/Convex Unit	-	++	--	+	+	+
Store entrances/Lineal Unit	-	++	-	+	+	-
Tenant Mix	+	+	+	++	-	--
Rent	+	--	+	++	++	-
Effort Index	-	-	++	++	+	-
Vacancy	++	+	-	--	++	--
Overall Scores	++	+	-	+	++	--
Contribution	19.3%	16.9%	14.5%	18.1%	20.5%	10.8%



B)

Financial & Quantitative		"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Benchmark	*Matrix*	10.5%	6.0%	18.8%	10.5%	7.5%	5.1%
	Score	+	-	++	+	-	--
Growth performance	*Matrix*	9.4%	10.0%	9.6%	9.4%	10.0%	8.1%
	Score	+	++	+	+	++	-
Quantitative assessment	*Matrix*	4.4%	4.4%	3.4%	2.8%	3.0%	3.9%
	Score	++	++	+	--	-	+
Overall Scores		+	-	++	-	-	--
Contribution		17.8%	14.9%	23.2%	16.6%	15.0%	12.5%



C)

Performance Analyse	"Ch"	"Mo"	"Av"	"Am"	"Ag"	"To"
Deviation (Yield vs. MCDM results)	4.4%	4.3%	-7.7%	4.5%	19.1%	-17.4%

A) Results representing outcomes from paragraph 4.4.

B) The percentages in table B are a result of calculations from the MCDM approach (Table 5.3) based on connected figures per criteria group.

C) Results are derived from Table 5.6.

This overview is the result of a simple comparison analyse per main criteria. The highest measure represents ++, and the lowest figure --. The difference between the highest and lowest figure divided by four leads to four quartiles as shown in the right figure. Per criteria, all figures are assigned to one of the four quartiles to find the performance per shopping centre. Overall score is the average score of all the criteria from Access complexity, as well as Financial and Quantitative results. The percentages in table B indicate the performance contribution per sub-group, and calculations ensue from the same MCDM formulas as shown in paragraph 5.1.

The design and complexity summery reveals that two properties ('Ch' and 'Ag') are able to achieve a spatial agreement within our hurdle quartile rate of ++. Nevertheless, we are aware of the negative criteria that are compliant in the future. Spatial complexity, Shop distribution and relation Store entrances/units are fixed and not mutable, for example shortcomings on tenant mix, rent and effort index are capable of improvement in the future by active asset management. Speaking of failing shopping centres, we conclude from this overview that property 'To' and 'Av' shows serious shortcomings on spatial performance. Even though this information does not give us an immediate go-ahead, it helps us weight the spatial risks and opportunities in a much more observable manner. Next, a summery per shopping centre based on spatial complexity, financial and quantitative assessment, helps us to indicate potentials and/or risk for all the centres.

Finally, we need to translate these observations into recommendations on disposition decision-making to answer our final research question.

Property "Ch" with his 10 convex network levels, mostly located in the lower levels and shops located nearby centre entrances, distinguish itself through functional and well-ordered layouts. People experience this centre as very interconnected and easy go through which is in accordance with a low access complexity measure and the lack of intervening spaces in the building. Most anchor tenants are located in the lower spatial levels which frustrate pedestrian streams with the exception of a dominant restaurant is located in spatial level 8. Rents in the centre are showing in accordance with the theory a decreasing pattern as spatial levels increase. Because of the Primary centre location, higher rents are applicable to this type of shopping centre which suppresses the relation rent and sales. In general, this centre shows a declining average effort index over the number of spatial levels which indicates satisfaction under tenants in the lower levels. No alarming effort index variety is measured within the different spatial levels, and there are no vacant units in the centre.
Financial outcomes from our benchmark support the positive results from access complexity theory. Property 'Ch' scores in the MCDM-matrix with most of the variables far above the average. Positive contribution came from rental figures, vacancy rate, footfall per sq.m/GLA, area of influence, and growth potential on effort index (+12.5%). Critical variables are the relatively low effort index, sales per visitor and the high transferring ratio. Final conclusion, this shopping centre performs +8.47% (Table 5.5) above average and +4.4% above its own investment value.

Property 'Mo' shows serious shortcomings on weighted average. Convex as well as lineal units are to a large extent located in the higher spatial levels in the centre, which results into a high complexity measure. Access problems are a result of the constructional and/or intervening barriers in the shopping area and give visitor a disordered experience. This is partly intercepted by the high score on shop entrance/convex and lineal unit ratio. This measure explains the awareness in a shopping centre and improves the sense of direction from space to another space. Another problem involves the highest entrance complexity of all properties, yet all anchor tenants except one are located in the higher levels which stimulate pedestrian streams. Property 'Mo' seems to fail on rent complexity because lower rents are paid in the lower levels although the opposite is intended. This observation is also recoverable in the effort index scores, and is manageable in the future. Attention to this determination is required to prevent a higher vacancy rate in the higher spatial levels.
The MCDM matrix results from benchmark perspective shows low figures to and rent incomes sales per sq.m/GLA. Furthermore, the relation GLA/Total area (49%) gives not a proof of effective floor plans but more frightening are the declining sales figures over the last year. This could be a sign of dissatisfaction under tenants when this becomes a tendency, and with an improved occupancy rate of +37.2% this decline isn't ascribable to vacancy in the centre. In the end, with a negative performance of -6.81% on averages in the benchmark, this shopping centre performs +4.3 above its own investment value.

Property 'Av', with a relative access complexity figure of 44.52, seems to fail on functionality and environmental design. Analyzing the floor plans in detail, this failing is above all the result of failing vertical lineal units. The floor plans self shows a minimum of intervening spaces and a well-ordered walking pattern make sure that visitors experience a pleasant shopping environment. Shop entrance complexity calculations give a proof that this shopping centre performs above average in this benchmark. We found a positive structure of store size variety, and most of the dominant anchor tenants are located in the higher spatial levels. Risky is the loss of potential from a stand alone anchor tenant which is not situated nearby this shopping centre. Negative remark involves the rental theories as mentioned in prior chapters. For this centre we couldn't find a strong declining rental line as spatial become higher. On the other hand, results from analyzing the effort index in the different spatial levels shows an effective and structured tenant mix. There is only vacancy in level 11 which could indicate a lower satisfaction under tenants in the higher spatial level.
In contrast with the spatial complexity, this shopping centre represents the best performing centre in the benchmark from financial and quantitative figures. First analyzing sales per sq.m/GLA that is +36.6% above average and a low transferring ratio (number of shops changing from tenant) satisfaction under tenants might be secured. Nevertheless, figures from effort index (-3.1%) and a disturbing increase of vacant units tells us the opposite and the possession of this shopping centre in portfolio is considered. Last indicator as a result of the applied MCDM-matrix is the percentage deviance on investment value. Table 6.5C shows this shopping centre is -7.7% under performance according to our yield calculation and from table 5.5 we see that on average this figure is -6.81%.

Property 'Am' is by far the most sizable centre in portfolio. With his high relative access complexity of 39.13 and Shop entrances Weighted Average of 7.86, this centre is situated in the backfield of our benchmark. We ascribe this failing to the high number of intervening spaces in the higher spatial levels, resulting in a high Weighted Average because of an increase of essential steps before reaching a destination in the centre. Furthermore, this high WA led to disorderly experience by visitors. Positive in this shopping centre are the observations on Tenant mix. There is a clear pattern perceptible for restaurants that are only located in the higher spatial levels, and branches like fashion, accessory and selective goods, which depend on high density pedestrian streams are mainly located in the lower spatial levels. Because of the sizable number of shops per spatial level, sometimes over 20 stores, we couldn't find a real pattern of shop size diversity. Anchors, as well as smaller shops are located in all the spatial levels. Positive observation is the strong declining rental line when spatial levels become higher and the relatively low effort index per level except for level 15. To prevent vacancy in this spatial level management need to determine if the rent now paid at this level correspond with the location in the centre.
Positive results arise from our MCDM matrix. Sales figure per sq.m. as well as per visitor gives us a good indication this shopping centre is performing well, in spite of the fact that these figures are lower than last year. Satisfaction under tenants is also secured with a constructive effort index which increased with +6.3%. Remarkable is, in contrast with sales figures, the number of vacant units and a possible tendency based on negative growth prospect (-1.1%). This is followed by a high transferring ratio where 14.5% of all shops have switched from tenant. Overall this shopping centre performs +5.48% above the benchmark average, which is committed to good financial and quantitative figures in the MCDM matrix. Compared to his investment value, this

shopping centre is performing +4.5% better and proofs based on growth figures over the last year that is has potential even though the disappointing access complexity figures.

Property 'Ag' is the best performing shopping centre in this benchmark, which is not astonishing when analyzing the interconnected floor plans. The low number of convex and lineal units is a result of the prevention of intervening areas, and above all these units are mainly located in the lower spatial levels. The shop entrance Weighted Average is, in relation with other spatial results, higher. The property is characterized by a high density of smaller shops in the highest four spatial levels. This leads to failing pedestrian streams in the centre and has a negative contribution to the endogenous performance. Same as property 'Am', this centre shows a declining rental line when spatial levels become higher and complexity increase. The effort index line is equal to our most ideal trend line and doesn't show deviation between the different spatial levels which indicates a structured and organized rent/sales relation for his tenants. There are no vacant units in the shopping centre.
Positive contributions to the endogenous value of this centre are the effort index with a decrease of 5.4% over the last year and a vacancy rate of 0.0%. Considering the number of branch types in relation with the GLA and a good correlation between rent and unit size proofs this retail property is effective and could have a serious potential in the future. Negative are the sales, rent and effort index figures in the benchmark, which suggests that all financial input is under average and forms a depressing picture. Overall score from MCDM approach explains that this centre performs +2.91% above average. Most outstanding is the value from MCDM analysis that implies an over-performance of +19.1% from investment value, and makes this centre an interesting investment object. This is a result of lower rent per sq.m. tenants are paying in this shopping centre which restricts the investment value from yield calculations.

Property 'To' is criticized as a failing shopping centre from access complexity viewpoint as from financial way of thinking. Although access complexity shows average figures in out benchmark, problems involves with rent, tenant mix and effort index observations. Positive is the low number of intervening spaces resulting and a good performance on Shop Entrance Weighted Average. Complexity reveals from vertical lineal units who are located in the remote corners of the centre and from tight spatial areas and an enclosed structure of shopping ways. Nevertheless most of the shop entrances are easy to reach with a minimum of steps. Failing is the result of, on one side complex walking patterns and on the other side inefficiency of constructing the space. Next, anchor tenants are situated in the lower levels and influence pedestrian streams negatively. Tenants like fashion, accessory and selective goods branches how are dependent of these streams are subsequently located in the higher spatial levels. Besides failing tenant mix, this centre gives no unambiguous segmentation on rents from spatial network thoughts. The effort index in the higher spatial levels shows potential of deterioration for vacancy rate in the centre because of displeasure under tenants. This observation is confirmed by the negative growth of occupancy rate in the MCDM matrix over the last year.
Results from the MCDM matrix reflect a negative contribution to the benchmark for most of the involved variables. Rent and sales have respectively -29.5% and -34.9% negative influences on average. Also the 8.99% vacancy rate is alarming and is strengthening by a negative occupancy rate of -1.7%. A positive observation from the matrix is the improvement of number of visitors that is increased with +10.3%. But, sales figures per visitor are lowest in the benchmark so this

gives us no proof op future potential. This retail property performs -12.98% under benchmark average, and compared to his investment value an endogenous performance of -17.4%. Disposition of this property is recommended because this shopping centre shows a negative contribution to the benchmark, but more important is the difference between the investment value which is higher than the endogenous value.

Table 6.5 is consequential and has an influence on centre management decision in the future by recognizing the failing patterns from negative contributions in the benchmark how are manageable. Summarizing the simulation approach, we will recommend the investor to purchase property 'To' immediately. Furthermore, enhance the access of property 'Av' from preventing the sizable number of intervening spatial areas and improve the effectiveness of centre management from rental and tenant mix viewpoint.

CHAPTER 7 CONCLUSIONS

In this thesis we established a proof of concepts that shopping centres possess endogenous performance potential when they are competitive in a retail market. Uncertainty from forecasted criteria is an important driver of future value and creating flexibility in interpretations with this financial economics approach. Subsequently, these financial models experience another basic shortcoming; there is no focus on access complexity that's improves the performance of a shopping centre now and in the future. These comments have been researched in the previous chapters and provided information about design, functionality, endogenous characteristics and valuation and on the way these could be combined to determine the shopping centre performance in aid of disposition decision-making. This chapter will discuss the final conclusions and recommendations for this thesis in order to provide answers to the research questions.

7.1 CONCLUSIONS

Financial approaches fails to notice satisfaction under retailers and visitors by focussing on investor motives, in contradistinction to the feasibility studies in the preliminary stage of a shopping centre development. Endogenous characteristics of a shopping center gives to a certain extent no explanation if a shopping center is an outstanding investment in financial terms, but provide an investor insight in difference in investment quality. This brings us to the first question of this research; 'What are the main characteristics of a shopping centre that leads to uncertainty of endogenous performance of an individual retail property?' The studies discussed in chapter two also struggle in trying to make the retail market more transparent. This is not a strange phenomenon, because the different research fields consider performance in a different context which results in innumerable characteristics. When we are able to see tenants and visitors as main stakeholders of an operating shopping center (as done in the preliminary stage), we could identify retail patterns and operational influences appear. First, attractive shopping centres are related with on the one hand the quality of the in-house *tenant mix* and subsequently with the *spatial environment* or *design* and *competition*. Second, housing strategies for retailers are in general based on the relation between *sales* potentials in a shopping area and the *rent* they have to pay for a unit in a centre (measured as *effort index*). The value of a retail property is directly related to the anticipated effectiveness of the property. Not the rental income from tenants are normative for performance, but understanding consumer shopping pattern impacts retail property rents and therefore the value. We may conclude that a shopping centre is seen as accumulation of individual shops from visitor's viewpoint and every shop is connected with a spatial area in the centre from tenant perspective. With this knowledge, endogenous performance comprehends influences as tenant mix, effort Index, rent, sales and vacancy, seen from independent spatial areas to measure satisfaction under stakeholders.

The second research question, 'What is the shape of the spatial effects and which process is essential to contribute spatial performance figures?' explains the approach behind the theory of tenants and visitors shaping the value of a shopping centre. This analysis implies a field

experiment that shows, through the interior spatial layout, how access complexity in relation with individual shops affect their functionality and consumer friendliness. This research made use of network modelling approach to compare the access networks of the common public space of six enclosed shopping centres, and next identified how the complexity of the access network related to indicators of physical environments. This approach enables investors to focus on specific characteristics from every location in a shopping center. Intuitively some general trends for the construction of an attractive or failing shopping center can be identified. Disposition decisions involve these failing patterns in the shopping system of a centre. First failing observation has to do with spatial network modelling, which is seen as a guideline of choices a visitor has to consider before reaching a definite location in a shopping center. This networks starts from the access origin (or centre entrance) and ends with the most secluded spatial area. Higher spatial levels go with a higher access complexity and are lesser interconnected with the shopping system. Investors need to recognize these observations before dissatisfaction under tenants appear. Not only rents as a result of the position of a shop in the network should attract attention, also the branch type has to be considered. Normatively, the closer a shop entrance is situated to the first spatial area or access origin the more attraction it has on visitors and subsequently the higher the rent. Furthermore, anchor tenant are attractive retailers who are independent to the location in a shopping centre. Further research should investigate if anchors tenant locations have the same attractiveness as the access origin (spatial level one). This could indicate that there are more spatial starting points or access origins next to the entrance. This is a logical argumentation, because most of the visitors enter this anchor tenant unit like they enter the first spatial level (centre entrance). Although declining footfall figures doesn't indisputable ends in a reduction of sales figures, some branches are weighted down by less interconnected spatial areas. Mainly the fashion, accessory and selective good retailers benefit from prominent locations. An investor should recognize these failings which might lead in the long run into vacancy. Last part of shaping spatial effects involves the effort index as a satisfaction ratio for retailers. Rents should, beside the type and size of a unit, be connected with the spatial level. Higher rents on lesser attractive locations leads to structural vacancy problems in the future, which influence not only the operational but in particular the financial performance. Final results from spatial network approach show that two shopping centres failing on access complexity and disposition is considered.
Two settled calculations (access and unit entrance complexity) involves this research and gives investors an indisputable proof of endogenous performance. Nevertheless, other patterns as effort index, tenant mix, rent and vacancy don't make use of these fixed performance related calculations, although they are to a certain extent connected with spatial network approach. A weighted average calculation for these financial variables isn't applicable by the lack of missing indicators as links and connections as an input for these calculations. Further research should concentrate on making these criteria measurable. Yet, these results give a good indication of spatial performance by recognizing and understanding shopping patterns, yet it's still based on observation and interpretations of an investor.

Now we know the shape of access complexity from spatial networks, last question remains: 'How can we shape the spatial components to contribute future disposition decision-making for a retail investment fund?' Therefore we make use of a Multiple Criteria Decision-making (MCDM) matrix. The essence of the method of MCDM is estimating the real estate value, based on endogenous as

well as exogenous criteria. Because of the shortcoming of market/exogenous criteria in this approach an investor should interpret these results carefully. The purpose of this matrix is not to establish a realistic disposal value of a shopping centre based on financial indicators, but this approach gives an indication of the endogenous performance from visitor and tenant's perspective. Furthermore, it's impossible to compare shopping centres locations and related criteria because of the diversity in the retail market. In other words, this research enables an investor insight in the endogenous and/or spatial performance from centre management viewpoint and satisfaction under stakeholders related to this centre. Comparing the outcomes from financial performance based on yield calculations or IRR with our expectations from prior spatial research, results offer an investor foundation for considered disposition decision-making.

This approach provides an investor a realistic picture of the actual reality of different shopping centres in portfolio, and anticipates on potential of future failings. We have proven that endogenous performance from spatial network analysis to a certain extent influence the financial performance. Although the number of shopping centres involved in this research is inadequate for statistical approaches, observations and figures gives us an expiation why it's that important to focus on access complexity.

7.2 GENERAL RECOMMENDATIONS

Primary purpose of this work was to find an indication for the presence of access complexity theories in the disposition decision-making process. If an investment manager believes there are valuable endogenous criteria concerning the functionality of a design and/or endogenous performance from spatial network observations, standard investment theories like IRR models are incomplete and fail on effectiveness to measure visitors and tenant satisfaction. However, these financial models are leading during investment decisions; they are based on data predictions and uncertainties and don't consider endogenous performance observations for spatial patterns and design in the shopping centre. The intention of this paper is not to establish a proof that IRR models are inadequate but shows shortcomings to this approach. Interpretations from decisive factors of performance for this type of real estate are lacking. We have to be conscious that both investment approaches gives us valuable, but one-sided, information how a shopping centre is performing. Therefore we recommend investment managers to look more extensive to access complexity and endogenous criteria, next to traditional NPV or IRR calculations. These measures are important for tenants in housing considerations. With the technique of comparison simulations associated with access theories, one can generate shapes of potential performance for the future and recognize fails on tenant mix, rent level or sales figures. In the concept phase of a development, such approaches have been well established in the field of risk management and in feasibly studies but after completion managers have only an eye for financials expectations. Our basis model layout is very similar to comparison analyses currently used by appraisers to determine selling price of office buildings and houses. As mentioned in a previous stage in this research, the value indicates a shape of performance expressed in a value which can't be seen as a realistic selling price. Nevertheless, important information arises from comparing the real selling price and the value as a result of the theory as written in this thesis. Sizable differences suggest there is a clear contradiction between financial and endogenous performance. Finally, attention to access complexity is required in these to prevent your portfolio for failing shopping centres.

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www.footfall.com
www.IPD.com

APPENDICES

Appendix 1:Branch mix

D

Group 1	Department Store	Colour Code Red
	Department Store	
	Theme Store (1000 sqm <)	

Hy

Group 2	Hypermarket	Colour Code Yellow
	Hypermarket	

R

Group 3	Restaurants	Colour Code Purple
	Restaurants Bars & Cafes	
	Fastfood	
	Kiosk coffee- / Fruit juice shop	
	Dairy foods / Ice cream shop	

E

Group 4	Electronics	Colour Code Light Blue
	Telecommunications	
	Electrical & Computer Goods	

F

Group 5	Fashion	Colour Code Dark Blue
	Male Fashion	
	Female Fashion	
	Childrens Fashion	
	Unisex Fashion	
	Value/Discount Fashion	
	Lingerie	

A

Group 6	Accessories	Colour Code Grey
	Shoes	
	Leather Goods	
	Jeweler's Store	
	Ties	

S

Group 7	Selective Goods	Colour Code Dark Green
	Perfumery	
	Natural Cosmetics	
	Gift Shop	
	Sport Goods	
	Crafts Hobbies & Toys	
	Music and Video	
	Books, Cards & Stationery	
	Pets & Accessories	
	Antiques & Art	
	Travel Accessories	
	Themed Store	

Hh

Group 8	Houshold Goods	Colour Code Green
	Soft Furnishing	
	Decoration	
	Light Fixtures	
	Pictures & Frames	
	Crystalware	
	Linen	

P

Group 9	Provision of Services	Colour Code Orange
	Pharmacy / Drugstore	
	Hairdresser	
	Opticians	
	Hairdresser	
	Key / Shoe repair	
	Copies	
	Quick Photo Development	
	Florist	
	Dry Cleaning	
	Services – Financial	
	Travel Agency	
	Press Centre	
	Tabacconist	

D

Group 10	DIY	[illegible]
	Do it yourself store	

L

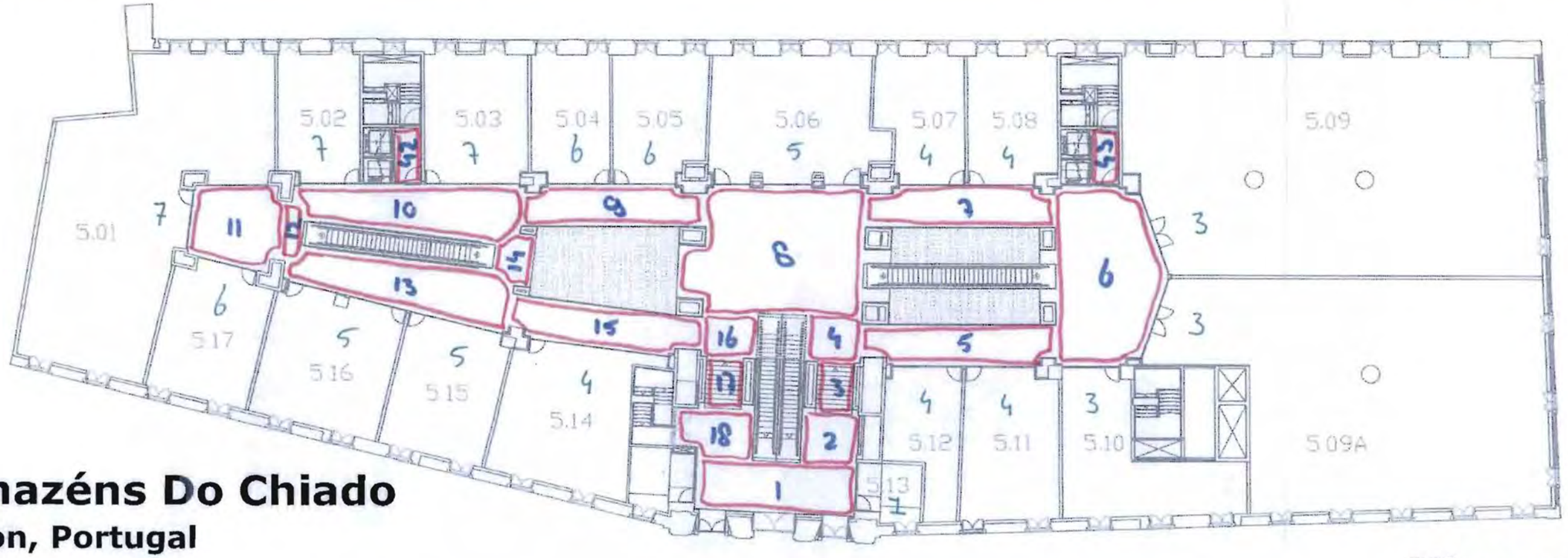
Group 11	Leisure	Colour Code Pink
	Fitness/health club/spa	
	Parlour	

M

Group 12	Miscellaneous	Colour Dark Grey
	Non-Supermarket Food Retailer	
	Delicatessen	

Appendix 2: Spatial Layouts

Shopping Centers:



Armazéns Do Chiado

Lisbon, Portugal

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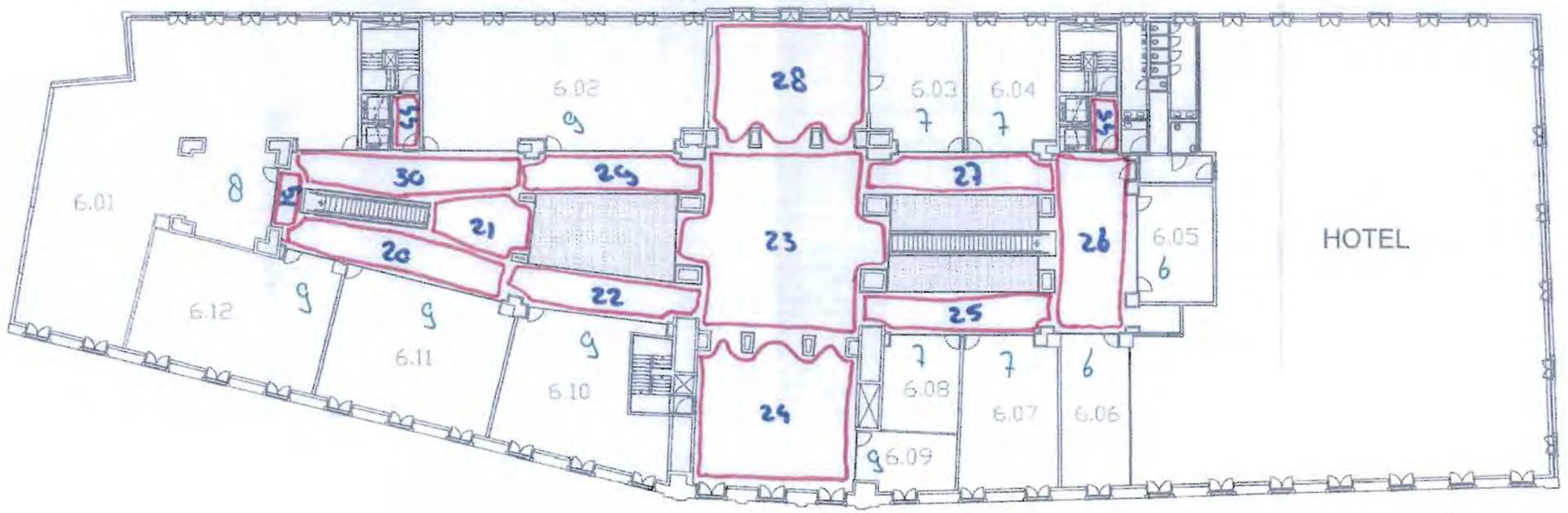

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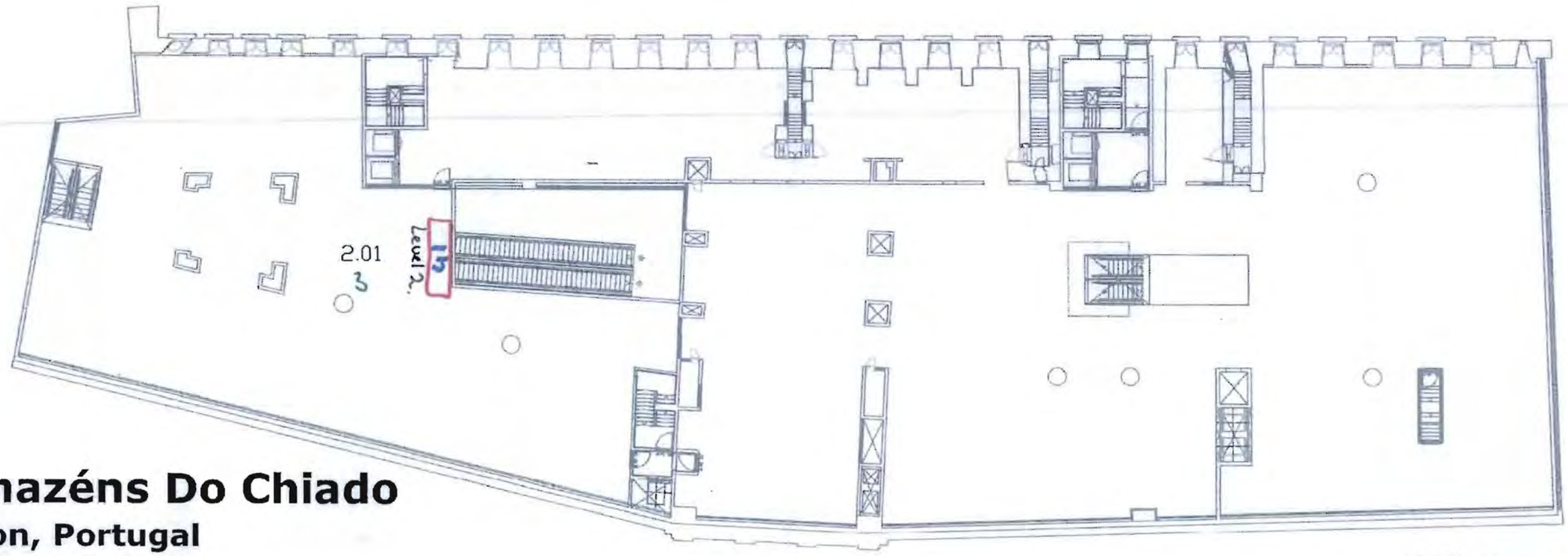

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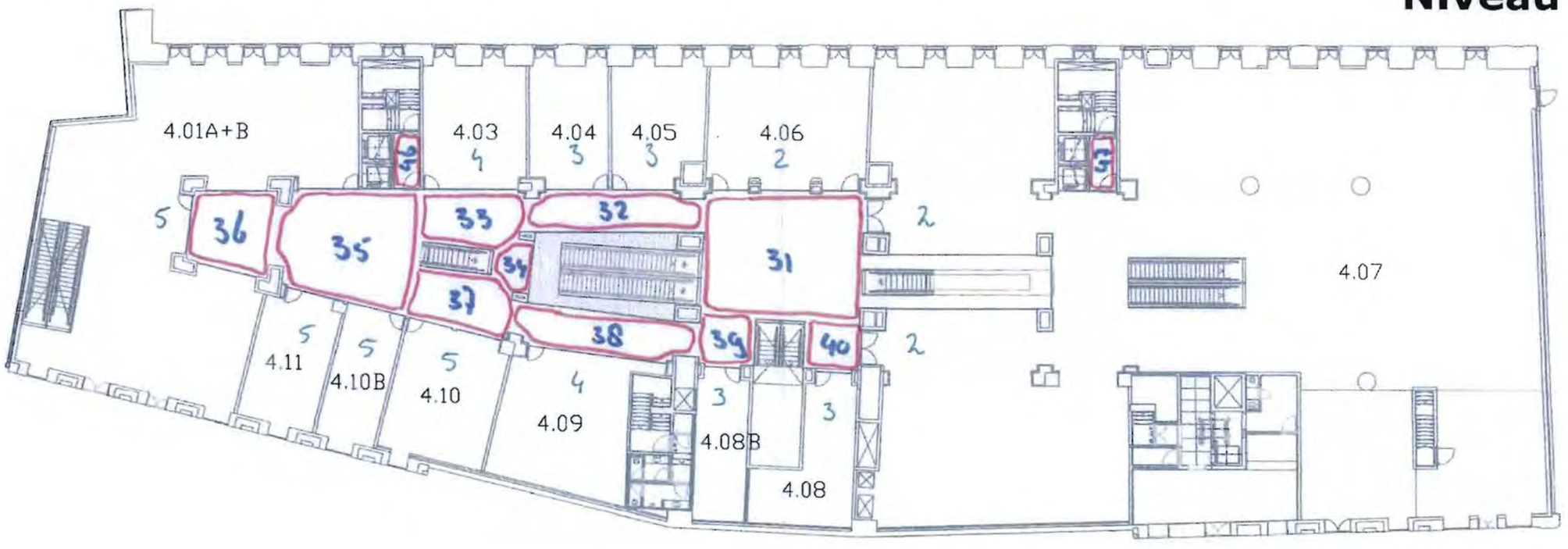

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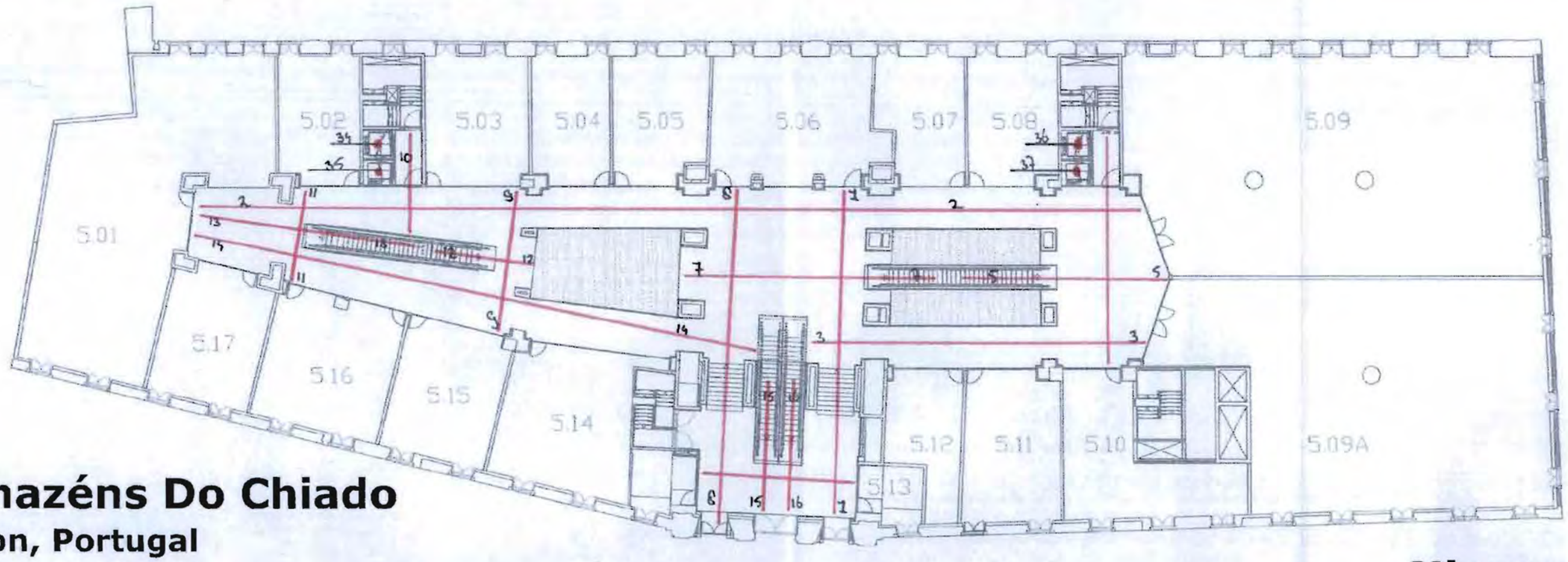

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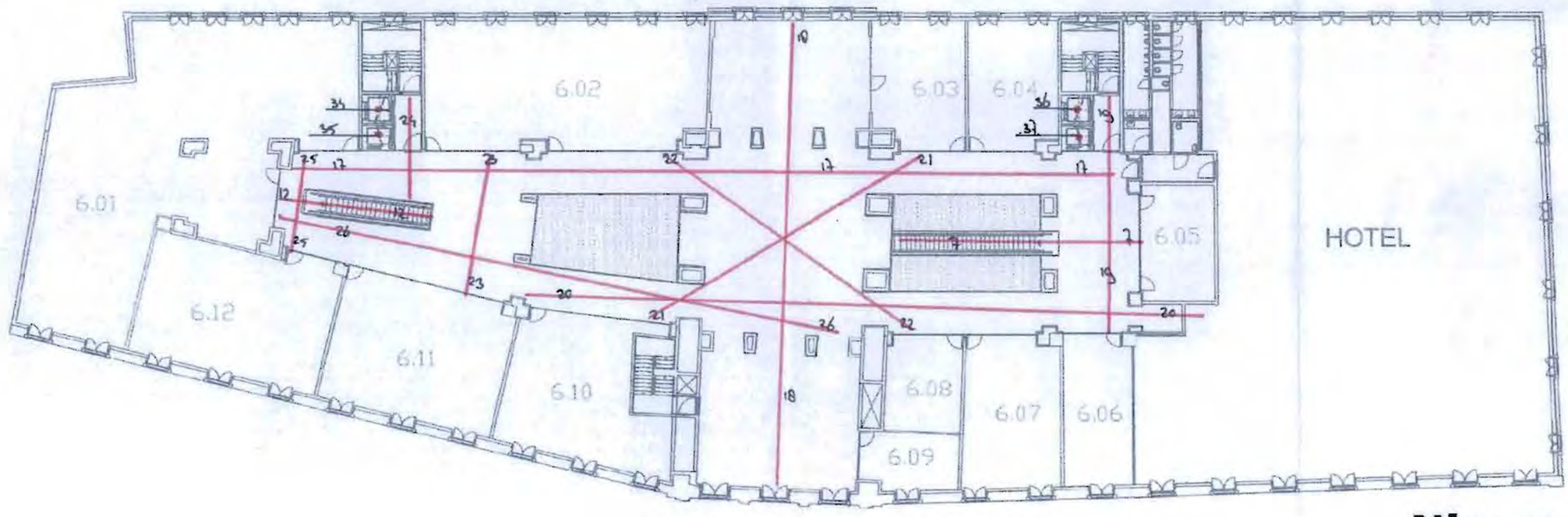

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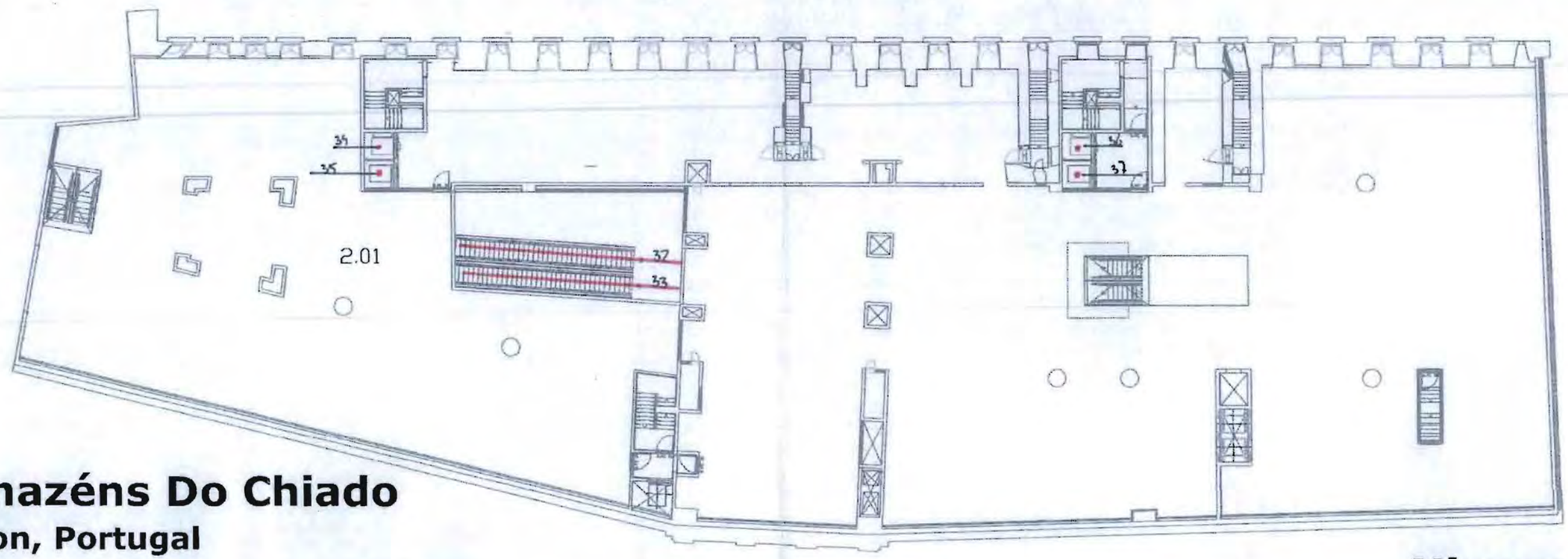

Armazéns Do Chiado
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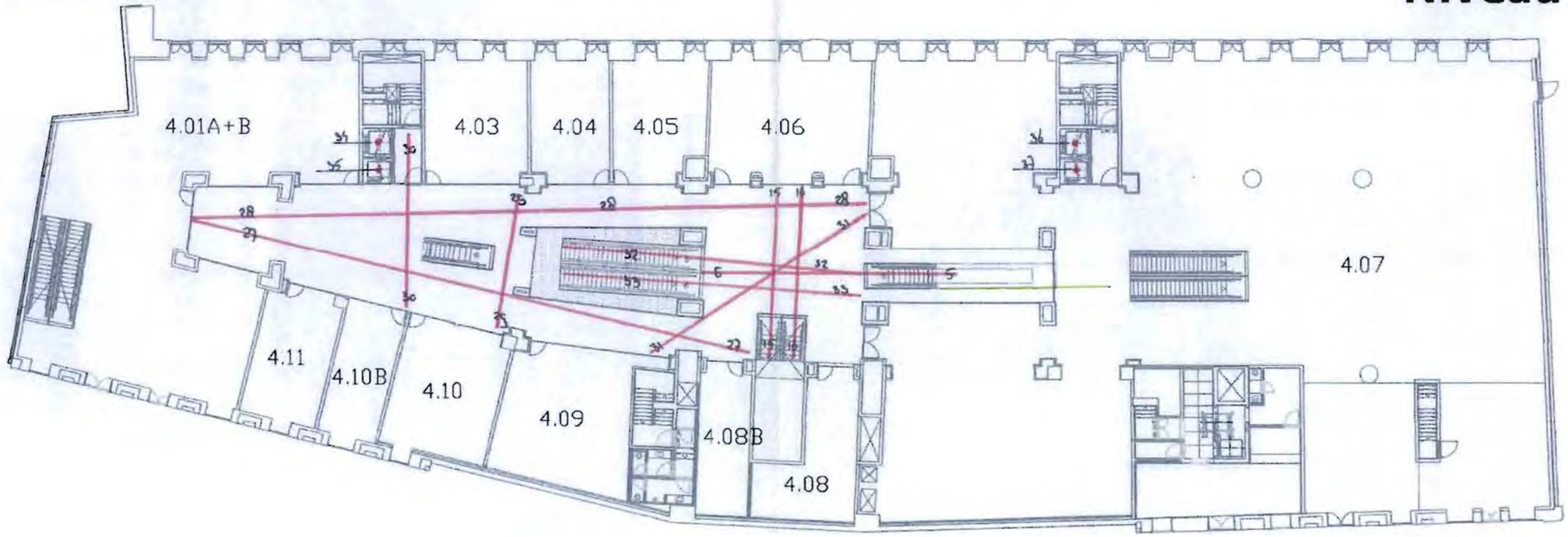

Niveau 4

Forum Montijo

Lisbon, Portugal

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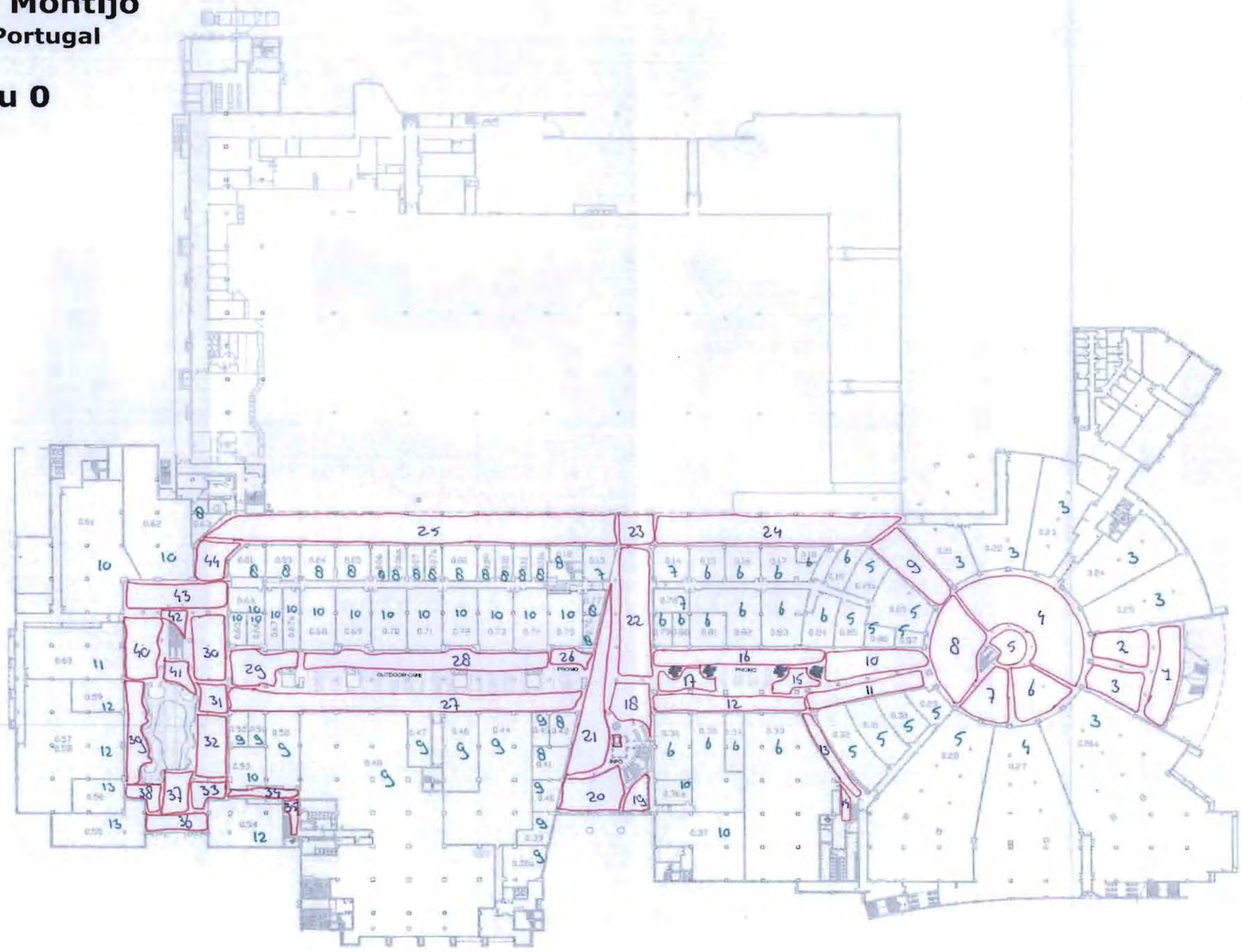

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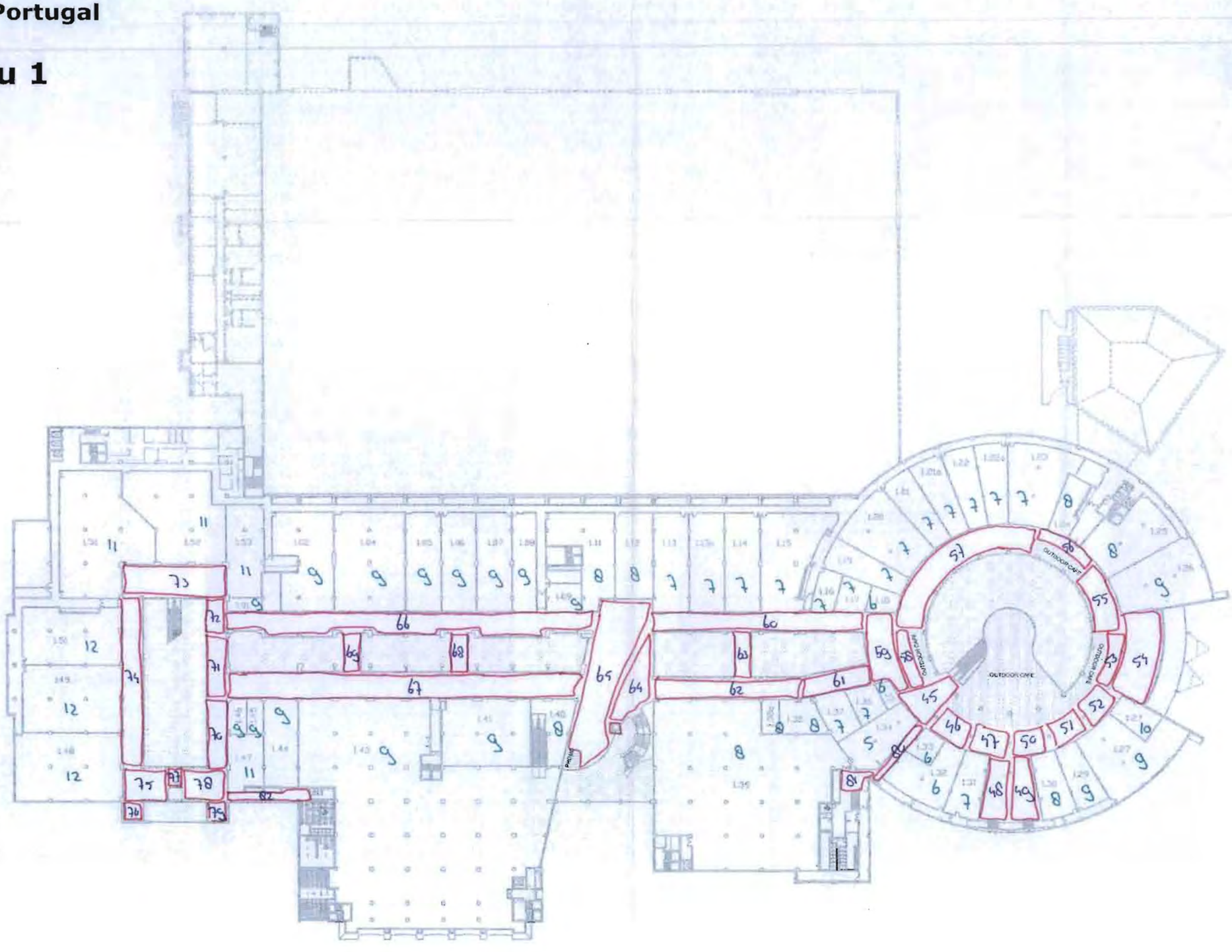

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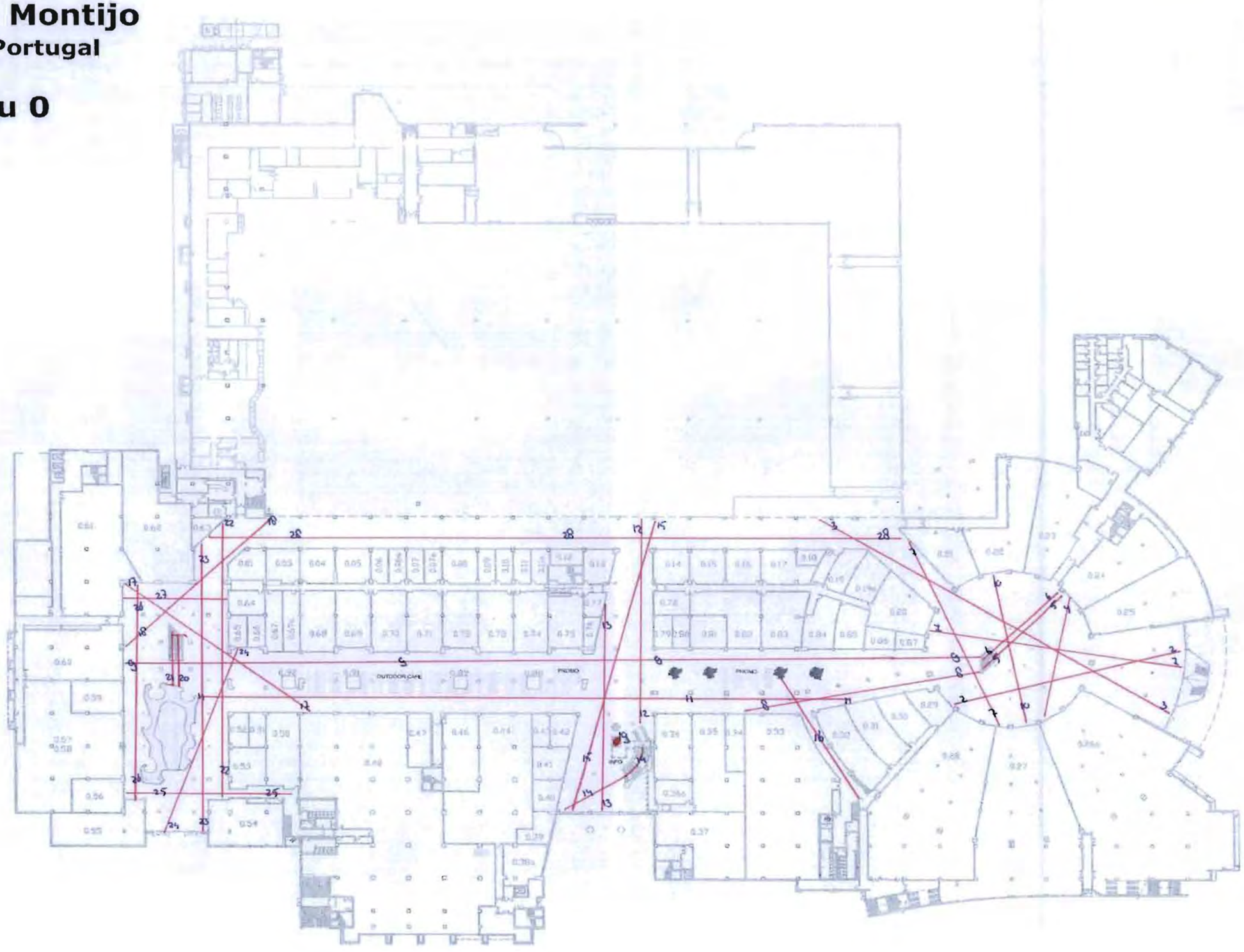

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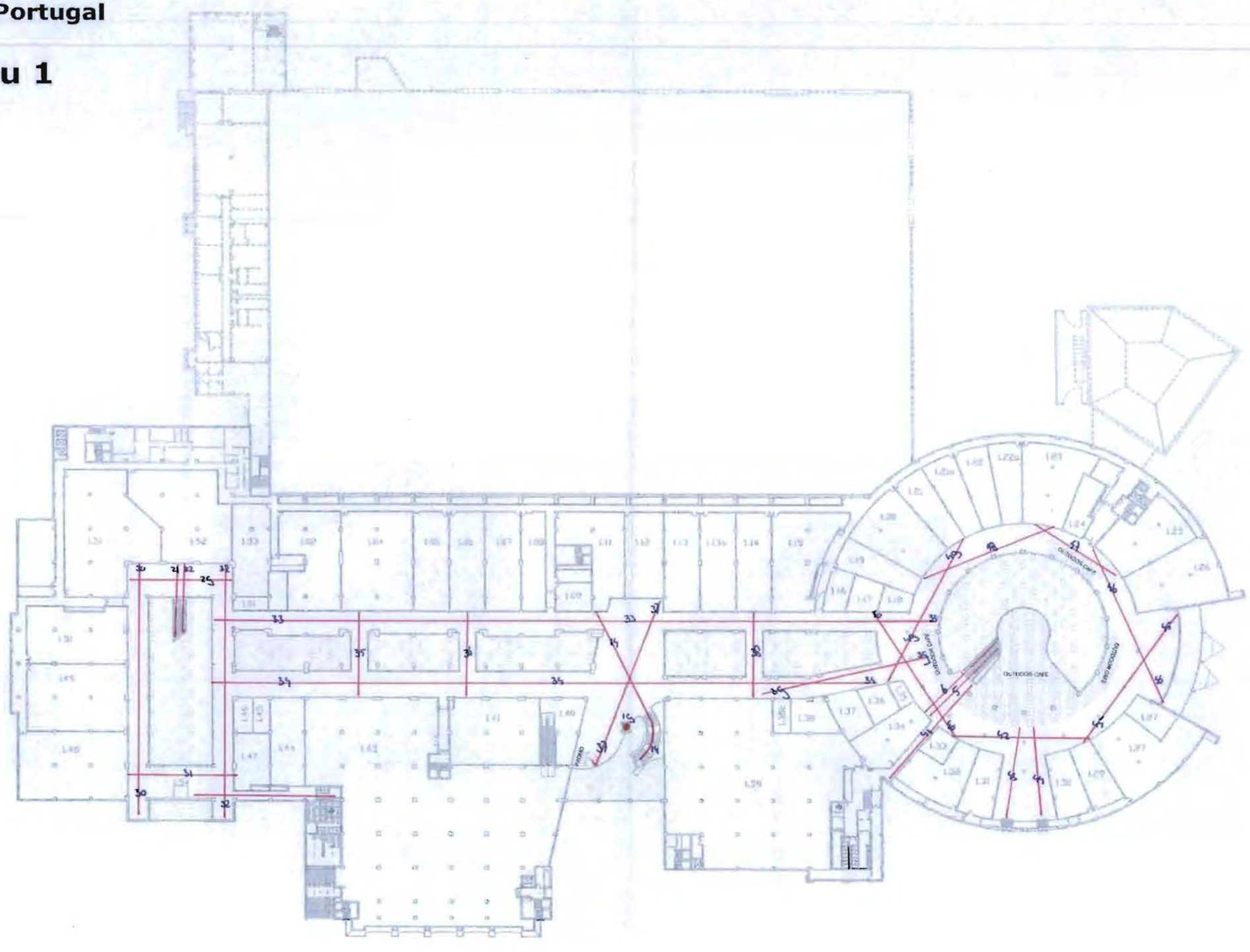

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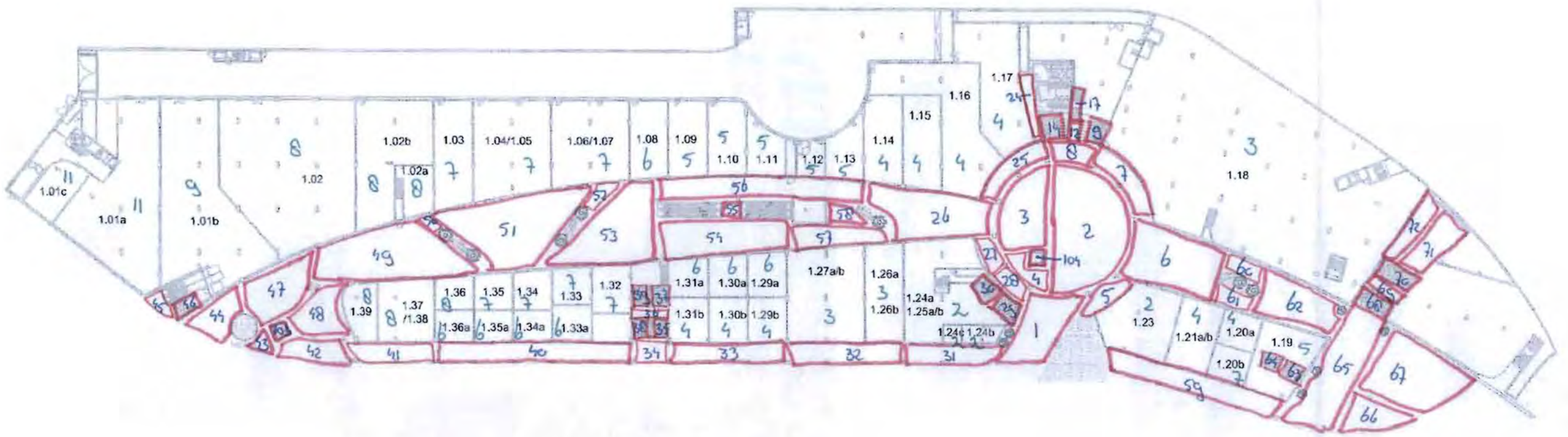
Lisbon, Portugal



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Forum Almada

Lisbon, Portugal

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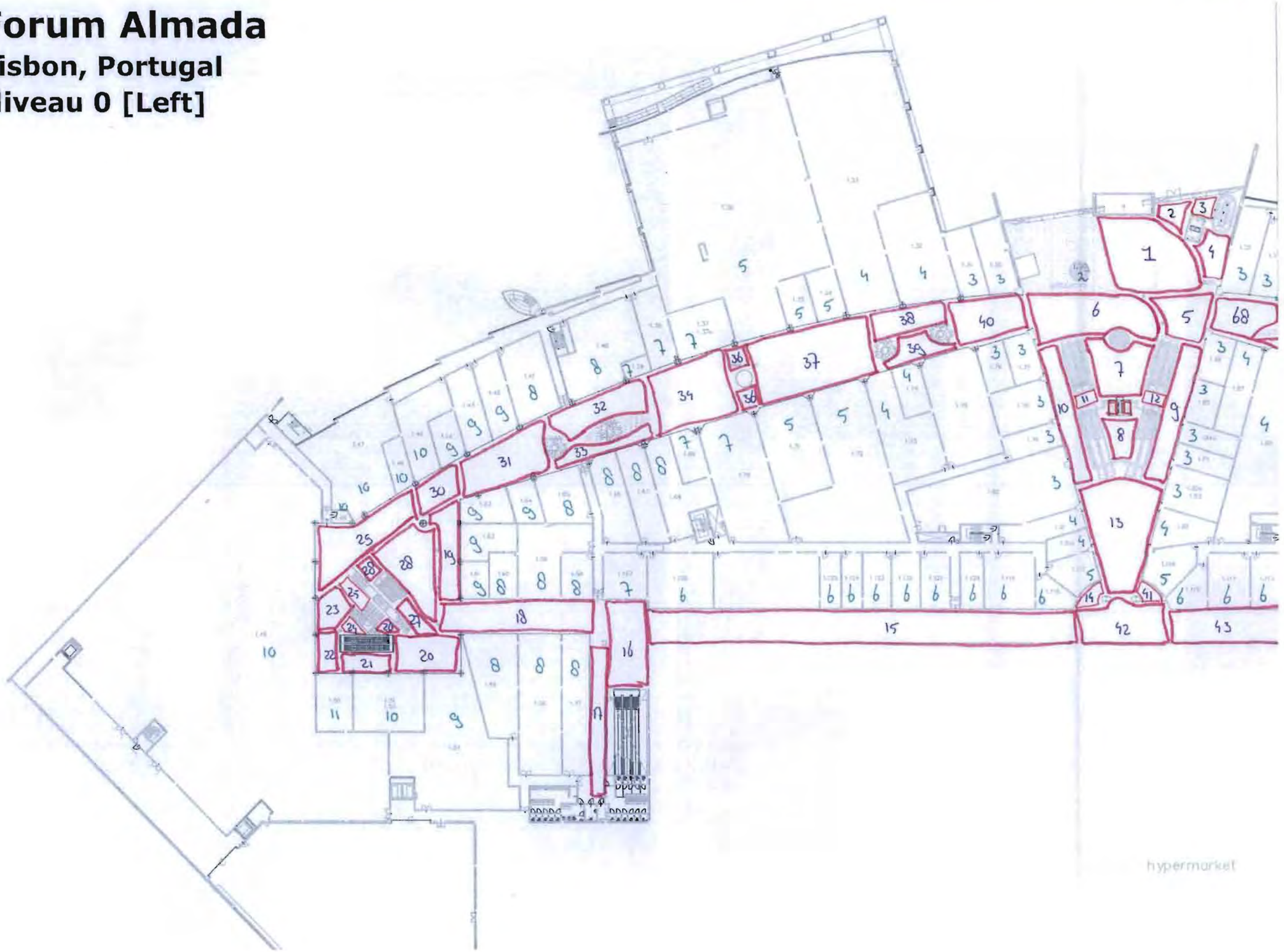

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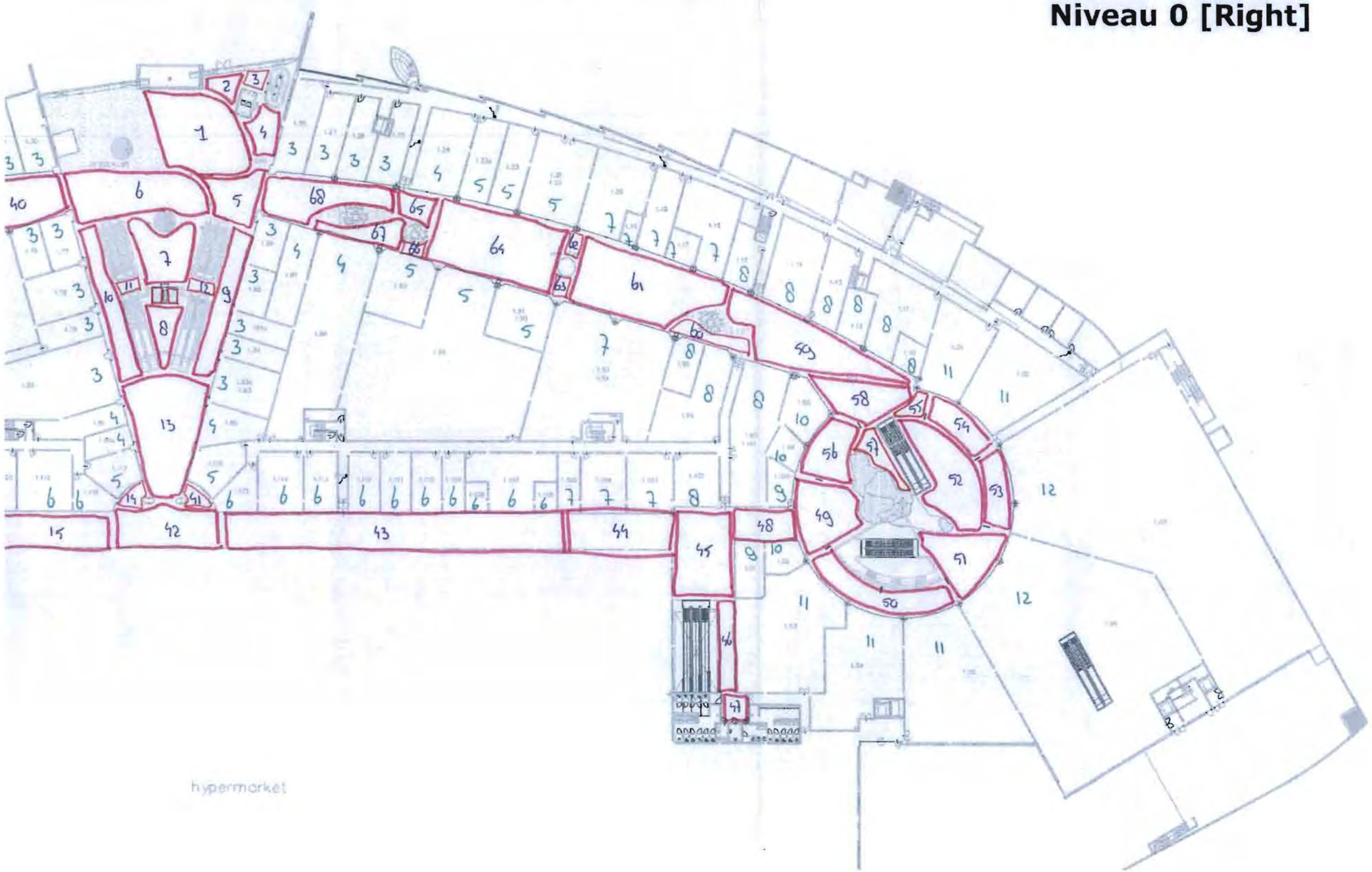

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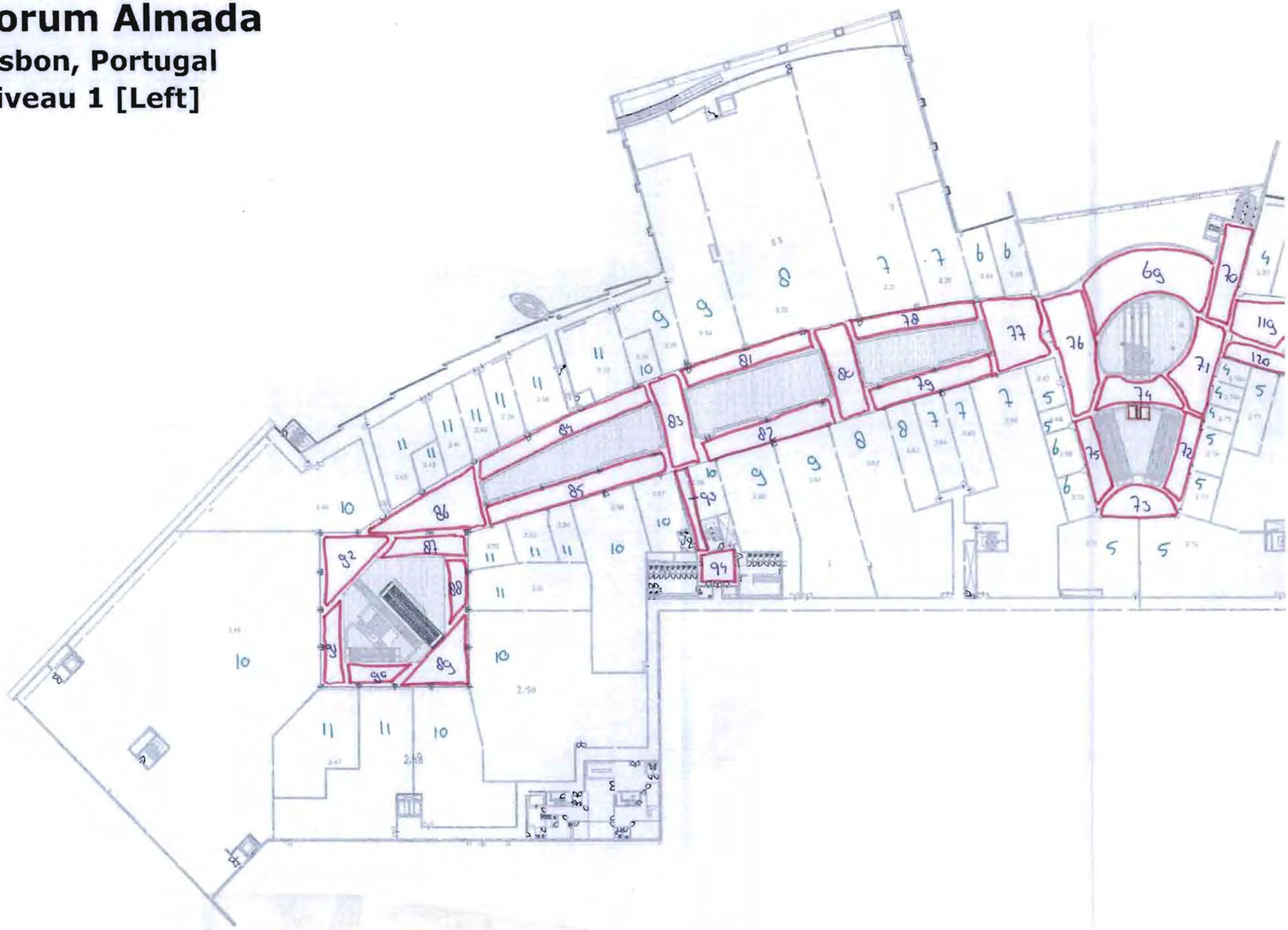

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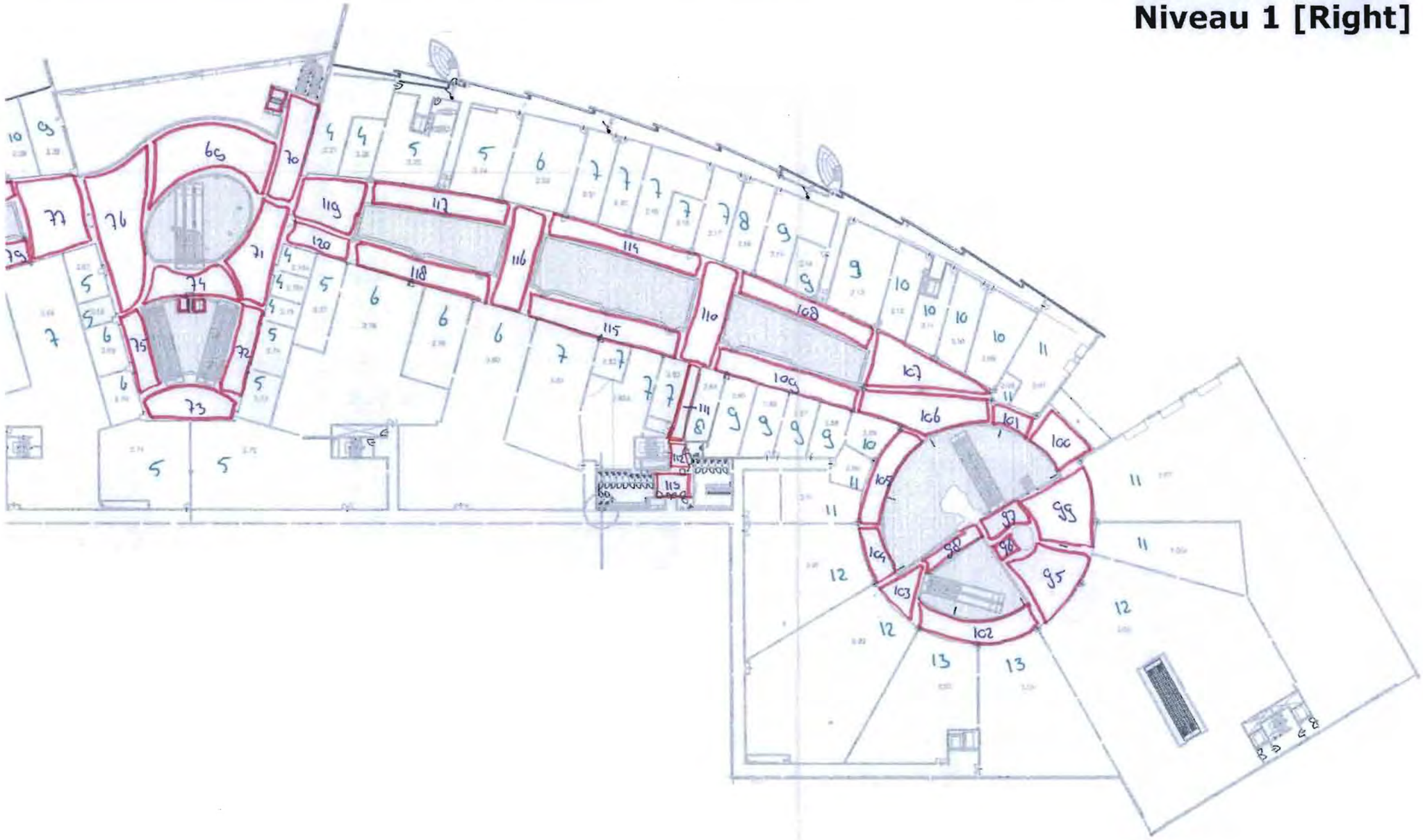

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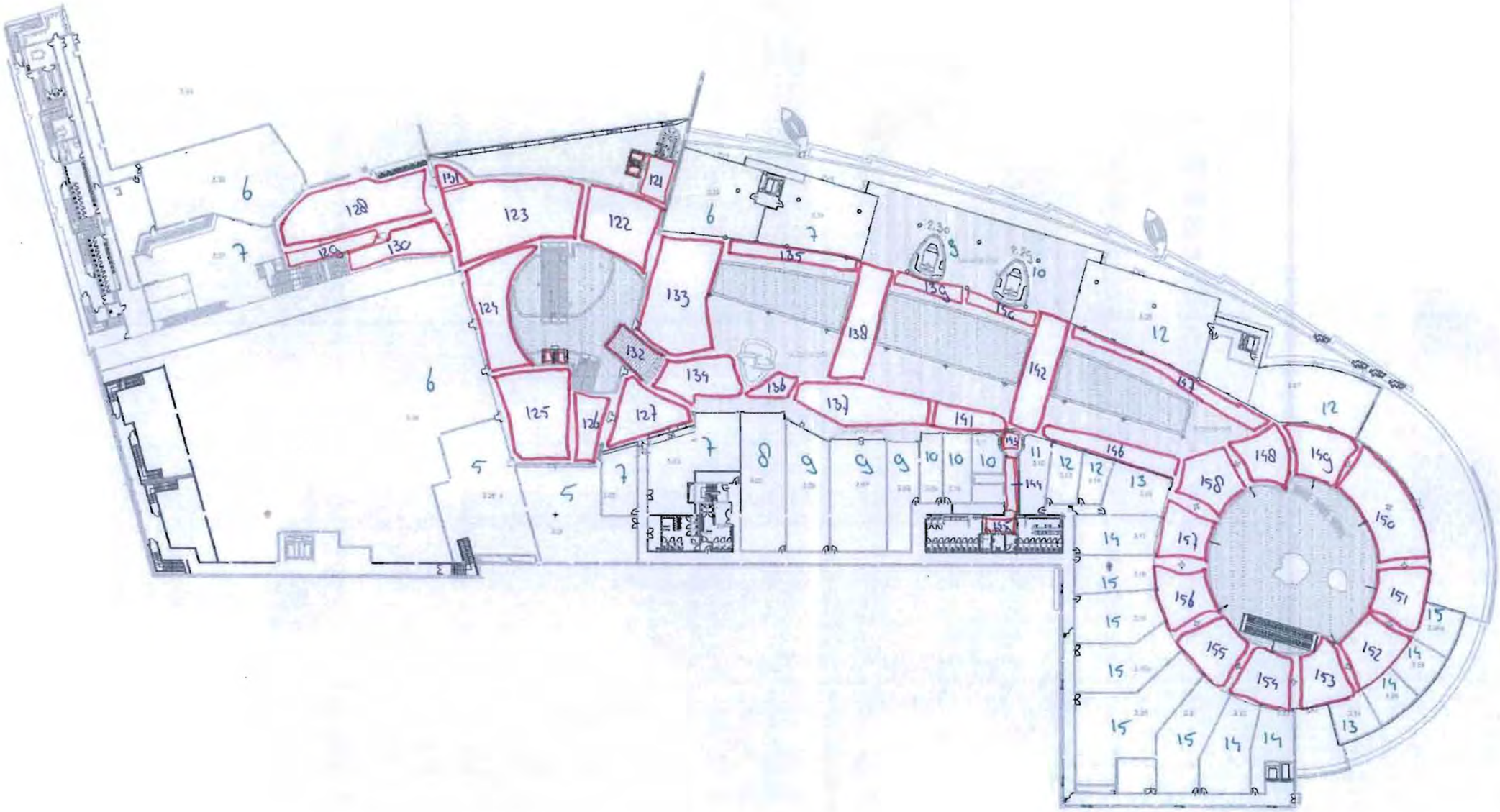

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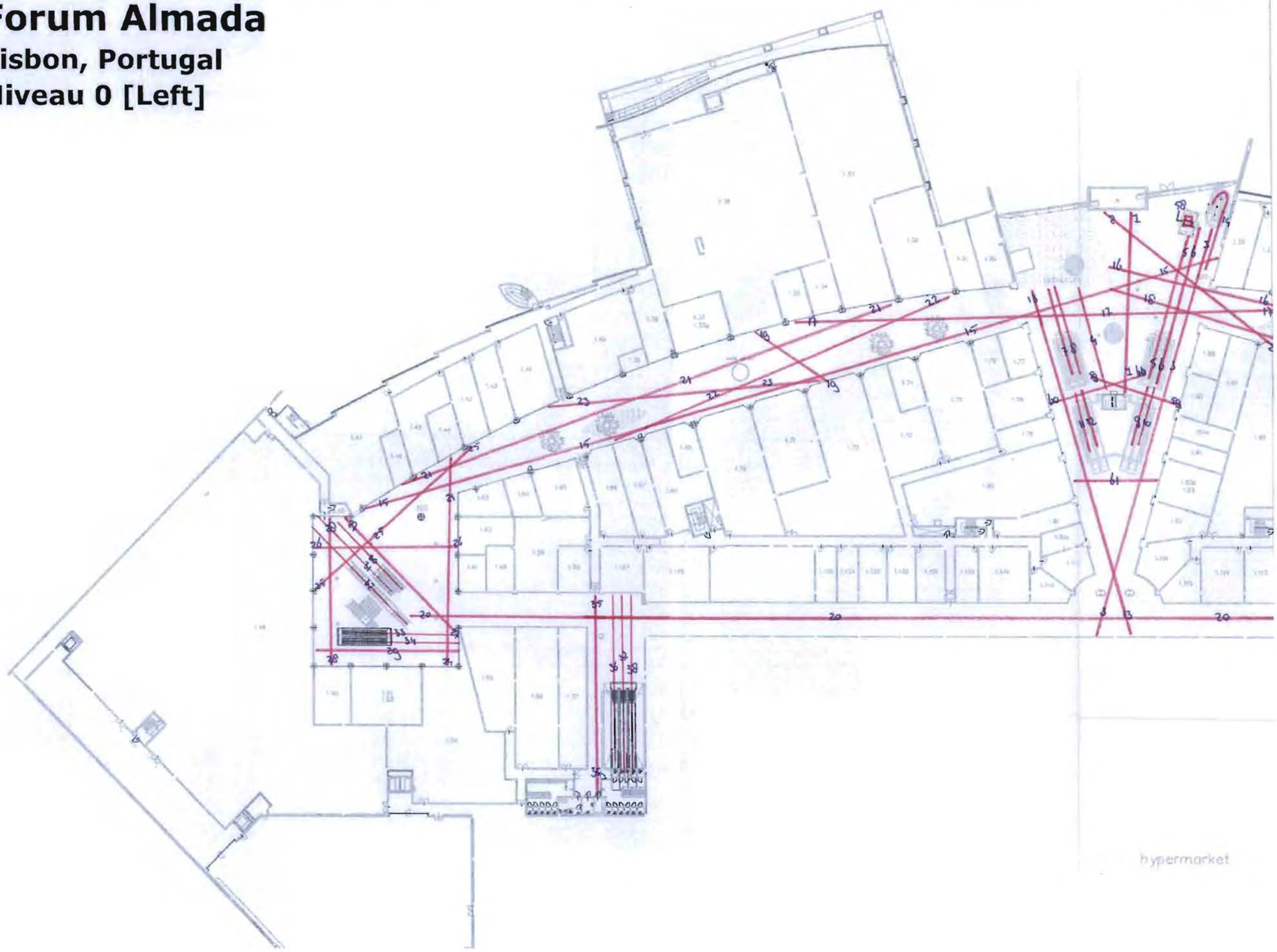

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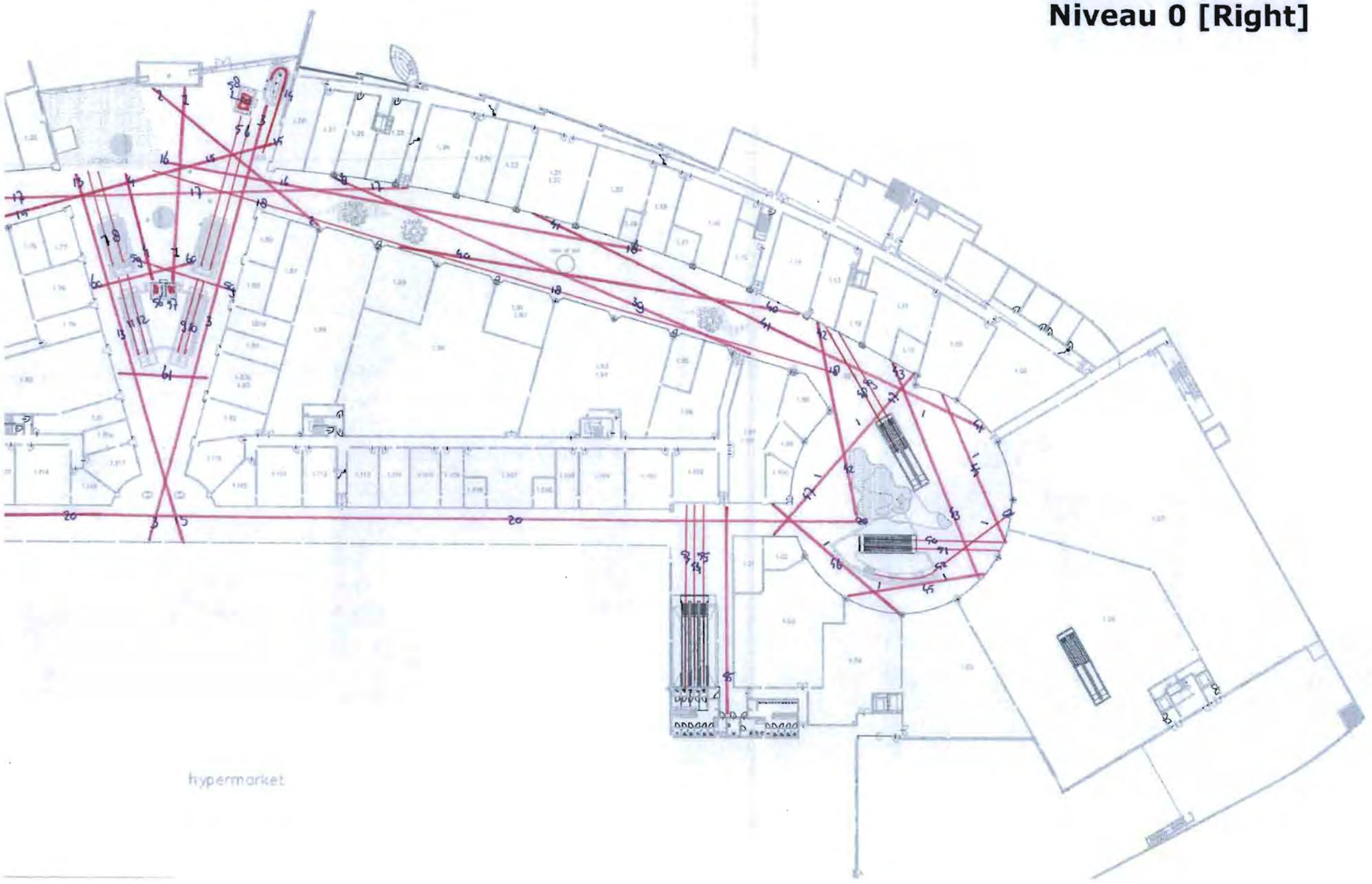

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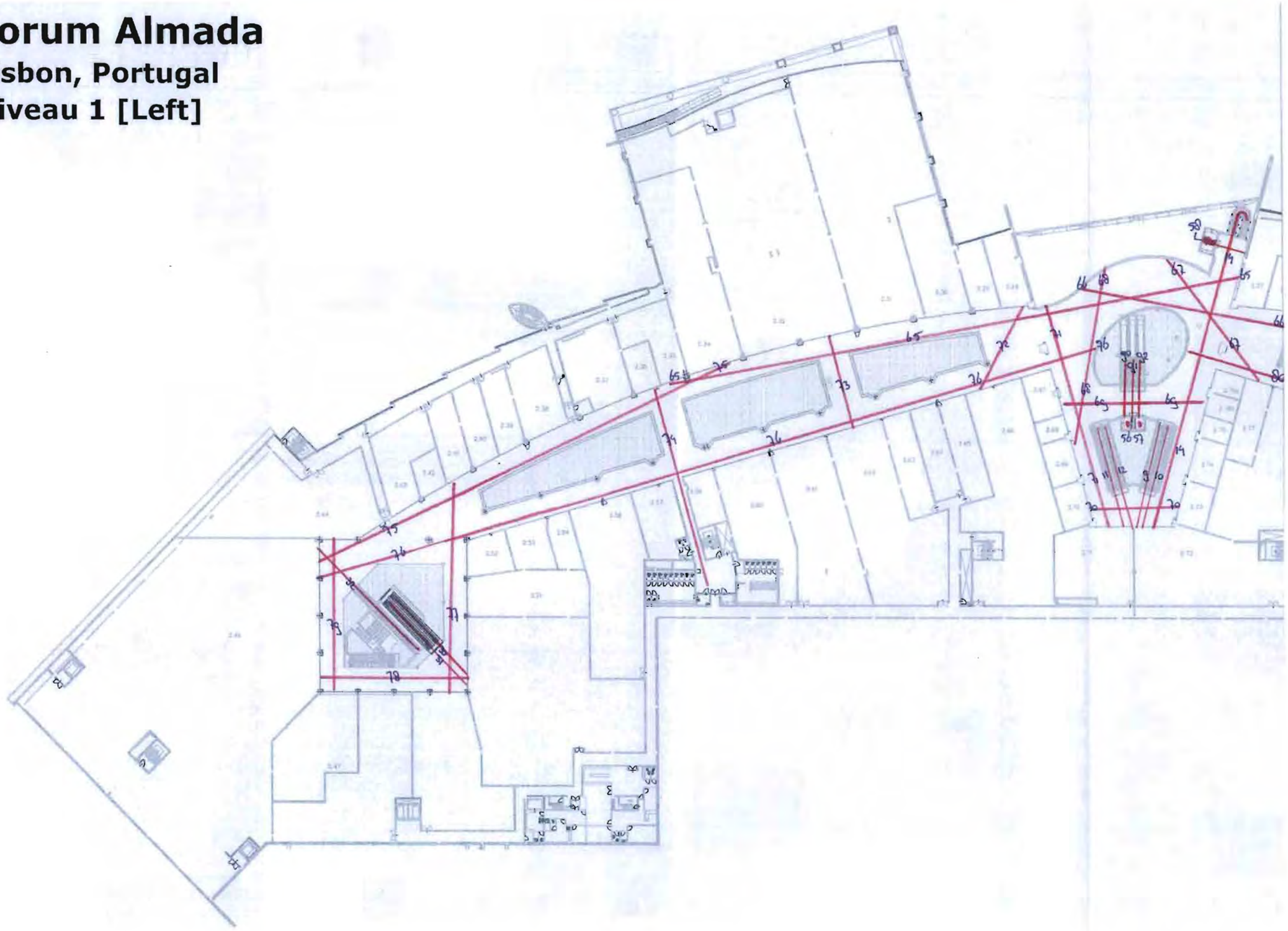

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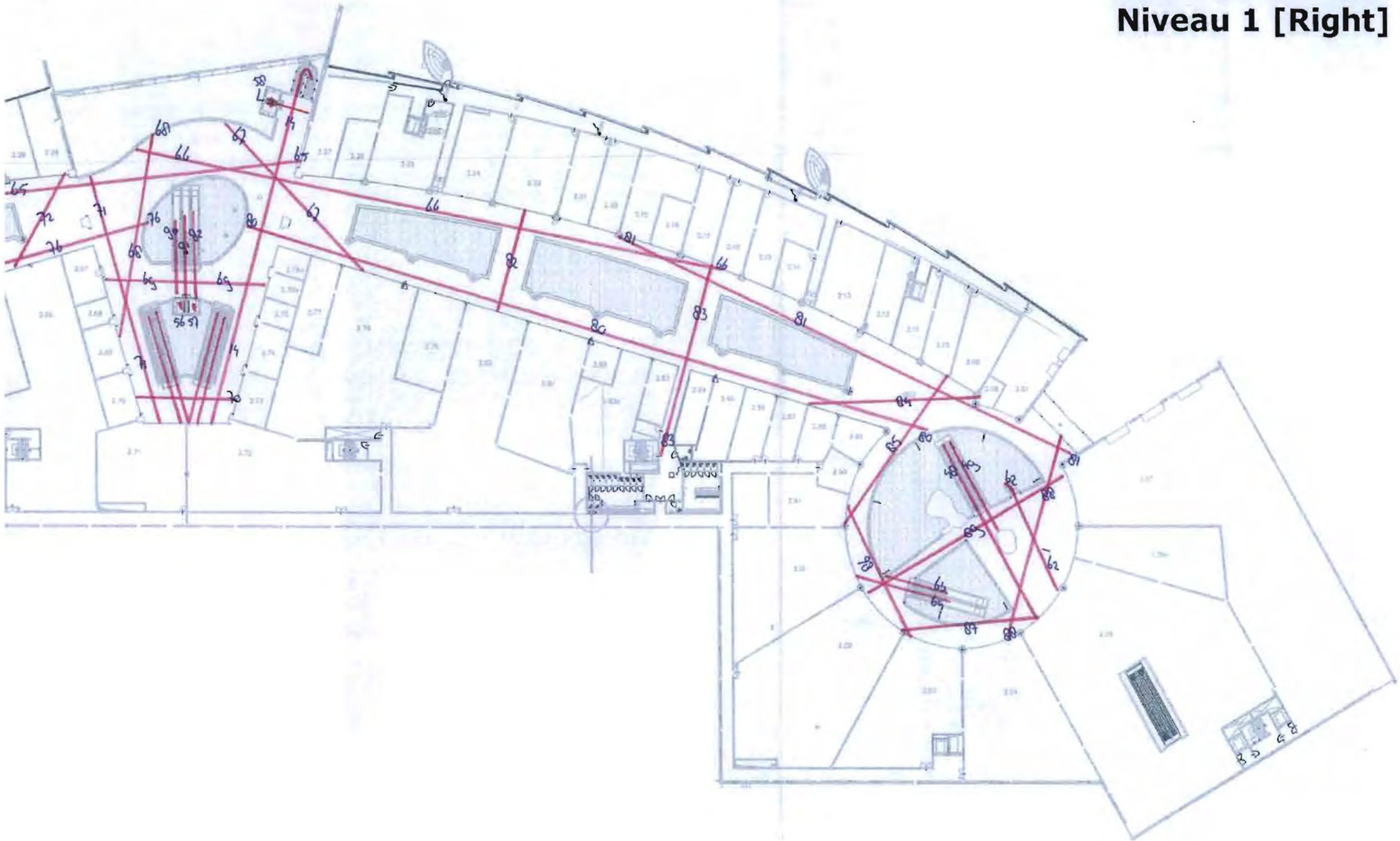

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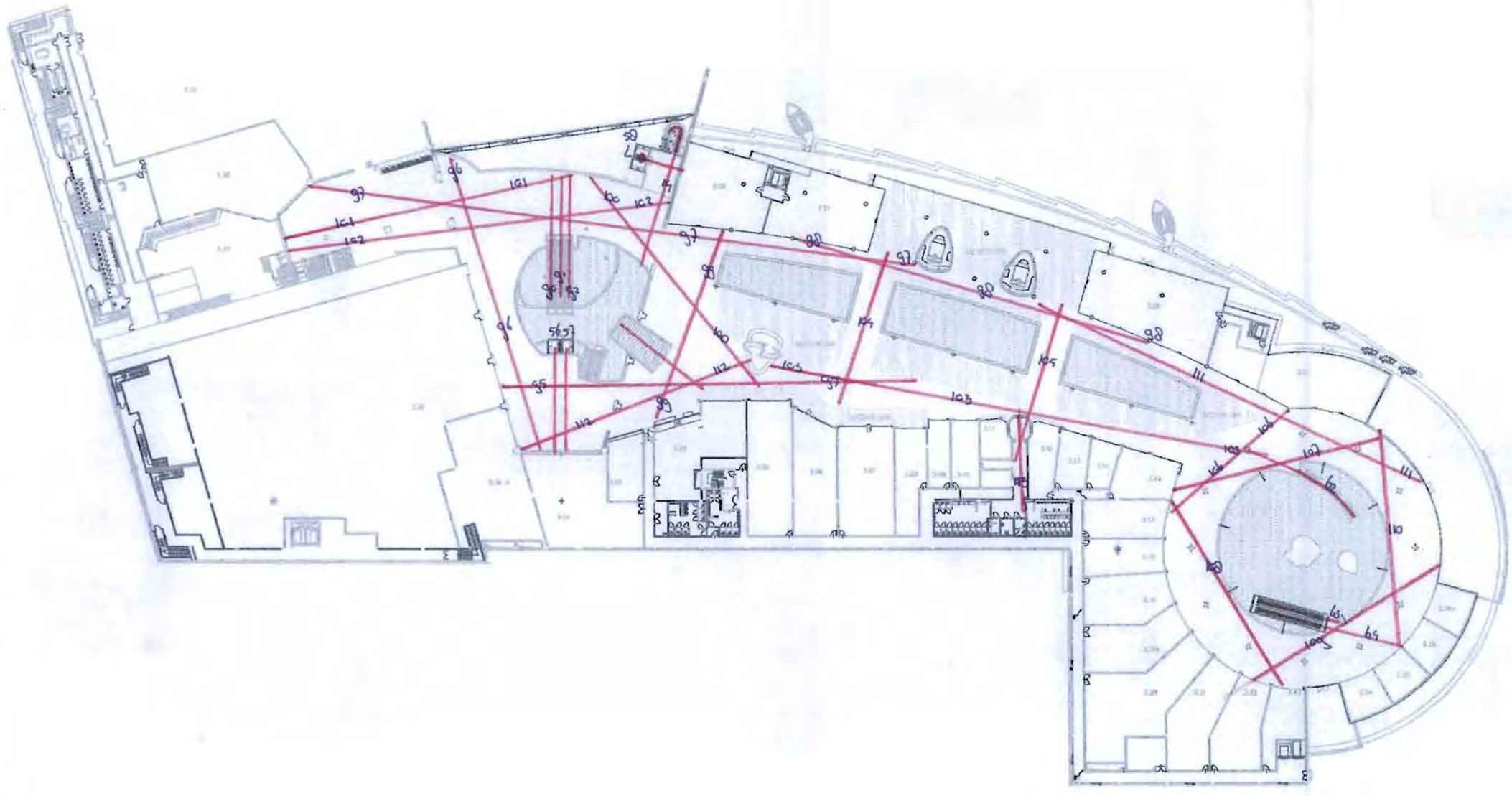

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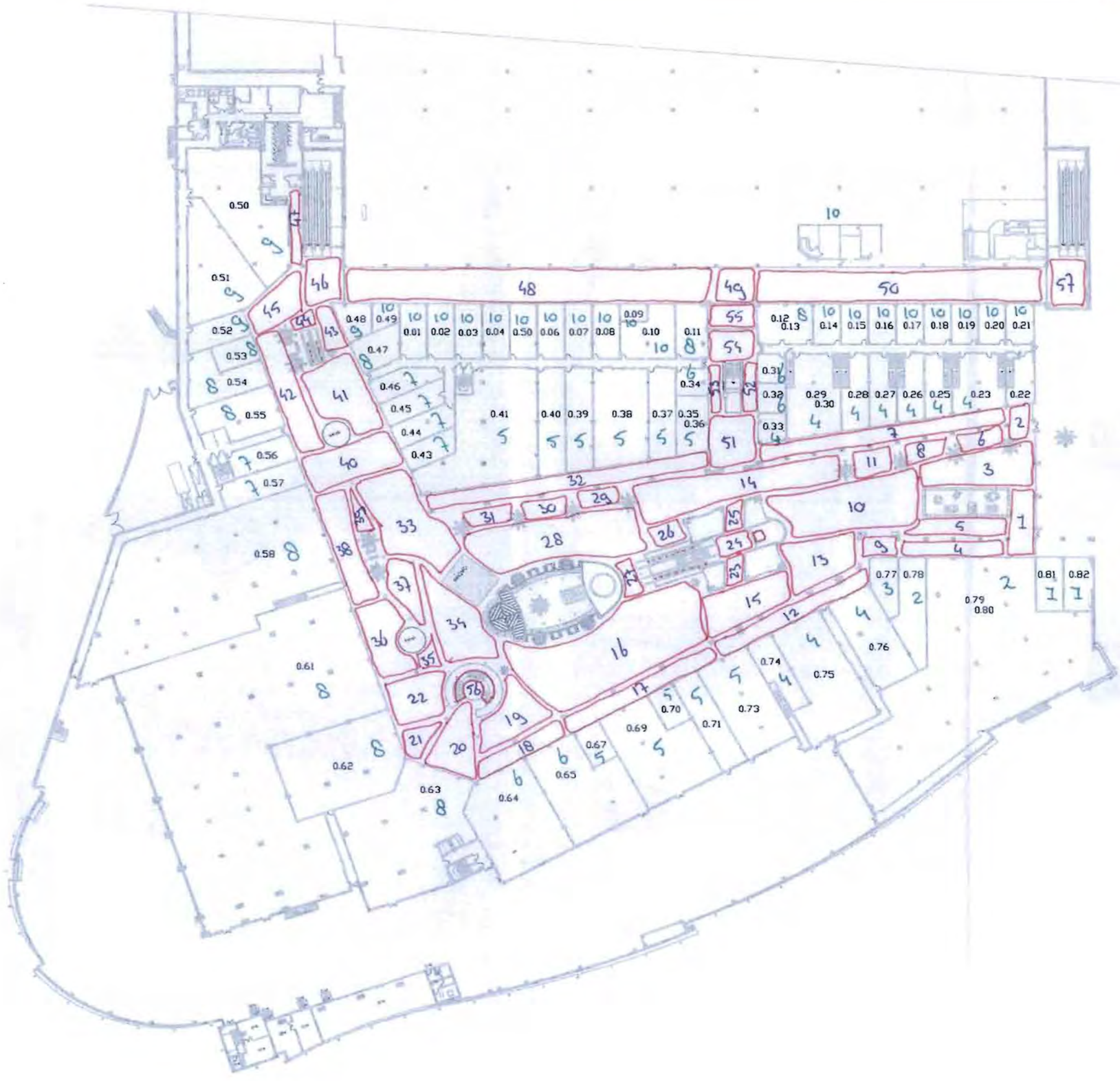

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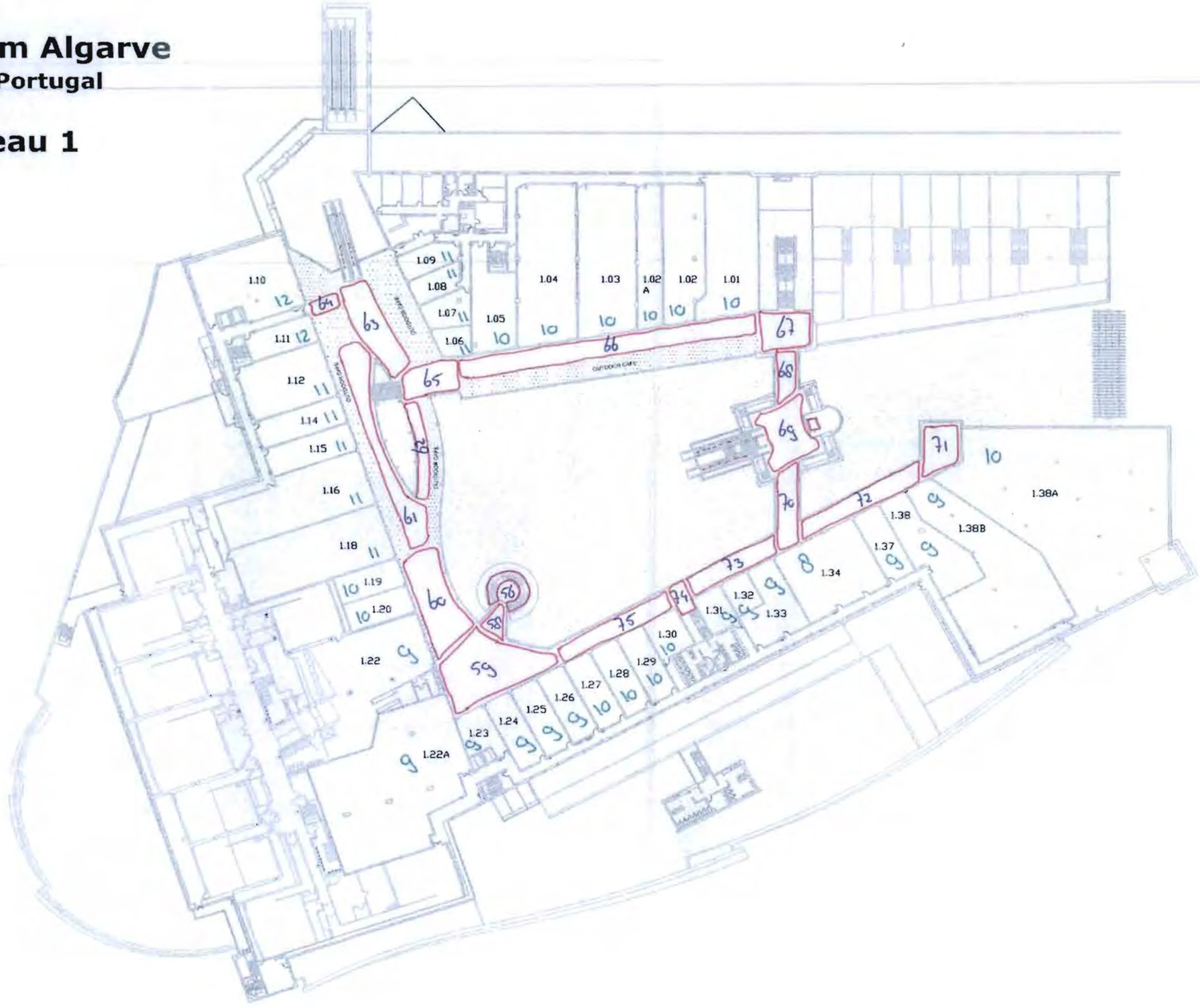

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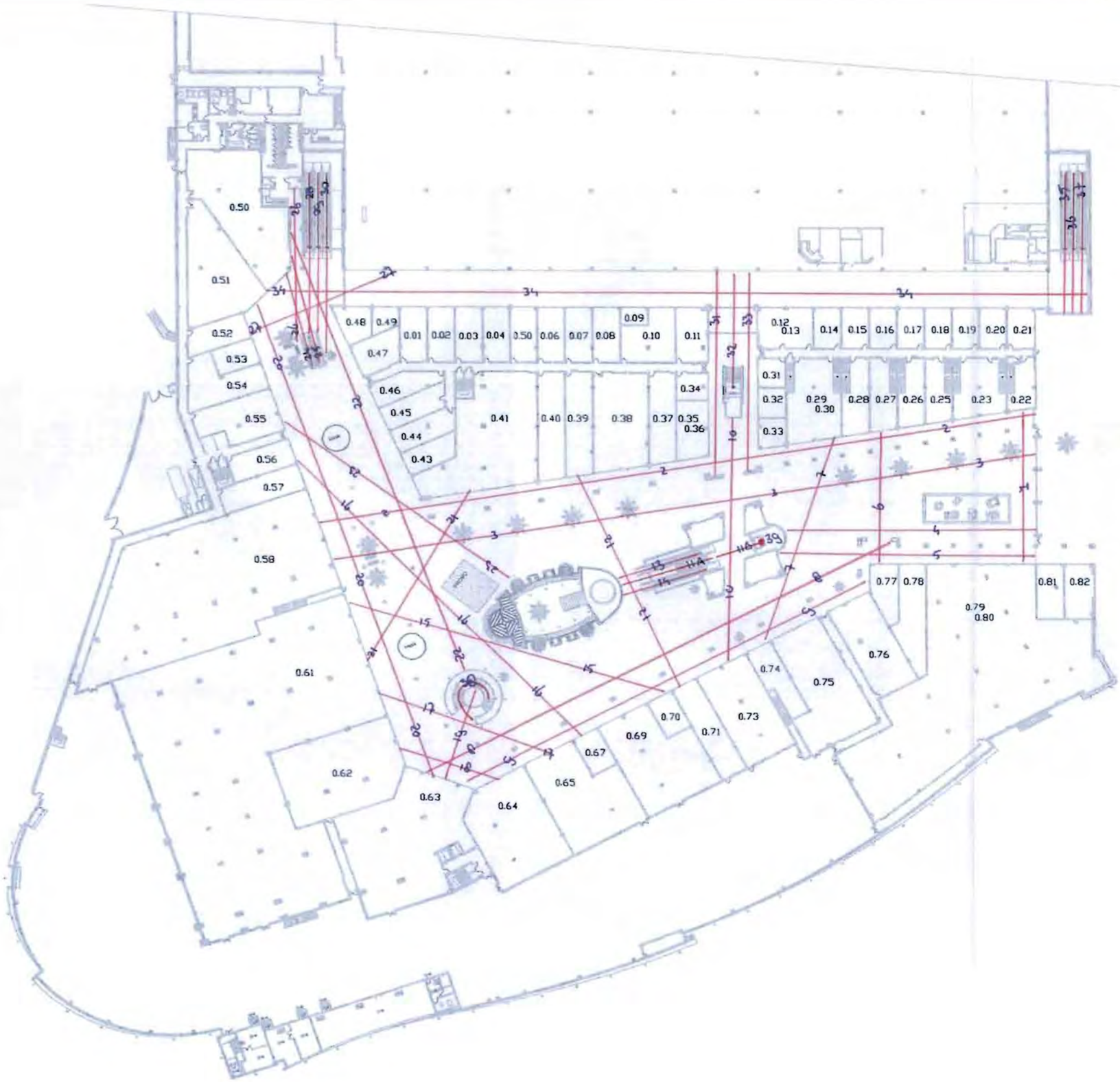

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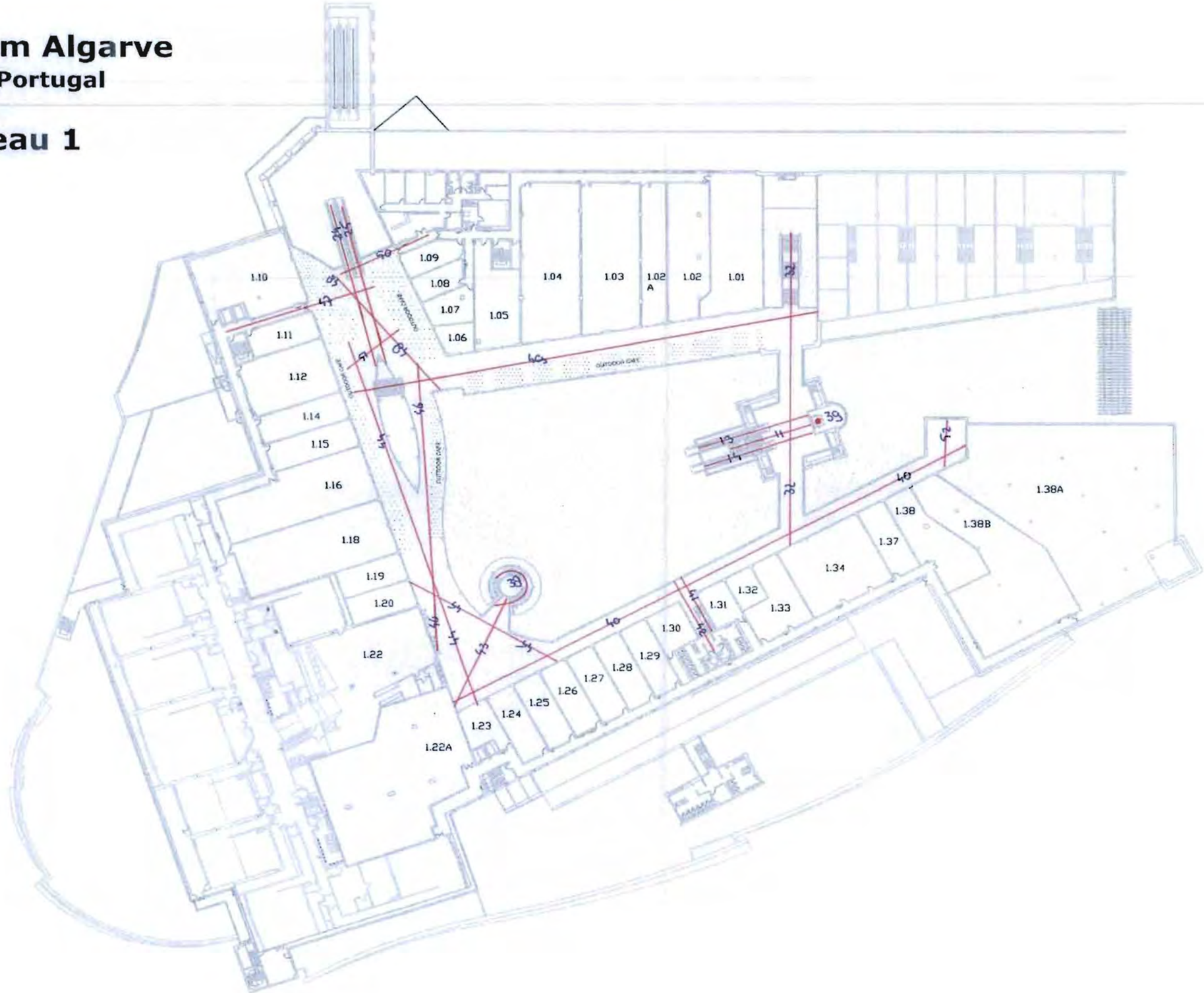

Espacio Torrelodones

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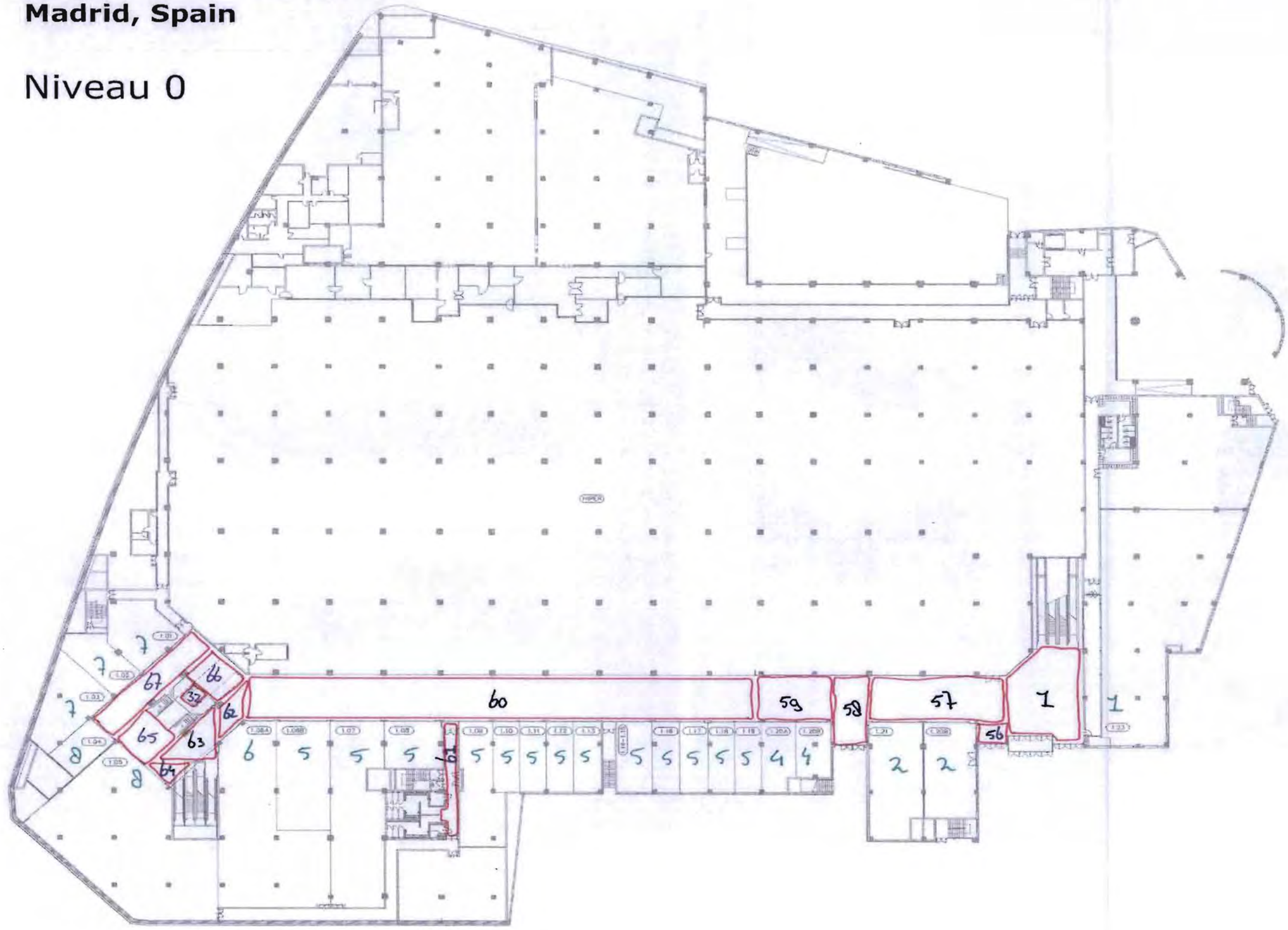

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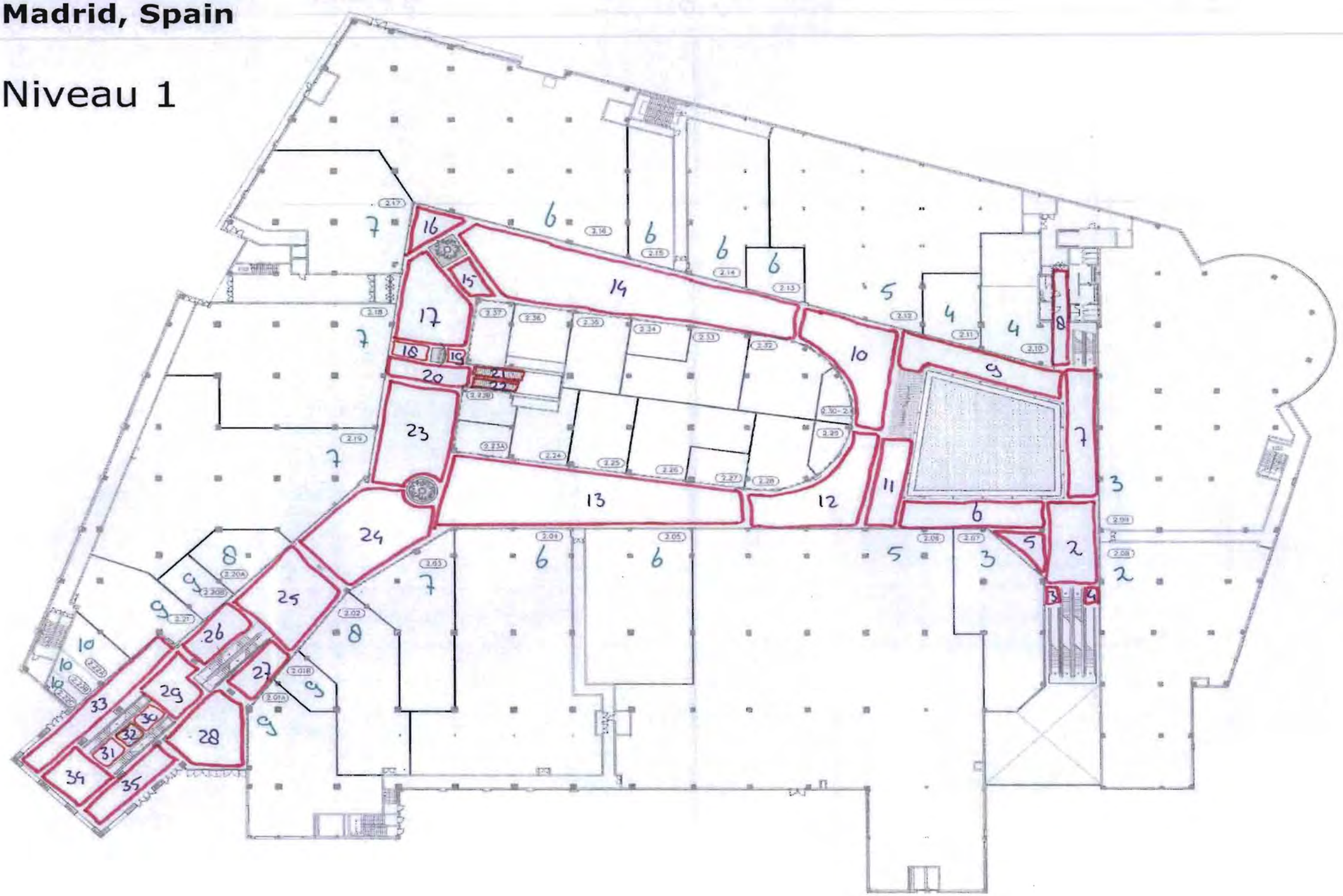

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Madrid, Spain

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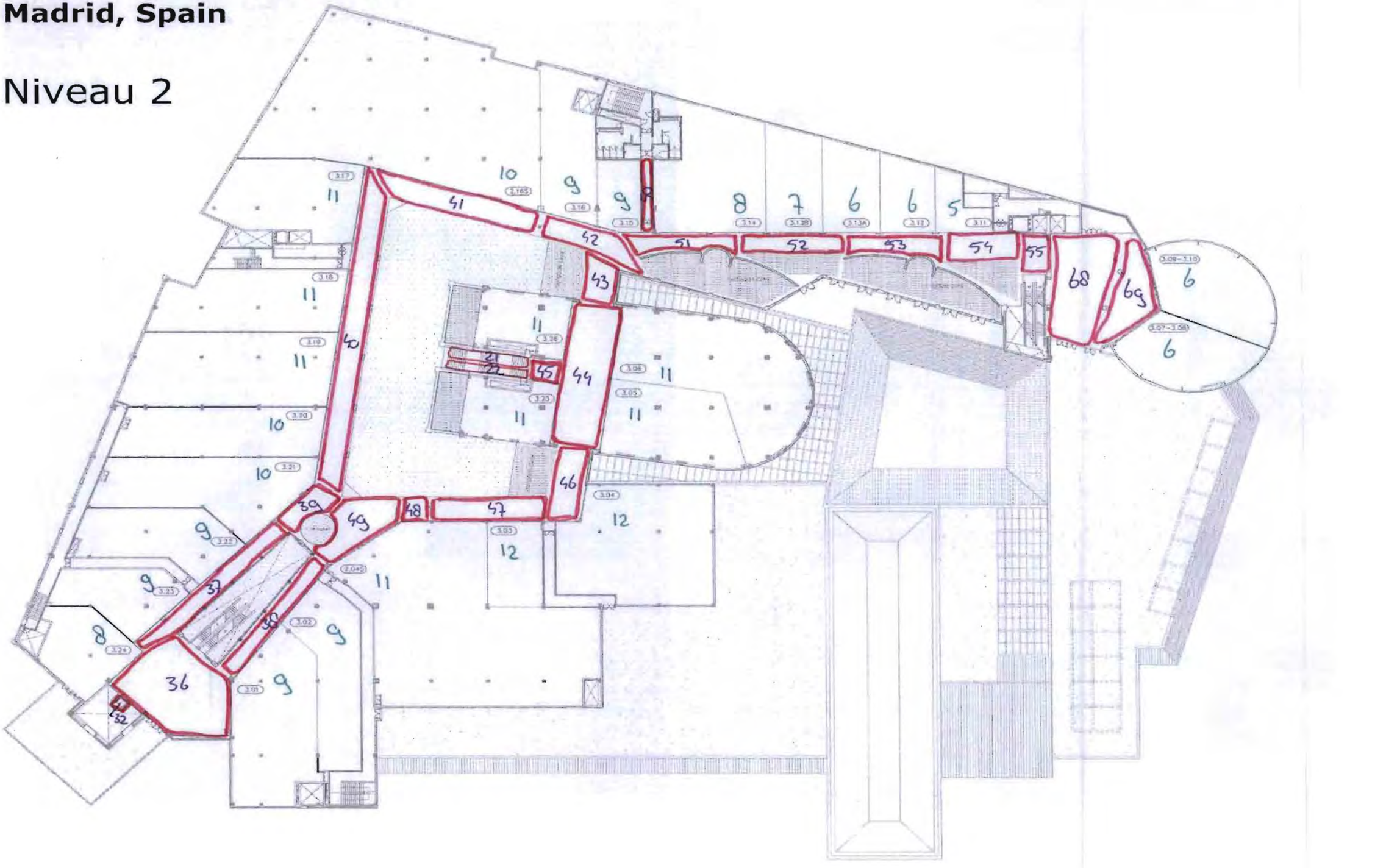
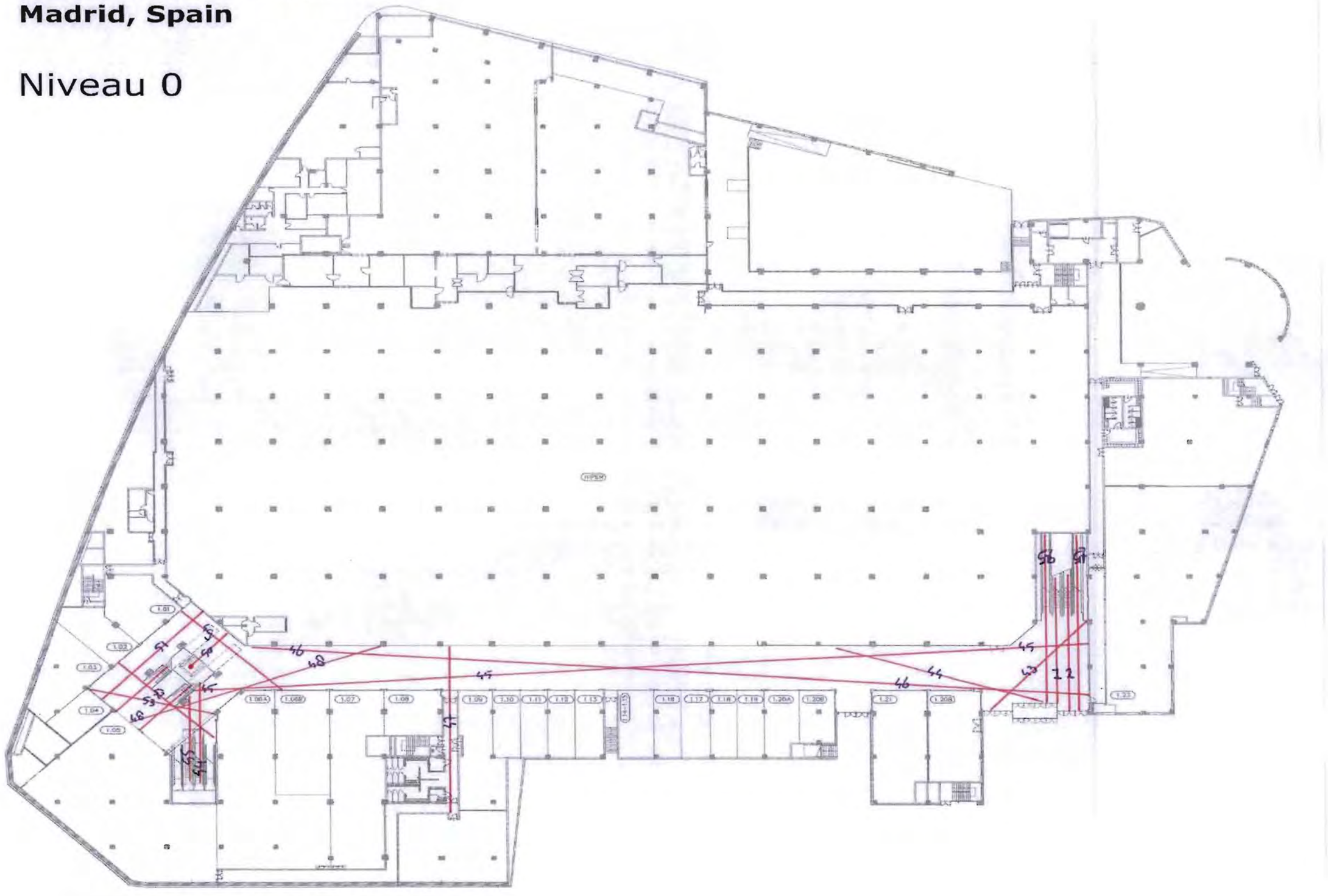


Espacio Torrelodones

Madrid, Spain

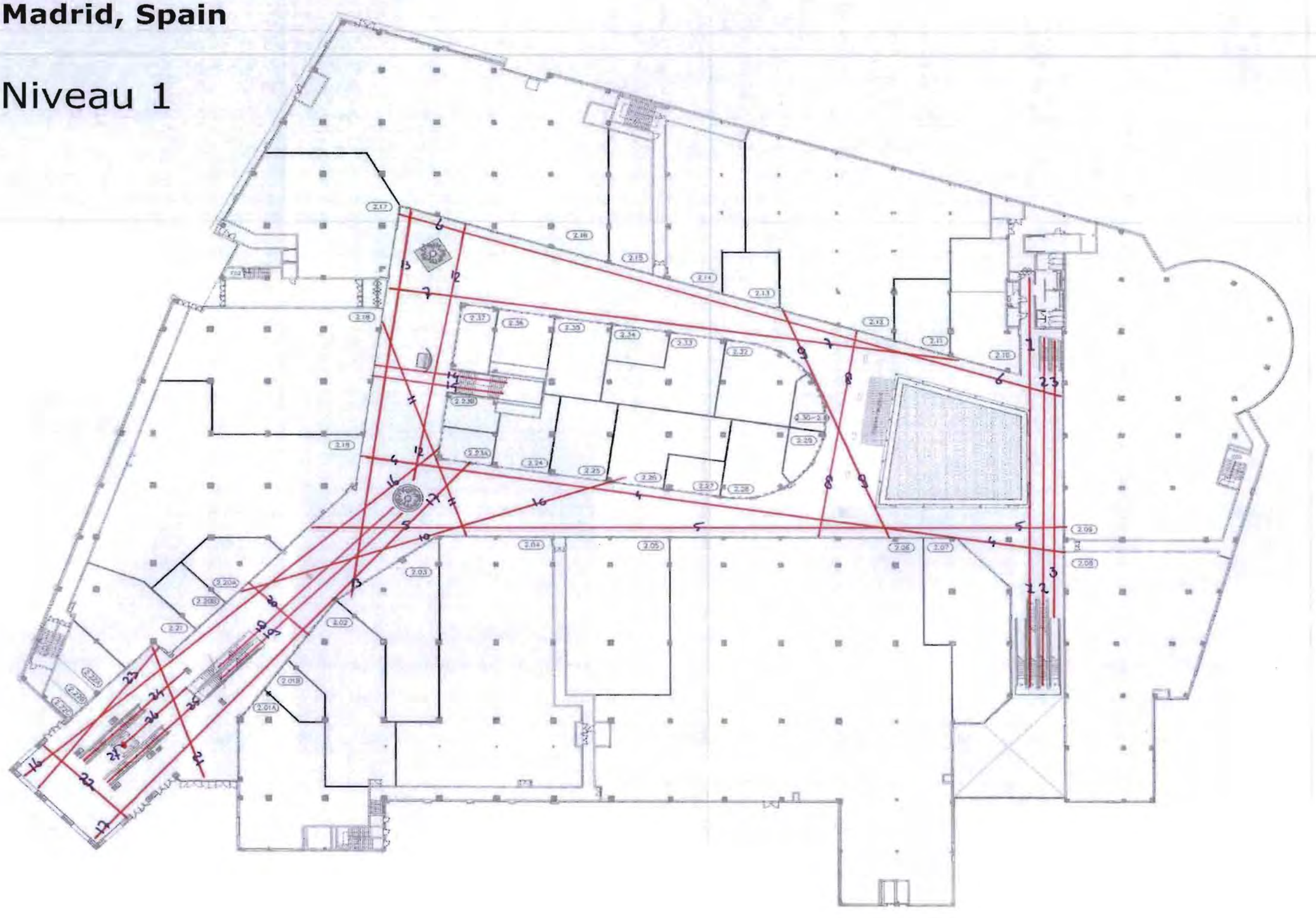
Niveau 0



Espacio Torrelodones

Madrid, Spain

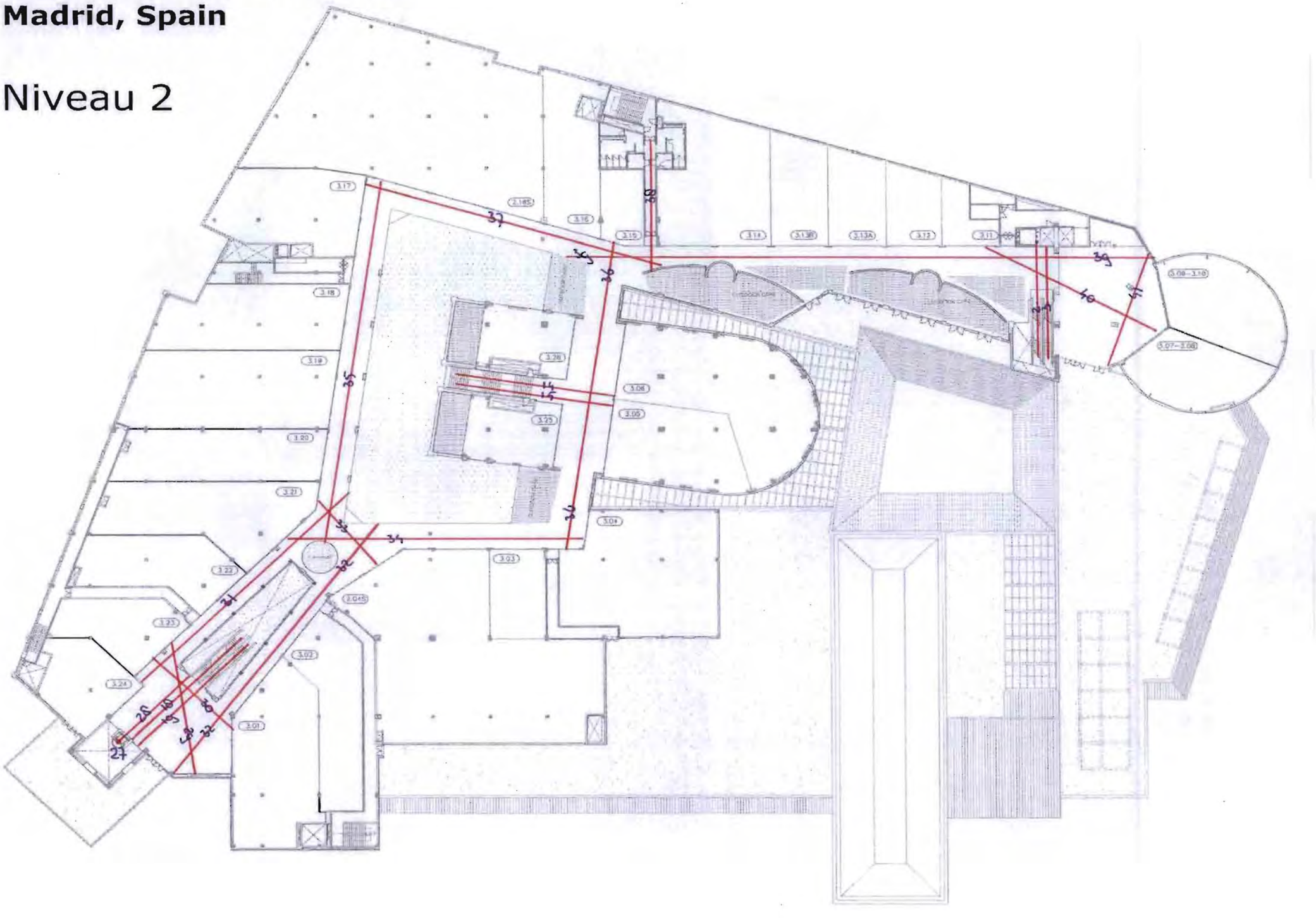
Niveau 1



Espacio Torrelodones

Madrid, Spain

Niveau 2



Appendix 3 Summary of Shop activity per spatial level

Property 'Ch'	Leasable sq.m.:	8,518
	Total of shops:	46
	Vacant units:	0

9 Spatial Levels

	Unit		Type	Branche	Level	SQM				Effort Index
1	5.13		S	S	1	20				4%
2	4.08		S	Hh	2	94				13%
3	4.07		A	S	2	2,689				4%
4	4.07a/b		S	F	2	145				
5	2.01		A	S	3	1,625				13%
6	4.04		S	S	3	48				
7	4.05		S	S	3	54				
8	5.09		M	S	3	410				
9	5.10		S	F	3	76				16%
10	4.08a		S	A	3	37				8%
11	4.08b		S	E	3	50				15%
12	5.09a		M	F	3	359				6%
13	4.03		S	S	4	62				
14	4.09		S	E	4	83				12%
15	5.07		S	F	4	51				
16	5.08		S	A	4	52				
17	5.11		S	F	4	67				
18	5.12		S	A	4	43				17%
19	5.14		S	R	4	18				17%
20	4.10		S	S	5	34				3%
21	4.11		S	F	5	38				
22	5.06		S	F	5	97				9%
23	5.15		S	F	5	86				20%
24	4.01b		S	F	5	165				15%
25	4.10b		S	F	5	32				13%
26	5.04		S	A	6	48				19%
27	5.05		S	F	6	54				
28	5.16		S	F	6	67				
29	5.17		S	F	6	36				20%
30	6.05		S	R	6	44				12%
31	6.06		S	R	6	48				12%
32	4.01a		M	F	6	299				
33	5.01		M	Hh	7	318				
34	5.02		S	A	7	47				20%
35	5.03		S	F	7	61				19%
36	5.18		S	A	7	42				20%
37	6.03		S	R	7	54				
38	6.04		S	R	7	53				15%
39	6.07		S	R	7	69				13%
40	6.08		S	R	7	25				7%
41	6.01		M	R	8	309				13%
42	6.02		S	R	8	164				20%
43	6.09		S	R	8	35				10%
44	6.10		S	R	8	140				5%
45	6.11		S	R	8	57				19%
46	6.12		S	R	8	113				

Property 'Mo'	Leasable sq.m.:	29,728
	Total of shops:	150
	Vacant units:	3

13 Spatial Levels

	Unit		Type	Branche	Level	SQM				Effort Index
1	0.21		S	Hh	3	146				
2	0.22		M	Hh	3	262				
3	0.24		M	Hh	3	289				
4	0.25		M	Hh	3	331				11%
5	0.26	a	A	S	3	1,311				11%
6	0.23		M	VAC	3	299				
7	0.27		M	S	4	872				8%
8	0.87		S	A	5	27				17%
9	0.20		S	F	5	149				11%
10	0.29		M	Hh	5	832				
11	0.30		S	Hh	5	86				
12	0.19	a	S	F	5	75				
13	0.32		S	F	5	157				11%
14	1.34		S	R	5	152				11%
15	0.29		S	S	5	61				14%
16	0.31		S	S	5	118				8%
17	0.85		S	S	5	75				5%
18	0.86		S	S	5	36				16%
19	0.79		S	A	6	36				5%
20	0.15		S	E	6	70				11%
21	0.18		S	E	6	70				5%
22	0.34		S	F	6	61				16%
23	0.35		M	F	6	220				2%
24	0.80		S	F	6	33				13%
25	0.81		S	F	6	88				5%
26	0.82		S	F	6	155				19%
27	0.33		M	Hh	6	701				
28	0.36		S	Hh	6	139				
29	0.84		S	Hh	6	86				13%
30	0.19		S	H	6	24				
31	0.19		S	H	6	58				
32	1.19		S	R	6	39				12%
33	1.32		S	R	6	189				
34	1.33		S	R	6	42				1%
35	1.35		S	R	6	22				4%
36	0.17		S	S	6	88				1%
37	0.83		S	S	6	131				8%
38	0.14		S	A	7	72				5%
39	0.78		S	A	7	46				19%
40	1.13		S	F	7	182				18%
41	1.13	a	S	F	7	189				
42	1.14		S	F	7	189				13%
43	1.15		M	F	7	287				
44	0.13		S	F	7	58				
45	1.18		S	S	7	54				19%
46	1.17		S	R	7	55				2%
47	1.19		S	R	7	119				15%
48	1.20		M	R	7	239				15%
49	1.21		S	R	7	119				17%
50	1.21	a	S	R	7	119				
51	1.22		S	R	7	119				15%
52	1.22	a	S	R	7	119				17%
53	1.23		M	R	7	248				
54	1.31		S	R	7	111				2%
55	1.38		S	R	7	57				11%
56	1.37		S	R	7	78				15%
57	0.41		S	A	8	84				1%
58	0.42		S	A	8	47				9%
59	1.39		S	A	8	79				6%
60	0.01		S	E	8	58				
61	0.03		S	E	8	64				13%
62	0.07		S	E	8	35				12%
63	0.07	a	S	E	8	35				
64	0.10		S	E	8	35				8%
65	0.11		S	E	8	35				
66	1.11		M	F	8	230				
67	1.12		S	F	8	179				
68	1.39		A	F	8	1,396				5%
69	0.08	a	S	Hh	8	35				19%
70	1.40		A	A	8	2,570				
71	0.04		S	R	8	70				19%
72	0.05		S	R	8	70				
73	0.06		S	R	8	35				
74	0.08		S	R	8	70				12%
75	0.09		S	R	8	35				1%
76	0.11	a	S	R	8	35				4%
77	0.12		S	R	8	30				14%
78	0.77		S	R	8	29				

79	1.38	a	S	R	8	33				19%
80	0.78		S	R	8	27				15%
81	1.24		S	R	8	78				13%
82	1.25		M	R	8	226				
83	1.30		S	R	8	110				
84	0.83		S	S	8	31				17%
85	0.40		S	A	9	48				
86	0.52		S	A	9	36				
87	1.09		S	A	9	56				15%
88	1.45		S	A	9	32				
89	1.46		S	A	9	37				
90	0.46		S	F	9	159				16%
91	0.47		S	F	9	74				
92	0.48		A	F	9	1,657				
93	0.51		S	F	9	33				13%
94	0.75		S	F	9	104				17%
95	1.01		S	F	9	26				13%
96	1.03		M	F	9	295				14%
97	1.04		M	F	9	379				16%
98	1.05		S	F	9	189				
99	1.06		S	F	9	190				16%
100	1.07		S	F	9	189				
101	1.08		S	F	9	133				
102	1.41		M	F	9	328				12%
103	1.43		A	F	9	2,261				13%
104	1.44		S	F	9	161				2%
105	0.91		S	L	9	9				1%
106	0.50		S	H	9	142				
107	0.88		S	H	9	9				
108	0.92		S	H	9	15				
109	0.39		S	R	9	51				16%
110	0.89		S	R	9	9				2%
111	1.26		M	R	9	276				7%
112	1.28		M	R	9	297				14%
113	1.29		S	R	9	101				17%
114	0.38	a	S	S	9	90				12%
115	0.43		S	S	9	33				
116	0.44		M	S	9	464				
117	0.90		S	S	9	9				2%
119	1.02		S	S	9	40				16%
119	0.36	a	S	A	10	51				13%
120	0.70		S	A	10	126				13%
121	0.74		S	A	10	116				14%
122	0.82		M	F	10	392				
123	0.84		S	F	10	50				11%
124	0.87		S	F	10	60				13%
125	0.97	a	S	F	10	59				
126	0.68		S	F	10	122				
127	0.69		S	F	10	112				
128	0.72		S	F	10	112				18%
129	0.73		S	F	10	120				1%
130	0.81		M	Hh	10	462				19%
131	0.85		S	R	10	34				3%
132	0.71		S	R	10	120				12%
133	0.88		S	R	10	32				
134	1.27		S	R	10	88				13%
135	0.37		M	VAC	10	367				
136	1.47		S	A	11	107				15%
137	0.80		M	F	11	294				3%
138	1.51		M	F	11	520				7%
139	1.52		M	F	11	408				
140	1.50		S	F	11	166				10%
141	0.53		S	S	11	61				3%
142	0.58		S	A	12	94				13%
143	0.57	0,58	M	E	12	568				5%
144	1.49		M	F	12	356				3%
145	1.50		M	F	12	296				2%
146	0.54		S	F	12	188				16%
147	1.48		M	S	12	402				18%
148	1.54		S	R	13	10				1%
149	0.55		S	S	13	189				1%
150	0.56		S	VAC	13	96				
	HYP		A	Hy	0	17.500				#DIV/0!

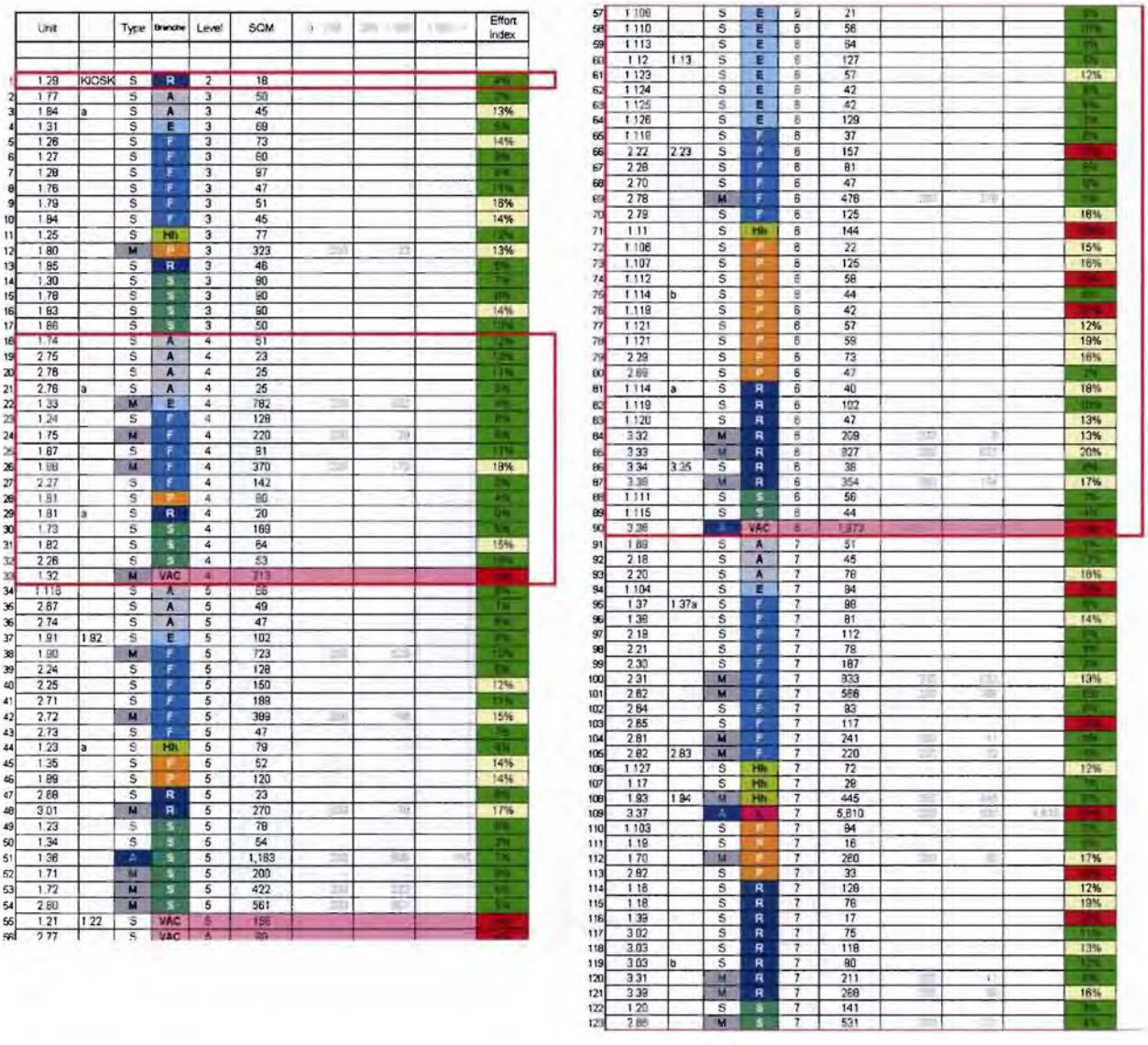
Property 'Av'	Leasable sq.m.:	16,659
	Total of shops:	86
	Vacant units:	1

12 Spatial Levels

	Unit		Type	Branche	Level	SQM				Effort index
1	1.23		S	F	2	184				
2	1.24	a/1.25	M	F	2	224				7%
3	1.24	b	S	S	2	29				17%
4	1.24	c	S	S	2	12				
5	1.26	b	S	E	3	80				
6	1.18		A	F	3	1,620				
7	1.27	a/b+1	M	F	3	254				
8	1.29	b	S	E	4	36				
9	1.14		S	F	4	116				
10	1.16		M	F	4	282				
11	1.17		M	F	4	220				
12	1.21	1.21b	S	F	4	108				
13	1.15		S	F	4	124				15%
14	1.20	a	S	F	4	48				
15	1.31	b	S	F	4	63				
16	1.30	b	S	R	4	61				
17	1.26	a	S	A	5	72				
18	1.09		S	F	5	101				
19	1.10		S	F	5	99				
20	1.11		S	F	5	83				
21	1.13		S	F	5	70				
22	1.19		S	F	5	119				12%
23	k2		S	F	5	9				
24	2.17	2.18	M	R	5	216				
25	2.18		S	R	5	68				
26	2.19		S	R	5	82				
27	2.20		S	R	5	54				15%
28	1.12		S	S	5	30				
29	1.30	a	S	A	6	58				
30	1.31	a	S	A	6	53				14%
31	1.35	a	S	E	6	32				
32	1.36	a	S	E	6	43				
33	1.08		S	F	6	103				
34	1.28	a	S	F	6	85				14%
35	2.13		A	Hy	6	1,666				
36	1.34	a	S	F	6	51				
37	2.09		S	R	6	55				
38	2.10		S	R	6	61				
39	2.11	a	S	R	6	35				
40	2.11		S	R	6	33				19%
41	2.12		M	S	6	582				
42	1.34		S	A	7	51				
43	1.36		S	A	7	50				
44	1.03		S	F	7	142				
45	1.04	1.05	M	F	7	254				
46	1.06	1.07	M	F	7	216				
47	1.32		S	F	7	39				
48	1.33	1.33b	S	F	7	108				
49	1.35		S	Hh	7	85				
50	L+2/L+3		A	E	7	1,662				
51	1.20	b	S	F	7	49				
52	k1		S	F	7	12				12%
53	2.08		S	R	7	35				
54	2.07	2.08	M	R	7	254				
55	2.08	b	S	R	7	32				15%
56	2.21		S	R	7	100				17%
57	2.22		S	R	7	96				
58	2.23		S	R	7	105				
59	1.02	b	M	F	8	258				
60	1.02		M	F	8	626				
61	1.37	1.38	S	F	8	174				
62	1.39		S	F	8	100				
63	1.02	a	S	F	8	53				
64	2.16		S	R	8	151				
65	2.24		S	A	9	99				
66	2.26		S	A	9	90				15%
67	1.01	b	M	F	9	471				
68	2.04	a	S	E	9	80				
69	2.04		M	F	9	219				
70	2.05		S	F	9	133				
71	2.25		S	Hh	9	92				
72	2.03	c	S	F	10	109				
73	2.27		S	S	10	86				
74	2.02		M	A	11	409				14%
75	2.28		S	A	11	82				
76	2.30		S	E	11	74				
77	2.02	a	S	F	11	185				
78	1.01	a	M	Hh	11	399				
79	1.01	c	S	F	11	73				16%
80	2.03	a	S	F	11	177				
81	2.03	b	S	S	11	130				
82	2.03		M	S	11	298				
83	2.29		S	S	11	78				
84	2.30		M	VAC	11	164				
85	k3		S	R	12	8				
86	2.01		A	S	12	1,233				

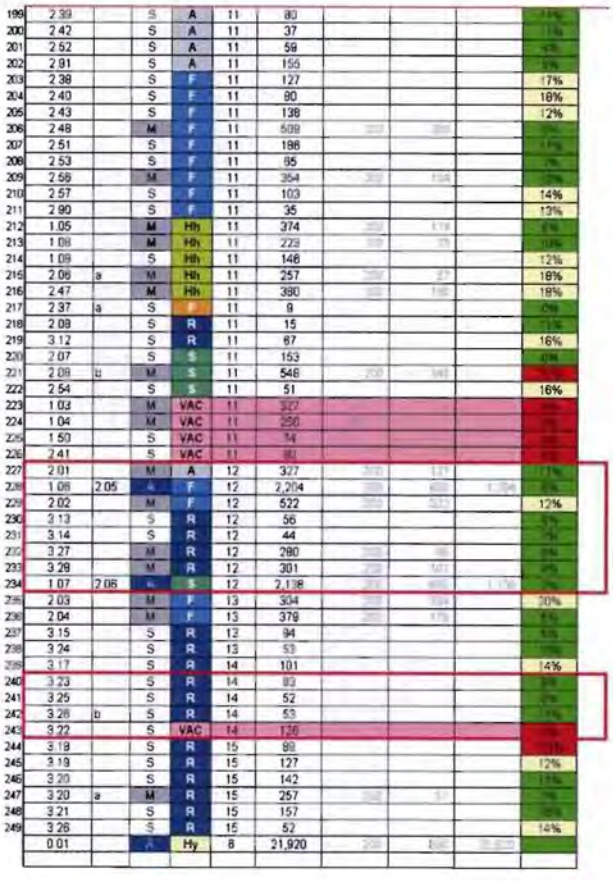
Property 'Am'	Leasable sq.m.:	52,812
	Total of shops:	249
	Vacant units:	11

15 Spatial Levels



Unit		Type	Branche	Level	SQM	Effort Index
1.29	KIOSK	S	R	2	18	4%
1.77		S	A	3	50	2%
1.84	a	S	A	3	45	13%
1.31		S	E	3	69	5%
1.26		S	F	3	73	14%
1.27		S	F	3	80	9%
1.28		S	F	3	97	8%
1.76		S	F	3	47	11%
1.79		S	F	3	51	18%
1.84		S	F	3	45	14%
1.25		S	Hh	3	77	12%
1.80		M	F	3	323	13%
1.85		S	R	3	46	5%
1.30		S	S	3	90	7%
1.78		S	S	3	90	9%
1.83		S	S	3	80	14%
1.86		S	S	3	50	10%
1.74		S	A	4	51	12%
2.75		S	A	4	23	12%
2.76		S	A	4	25	11%
2.76	a	S	A	4	25	8%
1.33		M	E	4	782	8%
1.24		S	F	4	128	8%
1.75		M	F	4	220	8%
1.87		S	F	4	91	11%
1.88		M	F	4	370	18%
2.27		S	F	4	142	8%
1.81		S	F	4	80	4%
1.81	a	S	R	4	20	0%
1.73		S	S	4	169	5%
1.82		S	S	4	64	15%
2.26		S	S	4	53	10%
1.32		M	VAC	4	213	10%
1.118		S	A	5	68	8%
2.67		S	A	5	49	11%
2.74		S	A	5	47	9%
1.91	1.82	S	E	5	102	6%
1.90		M	F	5	723	12%
2.24		S	F	5	128	5%
2.25		S	F	5	150	12%
2.71		S	F	5	188	11%
2.72		M	F	5	389	15%
2.73		S	F	5	47	10%
1.23	a	S	Hh	5	79	4%
1.35		S	F	5	52	14%
1.89		S	F	5	120	14%
2.68		S	R	5	23	8%
3.01		M	R	5	270	17%
1.23		S	S	5	78	9%
1.34		S	S	5	54	2%
1.36		A	S	5	1,183	1%
1.71		M	S	5	200	9%
1.72		M	S	5	422	6%
2.80		M	S	5	561	1%
1.21	1.22	S	VAC	5	156	10%
2.77		S	VAC	5	80	10%

57	1.108		S	E	6	21				8%
58	1.110		S	E	6	56				11%
59	1.113		S	E	6	64				6%
60	1.12	1.13	S	E	6	127				5%
61	1.123		S	E	6	57				12%
62	1.124		S	E	6	42				8%
63	1.125		S	E	6	42				8%
64	1.126		S	E	6	129				7%
65	1.116		S	F	6	37				8%
66	2.22	2.23	S	F	6	157				10%
67	2.28		S	F	6	81				8%
68	2.70		S	F	6	47				9%
69	2.78		M	F	6	476				7%
70	2.79		S	F	6	125				16%
71	1.11		S	Hh	6	144				10%
72	1.106		S	F	6	22				15%
73	1.107		S	F	6	125				16%
74	1.112		S	F	6	58				10%
75	1.114	b	S	F	6	44				8%
76	1.119		S	F	6	42				8%
77	1.121		S	F	6	57				12%
78	1.121		S	F	6	58				19%
79	2.29		S	F	6	73				16%
80	2.69		S	F	6	47				2%
81	1.114	a	S	R	6	40				18%
82	1.119		S	R	6	102				10%
83	1.120		S	R	6	42				13%
84	3.32		M	R	6	209				13%
85	3.33		M	R	6	927				20%
86	3.34	3.35	S	R	6	38				8%
87	3.36		M	R	6	354				17%
88	1.111		S	S	6	56				7%
89	1.115		S	S	6	44				11%
90	3.26		A	VAC	6	1,873				10%
91	1.88		S	A	7	51				12%
92	2.18		S	A	7	45				12%
93	2.20		S	A	7	78				18%
94	1.104		S	E	7	94				10%
95	1.37	1.37a	S	F	7	98				9%
96	1.38		S	F	7	81				14%
97	2.19		S	F	7	112				8%
98	2.21		S	F	7	78				9%
99	2.30		S	F	7	187				8%
100	2.31		M	F	7	933				13%
101	2.82		M	F	7	566				10%
102	2.84		S	F	7	83				9%
103	2.85		S	F	7	117				10%
104	2.81		M	F	7	241				9%
105	2.82	2.83	M	F	7	220				10%
106	1.127		S	Hh	7	72				12%
107	1.17		S	Hh	7	28				7%
108	1.93	1.94	M	Hh	7	445				9%
109	3.37		A	S	7	5,810				10%
110	1.103		S	F	7	94				7%
111	1.19		S	F	7	16				6%
112	1.70		M	F	7	260				17%
113	2.92		S	F	7	33				10%
114	1.18		S	R	7	128				12%
115	1.18		S	R	7	78				19%
116	1.39		S	R	7	17				10%
117	3.02		S	R	7	75				11%
118	3.03		S	R	7	118				13%
119	3.03	b	S	R	7	80				12%
120	3.31		M	R	7	211				8%
121	3.39		M	R	7	269				16%
122	1.20		S	S	7	141				9%
123	2.86		M	S	7	531				6%



Property 'Ag'	Leasable sq.m.:	22,288
	Total of shops:	115
	Vacant units:	0

12 Spatial Levels

	Unit		Type	Branche	Level	SQM				Effort Index
1	0.81		S	A	1	60				16%
2	0.82		S	S	1	84				
3	0.78		S	F	2	116				12%
4	0.79	0.80	S	F	2	1,294				
5	0.86		S	A	3	19				
6	0.33		S	A	4	34				
7	0.22		S	E	4	108				
8	0.26		S	F	4	131				
9	0.74		S	F	4	76				15%
10	0.75		M	F	4	300				
11	0.76		S	F	4	185				16%
12	0.29	0.30	M	Hh	4	344				
13	0.23		M	A	4	240				15%
14	0.27		S	A	4	136				
15	0.83		S	F	4	33				
16	0.25		S	S	4	127				
17	0.28		S	S	4	140				
18	0.35	0.36	S	A	5	78				
19	0.70		S	A	5	45				
20	0.77		S	A	5	59				
21	0.37		S	F	5	101				
22	0.38		M	F	5	213				
23	0.39		S	F	5	114				
24	0.40		S	F	5	119				
25	0.41	0.42	M	F	5	413				
26	0.87		S	F	5	45				
27	0.88		M	F	5	293				15%
28	0.71		S	F	5	113				
29	0.72	0.73	M	F	5	227				
30	0.85		S	F	5	31				
31	0.84		S	R	5	16				
32	0.85		M	A	6	383				
33	0.32		S	F	6	34				
34	0.84		M	F	6	320				
35	0.31		S	Hh	6	35				17%
36	0.34		S	S	6	39				17%
37	0.43		S	A	7	54				
38	0.45		S	A	7	66				14%
39	0.46		S	A	7	84				13%
40	0.56		S	A	7	72				14%
41	0.57		S	A	7	88				12%
42	0.44		S	F	7	84				13%
43	0.87		S	R	7	11				
44	0.88		S	R	7	12				
45	0.11		S	A	8	78				13%
46	0.12	0.13	S	A	8	93				
47	0.47		S	A	8	68				
48	0.53		S	F	8	46				15%
49	0.54		S	F	8	116				
50	0.55		S	F	8	131				18%
51	0.58		A	F	8	1,108				18%
52	0.82		M	F	8	360				
53	0.83		M	F	8	518				
54	1.34	1.36	M	F	8	237				
55	1.25		S	A	9	78				
56	1.31		S	A	9	49				
57	1.32		S	A	9	40				15%
58	1.36		S	A	9	150				15%
59	0.51		M	F	9	247				
60	0.52		S	F	9	67				
61	1.26		S	F	9	78				
62	1.33		S	F	9	118				15%
63	1.81		A	F	9	2,088				
64	0.50		M	Hh	9	334				17%
65	1.22	a	M	Hh	9	606				
66	1.24		S	Hh	9	79				
67	1.22		A	S	9	3,082				
68	1.37		S	S	9	79				
69	0.48		S	S	9	47				
70	1.23		S	S	9	59				17%
71	1.38	a	A	S	9	1,082				

72	0.21		S	A	10	47				12%
73	0.49		S	A	10	28				14%
74	0.04		S	E	10	61				
75	0.06		S	E	10	61				
76	0.10		S	E	10	102				
77	0.14		S	E	10	45				
78	0.20		S	E	10	45				
79	0.17		S	F	10	45				
80	0.03		S	Hh	10	61				18%
81	0.08		S	M	10	61				
82	0.01		S	F	10	61				
83	0.05		S	F	10	61				
84	0.09		S	F	10	20				
85	0.16		S	F	10	45				18%
86	0.19		S	F	10	45				
87	0.02		S	R	10	61				
88	1.01		M	R	10	274				
89	1.02	a	S	R	10	184				18%
90	1.02		S	R	10	196				
91	1.03		M	R	10	260				20%
92	1.04		M	R	10	327				
93	1.05		S	R	10	151				
94	1.20		S	R	10	66				
95	1.21		S	R	10	88				13%
96	0.07		S	S	10	61				
97	0.18		S	S	10	45				
98	1.27		S	S	10	79				18%
99	1.28		S	S	10	79				14%
100	1.29		S	S	10	79				
101	1.30		S	S	10	59				
102	1.35	a	M	S	10	458				19%
103	1.15		S	F	11	45				
104	-1.01	KIOSK	S	M	11	20				
105	1.06		S	R	11	34				19%
106	1.07		S	R	11	59				
107	1.08		S	R	11	49				12%
108	1.09		S	R	11	56				
109	1.12		S	R	11	177				14%
110	1.14		S	R	11	89				16%
111	1.15		S	R	11	89				13%
112	1.16		M	R	11	286				14%
113	1.18		M	R	11	305				15%
114	1.10		M	R	12	244				
115	1.11		S	R	12	72				16%
	2.00		A	Hy		18,108				

Property 'To'	Leasable sq.m.:	21,606
	Total of shops:	89
	Vacant units:	8

12 Spatial Levels

	Unit		Type	Branche	Level	SQM				Effort Index
1	1.23		M	S	1	822				12%
2	1.21		S	E	2	164				7%
3	2.08		M	F	2	872				12%
4	1.22		S	F	2	133				6%
5	2.07		M	F	3	268				13%
6	2.09		A	F	3	1,220				16%
7	1.20	b	S	A	4	54				18%
8	2.10		S	A	4	102				12%
9	2.11		S	F	4	85				9%
10	1.20	a	S	R	4	60				7%
11	1.09		S	A	5	72				14%
12	2.29		S	A	5	32				9%
13	1.11		S	E	5	49				14%
14	1.18		S	E	5	49				9%
15	1.18		S	E	5	48				9%
16	2.06		A	F	5	1,856				9%
17	2.12		M	F	5	694				7%
18	2.30	2.31	S	F	5	32				9%
19	2.32		S	F	5	124				14%
20	1.07		M	Hh	5	250				8%
21	1.08		S	F	5	129				15%
22	1.10		S	F	5	49				15%
23	1.12		S	F	5	50				16%
24	1.14	1.15	S	F	5	65				8%
25	1.17		S	F	5	62				9%
26	1.06	b	S	S	5	152				12%
27	1.13		S	VAC	5	56				9%
28	1.19		S	VAC	5	49				9%
29	3.11		S	VAC	5	60				9%
30	2.15		S	A	6	131				9%
31	2.04	(+sup)	A	F	6	1,500				12%
32	2.13		S	F	6	61				16%
33	2.14		M	F	6	257				17%
34	2.16	(+sup)	A	F	6	1,827				9%
35	2.24		S	F	6	76				9%
36	2.26		S	F	6	97				12%
37	2.26		S	F	6	150				13%
38	2.27		S	F	6	44				8%
39	2.28		S	F	6	95				18%
40	2.33		S	F	6	150				9%
41	2.35		S	F	6	98				12%
42	2.05		M	Hh	6	355				10%
43	3.08		S	R	6	184				9%
44	3.12		S	R	6	95				17%
45	3.13	a	S	R	6	117				15%
46	1.06	a	M	S	6	377				8%
47	2.36		S	S	6	67				7%
48	2.34		S	VAC	6	46				9%
49	3.09	3.10	M	VAC	6	213				9%
50	2.20	a	S	A	7	38				7%
51	2.03		M	F	7	235				8%
52	2.17		M	F	7	351				8%
53	2.18		M	F	7	508				7%
54	2.19		M	F	7	658				8%
55	2.23	b	S	F	7	39				10%
56	2.37		S	F	7	55				8%
57	1.01		S	F	7	95				15%
58	1.02		S	R	7	69				14%
59	3.13	b	S	R	7	135				8%
60	1.03		S	S	7	119				17%
61	2.02	3.02	M	F	8	480				8%
62	3.14		M	R	8	303				7%
63	3.24		S	R	8	146				9%
64	1.05		M	S	8	530				8%
65	2.20	a	S	S	8	83				8%
66	1.04		S	VAC	8	49				9%
67	2.01	b	S	A	8	48				7%
68	2.21		S	A	9	160				13%
69	3.15		S	A	9	74				11%
70	3.16		S	A	9	190				15%
71	3.22		S	A	9	192				9%
72	3.23		S	A	9	146				12%
73	2.20	b	S	F	9	52				9%
74	2.01	a	M	Hh	9	298				8%
75	3.01		M	Hh	9	310				15%
76	2.22	b	S	A	10	22				9%
77	3.21		M	F	10	282				9%
78	2.22	c	S	F	10	18				9%
79	2.22	a	S	VAC	10	58				9%

80	3.19		M	A	11	345				9%
81	3.05		M	F	11	226				15%
82	3.17		M	F	11	245				9%
83	3.18		M	F	11	265				18%
84	3.20		M	F	11	236				17%
85	3.06		M	R	11	406				19%
86	3.26		S	R	11	119				9%
87	3.25		S	VAC	11	120				9%
88	3.03		S	Hh	12	111				9%
89	3.04		M	S	12	411				9%
	1.00		A	Hy	5	11,700				9%

Appendix 4 : Units Complexity

Property 'Ch'

Unit Complexity - SPATIAL NETWORK — PROPERTY 'Ch'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No. 46	5.14 5.13	4.07 a/b 4.06 4.07	4.08 a 4.08 b 5.09 a 5.10 2.01 5.09 4.04 4.05	5.08 5.12 4.09 5.07 5.11 4.03	4.01 b 5.06 5.15 4.10 b 4.11 4.10	5.04 4.01 a 5.05 5.16 5.17 6.05 6.06	5.02 5.18 5.03 5.01 6.03 6.04 6.07 6.08	6.01	6.02 6.09 6.10 6.11 6.12						
Count	2	3	8	6	6	7	8	1	5						

Property 'Mo'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No. 150			0.21 0.22 0.23 0.24 0.25 0.26 a	0.27	0.19 a 0.20 0.28 0.29 0.30 0.31 0.32 0.85 0.86 0.87 1.34	0.15 0.16 0.17 0.18 0.19 0.33 0.34 0.35 0.36 0.79 0.80 0.81 0.82 0.83 0.84 1.18 1.32 1.33 1.35	0.13 0.14 0.78 1.13 1.13 a 1.14 1.15 1.16 1.17 1.19 1.20 1.21 1.21 a 1.22 1.22 a 1.23 1.31 1.36 1.37	0.01 0.03 0.04 0.05 0.06 0.06 a 0.07 0.07 a 0.08 0.09 0.10 0.11 0.11 a 0.12 0.41 0.42 0.63 0.76 0.77 1.11 1.12 1.24 1.25 1.30 1.38 1.38 a 1.39 1.40	0.38 a 0.39 0.40 0.43 0.44 0.46 0.47 0.48 0.50 0.51 0.52 0.75 0.88 0.89 0.90 0.91 0.92 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.26 1.28 1.29 1.41 1.43 1.44 1.45 1.46	0.36 a 0.37 0.61 0.62 0.64 0.65 0.66 0.67 0.67 a 0.68 0.69 0.70 0.71 0.72 0.73 0.74 1.27	0.53 0.60 1.47 1.51 1.52 1.53	0.54 0.57 0,58 0.59 1.48 1.49 1.50	0.55 0.56 1.54		
Count	0	0	6	1	11	19	19	28	34	17	6	6	3		

Property 'Av'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No.		1.23	1.18	1.14	1.09	1.08	1.03	1.02 a	1.01 b	2.03 c	1.01 a	2.01			
86		1.24 a/1.2	1.26 b	1.15	1.10	1.29 a	1.04 1.05	1.02 b	2.04 a	2.27	1.01 c	3.00 k3			
		1.24 b	1.27 a/b+1	1.16	1.11	1.30 a	1.06 1.07	1.02	2.04		2.02 a				
		1.24 c		1.17	1.12	1.31 a	1.20 b	1.37 1.38	2.05		2.02				
				1.20 a	1.13	1.34 a	1.32	1.39	2.24		2.03 a				
				1.21 1.21b	1.19	1.35 a	1.33 1.33b	2.16	2.25		2.03 b				
				1.29 b	1.26 a	1.36 a	1.34		2.26		2.03				
				1.30 b	2.17 2.18	2.09	1.35				2.28				
				1.31 b	2.18	2.10	1.36				2.29				
					2.19	2.11 a	2.06				2.30				
					2.20	2.11	2.07 2.08				2.30				
					2.00 k2	2.12	2.08 b								
						2.13	2.21								
							2.22								
							2.23								
							1.00 k1								
							2.00 L+2/L+3								
Count	0	4	3	9	12	13	17	6	7	2	11	2			

Property 'Am'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No.		1.29 KIOS	1.25	1.24	1.12	1.11	1.10	1.10	1.01	3.33	1.03	1.06 2.05	2.03	3.22	3.18
249			1.26	1.32	1.21 1.22	1.11	1.10	1.12	1.10	3.34	1.04	1.07 2.06	2.04	3.23	3.19
			1.27	1.33	1.23	1.11	1.13	1.14	1.10	1.02	1.05	2.01	3.15	3.25	3.20
			1.28	1.73	1.23 a	1.11	1.16	1.15	1.42	1.45	1.08	2.02	3.24	3.26 b	3.20 a
			1.30	1.74	1.34	1.11	1.17	1.40	1.43	1.46	1.09	3.13	3.17		3.21
			1.31	1.75	1.35	1.11	1.18	1.41	1.44	1.47	1.50	3.14			3.26
			1.76	1.81	1.36	1.11	1.19	1.55	1.54	1.48	2.06 a	3.27			
			1.77	1.81 a	1.71	1.11	1.20	1.56	1.61	1.49	2.07	3.28			
			1.78	1.82	1.72	1.11 a	1.37 1.37a	1.57	1.62	1.51 1.52	2.08 b				
			1.79	1.87	1.89	1.11 b	1.38	1.58	1.63	1.98	2.08				
			1.80	1.88	1.90	1.12	1.39	1.59	1.64	1.99	2.37 a				
			1.83	2.26	1.91 1.92	1.12	1.69	1.60	2.13	2.09	2.38				
			1.84	2.27	2.24	1.12	1.70	1.65	2.14	2.10	2.39				
			1.84 a	2.75	2.25	1.12	1.93 1.94	1.66	2.15	2.11	2.40				
			1.85	2.76	2.67	1.12 1.13	2.18	1.67	2.34	2.12	2.41				
			1.86	2.76 a	2.68	1.12	2.19	1.68	2.35 2.37	2.36	2.42				
					2.71	1.12	2.20	1.95	2.60	2.44	2.43				
					2.72	1.12	2.21	1.96	2.61	2.46	2.47				
					2.73	1.12	2.30	1.97 1.10	2.85	2.46 a	2.48				
					2.74	1.12	2.31	2.16 2.17	2.86	2.49	2.51				
					2.77	1.13	2.62	2.32	2.87	2.58	2.52				
					2.80	1.13	2.64	2.84	2.88	2.89	2.53				
					3.01	2.22 2.23	2.65	3.05	3.06	3.09	2.54				
						2.28	2.66		3.07	3.10	2.56				
						2.29	2.81		3.08	3.11	2.57				
						2.69	2.82 2.83		3.30 KIOS	3.29 KIOS	2.90				
						2.70	2.82				2.91				
						2.78	3.02				3.12				
						2.79	3.03								
						3.32	3.03 b								
						3.33	3.31								
						3.34 3.35	3.37								
						3.36	3.39								
						3.38									
Count	0	1	16	16	23	34	33	23	26	26	28	8	5	4	6

Property 'Ag'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No.	0.81	0.78	0.86	0.22	0.35 0.36	0.31	0.43	0.11	0.48	0.01	1.06	1.10			
115	0.82	0.79 0.80		0.23	0.37	0.32	0.44	0.12 0.13	0.50	0.02	1.07	1.11			
				0.25	0.38	0.34	0.45	0.47	0.51	0.03	1.08				
				0.26	0.39	0.64	0.46	0.53	0.52	0.04	1.09				
				0.27	0.40	0.65	0.56	0.54	1.22 a	0.05	1.12				
				0.28	0.41 0.42		0.57	0.55	1.22	0.06	1.14				
				0.29 0.30	0.67		0.87	0.58	1.23	0.07	1.15				
				0.33	0.68		0.88	0.62	1.24	0.08	1.15				
				0.74	0.70			0.63	1.25	0.09	1.16				
				0.75	0.71			1.34 1.36	1.26	0.10	1.18				
				0.76	0.72 0.73				1.31	0.14	#####				
				0.83	0.77				1.32	0.16					
					0.84				1.33	0.17					
					0.85				1.37	0.18					
									1.38	0.19					
									1.38 a	0.20					
									1.61	0.21					
										0.49					
										1.01					
										1.02 a					
										1.02					
										1.03					
										1.04					
										1.05					
										1.20					
										1.21					
										1.27					
										1.28					
										1.29					
										1.30					
										1.38 b					
Count	2	2	1	12	14	5	8	10	17	31	11	2			

Property 'To'

LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UNIT No.	1.23	1.21	2.07	1.20 b	1.06 b	1.06 a	1.01	1.04	2.01 b	2.22 b	3.05	3.03			
89		1.22	2.09	1.20 a	1.07	2.04 (+sup	1.02	1.05	2.01 a	2.22 c	3.06	3.04			
		2.08		2.10	1.08	2.05	1.03	2.02 3.02	2.20 b	2.22 a	3.17				
				2.11	1.09	2.13	2.03	2.20 a	2.21	3.21	3.18				
					1.10	2.14	2.17	3.14	3.01		3.19				
					1.11	2.15	2.18	3.24	3.15		3.20				
					1.12	2.16 (+sup	2.19		3.16		3.25				
					1.13	2.24	2.23 a		3.22		3.26				
					1.14 1.15	2.25	2.23 b		3.23						
					1.16	2.26	2.37								
					1.17	2.27	3.13 b								
					1.18	2.28									
					1.19	2.33									
					2.06	2.34									
					2.12	2.35									
					2.29	2.36									
					2.30 2.31	3.08									
					2.32	3.09 3.10									
					3.11	3.12									
						3.13 a									
Count	1	3	2	4	19	20	11	6	9	4	8	2			

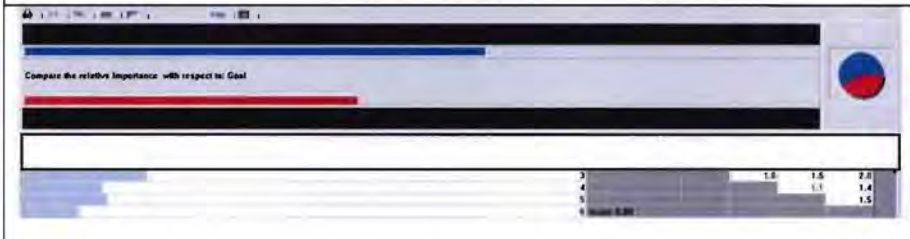
Appendix 5 Results: Expert assessment

Number of respondent:	21
Number of Questions	19
Method:	Expert Choice

Outcome Questions: 1 - 8.

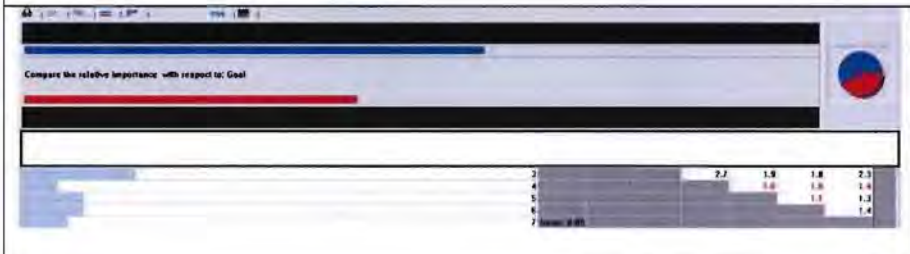
Goal
1 (L: .148)
2 (L: .108)
3 (L: .148)
4 (L: .087)
5 (L: .114)
6 (L: .087)
7 (L: .148)
8 (L: .160)

Outcome Questions: 9, 12, 13.



4 (L: .139) (9)
5 (L: .151) (12)
6 (L: .105) (13)

Outcome Questions: 10, 11, 14, 16.



4 (L: .072) (10)
5 (L: .116) (11)
6 (L: .124) (14)
7 (L: .093) (16)

Outcome Questions: 15, 17, 18, 19.

4 (L: .069)	(15)
5 (L: .129)	(17)
6 (L: .165)	(18)
7 (L: .120)	(19)

Questions:

Part 1:
WHY ARE RETAILERS WILLING TO LEASE SPACE IN A SHOPPING CENTER?

---

1) *Design and Layout (functionality) of the Center.*

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

2) *Tenant mix in the shopping Center.*

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

3) *The Relation between Rent/Sales for retailers in the shopping Center.*

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

PART 2:
WHY WILL INVESTORS INVEST MORE IN A SPECIFIC RETAIL PROPERTY?

---

4) Improved Occupancy Rate over a period of 12 months.

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

5) Improved Sales figures over a period of 12 months.

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

6) Improved Visitors/Footfall figures over a period of 12 months.

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

7) Improved Rental (Fixed and Turnover) Income figures over a period of 12 months.

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

8) From interviewing visitors, results tell us that the center area experience is very positive and people can easily find their way to required shop.

Low importance						High importance
1	2	3	4	5	6	7
○	○	○	○	○	○	○

PART 3:

WHICH OF THE FOLLOWING, INFLUENCES FUTURE PERFORMANCE (INCOME, SALES, FOOTFALL AND/OR VACANCY RATE) OF A SHOPPING CENTER?

---

9) Size (gross Lettable area) of the center in a competitive catchment area.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

10) Age of the Shopping Center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

11) Maintenance standard and conditioning of the Shopping Center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

12) Number of different retail branches (example Fashion, Selective goods, etc.).

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

13) Diversity of unit-size classes (Shop, Mid-Size and Anchor) in the center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

14) Frequency of temporality vacant units, caused by replacing tenants.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

15) Fixed opening hours of the Shops in the Shopping Center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

16) Relation between Fixed and Turnover rent.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

17) Stand Alone shops like a Hypermarket, department store or Do it yourself store, located in the Shopping Center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

18) Market Share in the catchment area of Influence.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

19) Population density of the catchment area of the Shopping Center.

Low influence						High influence
1	2	3	4	5	6	7
○	○	○	○	○	○	○

Weight Criteria: