DELIVERABLE 2.3

Typical functional patterns and socio-cultural context

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Contents

Executive Summary

The CommON*Energy* project aims to reconceptualise shopping centres through deep retrofitting, developing a systemic approach made up of innovative technologies and solution sets as well as methods and tools to support their implementation and to assess their environmental and social impact in a life-cycle approach.

This report is a WP 2 deliverable. The main aim of WP 2 is to define the retrofitting drivers for shopping centres, namely the building demands in terms of energy efficiency motivating intervention and which are the main basis for developing energy retrofitting concepts including technologies, solutions and scenarios for shopping centres. In order to define retrofitting drivers, an analysis which takes into account the buildings as structures for retail and social activity, venues for experience, their interaction with the surrounding infrastructure, and their urban integration or interaction with the local built environment is necessary. These aspects are often described as "socio-cultural and functional aspects" within building certification schemes and methodologies that address the sustainable assessment of buildings. This report provides an analysis of the aforementioned aspects with the intention of defining socio-cultural and functional aspects and derive performance indicators with respect to shopping centres, especially during retrofitting. To achieve this, an understanding is required of:

- who are the users,
- how shopping centres function today, and
- in what ways the physical environment is tailor-made to support the retail activity.

The report considers two main questions:

1) What are the typical functional patterns and socio-cultural aspects found in the European shopping centre building stock today?
2) What potentials exist in relation to the typical functional patterns for reductions in energy use?

To support the analysis the report is divided into three main sections:

1. Chapter 2 is a presentation and analysis of typical function patterns found in and around shopping centres. This includes an analysis of the four main stakeholder groups alongside what is understood as typical retail activity, owners/managers, tenants, customers and community. This is linked to an overview of different shopping centre types.
2. Chapter 3 provides an analysis of architectural and aesthetic quality in shopping centres; data from the questionnaires offers insight into typical features and challenges associated with shopping centre architecture. Four main themes are considered:
   - universal design
   - concept and lay-out
   - functionality and flexibility
   - future architecture and design

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3. Chapter 4, reporting the use of the OPEN HOUSE sustainability assessment tool, provides an analysis of the needs of shopping centres, and a list of indicators which are relevant when planning the retrofitting of shopping centres.

There exist a number of different types of shopping centre, and seven shopping centre types are presented in the report. There exist different types because customer satisfaction and community needs vary. Shopping means different things to different consumer groups. Why and when we shop influences our decisions about where we choose to shop, for example convenience needs, or comparison and leisure needs. Different types of centre provide different solutions to shopping needs and the wide range of shopping centre types suggests that these needs are various. Different types of retail activities have to be taken into consideration because they influence typical functional patterns in shopping centres and may therefore influence retrofitting and design processes in the different categories of shopping centres. Shopping centres are essentially about customer satisfaction and typical functional patterns in shopping centres are about servicing customer needs and achieving customer satisfaction. An effective sustainable retrofit must therefore take into account the need to provide attractive solutions for customers, by considering the:

- maximization of profits for management and tenants
- needs of the surrounding community

Shopping centre architecture is developed for a particular function, supporting retail needs, which in turn lead to customer satisfaction. Within the framework of technology, functionality and aesthetic quality supporting this function there exist potentials for energy use reductions. Shopping centres are subject to regular changes and two aspects are therefore central:

- An integrated design process is needed
- System thinking in terms of optimising of more than one system at the same time

There is a need for a strong focus on adaptation of building, elasticity, as well as a demand for spaces within the walls being adequately general and flexible both in terms of usage and energy consumption. Customer satisfaction remains at the core of running a successful shopping centre owners and managers rate improving architecture and design as one of the main motivations for upgrading a shopping centre, although according to the surveys it may not be the top priority for customers. Sustainable shopping centres of the future should therefore include architectural and aesthetic quality with focus on legibility, durability and energy use. Technology, functionality and flexibility should not be allowed to dominate at the cost of good architecture.

1. Introduction

The CommON*Energy* project aims to "re-conceptualize shopping malls through deep retrofitting, developing a systemic approach made of innovative technologies and solution sets as well as methods and tools to support implementation and to assess their environmental and social impact in a life cycle approach." The project encourages the development of sustainable shopping centres by supporting the energy efficient refurbishment of existing shopping centres and providing knowledge which will further the efficient planning and design of new shopping centres. This aim is achieved with support from seven work packages. Work package 2 is responsible for the development of this report and has as its main focus the defining of retrofitting drivers. The drivers will provide the basis for the development of energy retrofitting concepts, offering amongst other things, constructive technology, an understanding of typical function patterns, socio-cultural aspects, and an understanding of the potentials associated with the interaction with local energy grids.

The CommON*Energy* shopping centre definition describes the various shopping centres types and typical terminology used when talking about the centres, its size, location, and what kind of stores it includes (Bointner, et al., 2014). However this definition does not address the fact that shopping and therefore shopping centres are mainly about fulfilling customer needs; whether these involve experiencing a special event such as a fashion show or a visit to the cinema, or obtaining daily necessities such as milk, butter and jam. In order to define successful retrofitting drivers, an analysis which takes into account the buildings as social arenas, venues for experience, their interaction with the surrounding infrastructure, and their urban integration or interaction with the local built environment is needed. These aspects are often described as "socio-cultural and functional aspects" within e.g. building certification schemes and methodologies that address the sustainable assessment of buildings. Thus the goal is to define socio-cultural and functional aspects and to derive performance indicators to be analysed with respect to shopping centres. To do this an understanding of who the users are, how shopping centres function today and how the physical environment supports the retail activity which takes place there is required.

The way we shop is ultimately intertwined with the way we live, both are prone to constant changes and are influenced by demographic changes, economic forces, consumer forces, technological forces and political forces, some influences are global while others are more regional or even local. One of the greatest forces in modern times, one which also influences consumers, is environmental trends. In the 1980s the general public became aware of a threat against the earth through atmospheric research and the discovery of a "hole" in the protective ozone layer. In addition research on atmospheric pollution suggested that the emission of "greenhouse gases" and CO_2 from industrial production, traffic and agricultural practice have great influence on the earth's temperature. Environmental trends are also retailing issues because these trends *may* be the result of capitalist industrial processes which have been created to produce goods for economic markets (O'Brien et al., 2013). Today we have additional environmental issues to worry about, such as climate changes,

melting polar icecaps and it is still a retail issue, and sustainable retailing requires sustainable shopping centres, as well as customers, tenants and owners/ managers who are engaged in solving these issues.

The most important aspect when designing or refurbishing a shopping centre is to remember its main purpose, namely that it is built to satisfy the needs of shopping and everything that goes with it. Tom Nathan, the manager of the Brent Cross shopping centre, explained, "*Everything we do is customer driven and it is very easy to forget that. In particular if you are an engineer, planner, builder or developer. I have just come from a meeting where we were talking about this. We have a remarkable capacity to never mention the C word customer, and yet everything we do has to be driven by the customer. This is a far wider issue than* sustainability. If you go to the widest possible definition of what a shopping centre is, it's a *place that gives customers what they want*". In order to succeed in the task of optimising energy savings in shopping centres and providing customers with sustainable shopping centres, it is essential that the design team get familiar with and have an overall understanding of typical functional patterns and socio cultural influences, as well as all the technical aspects.

A reader's guide

The report begins with a presentation of the methods used in determining the typical functional patterns and socio-cultural aspects in shopping centres. Chapter 2 is a presentation and analysis of typical function patterns found in and around shopping centres. This chapter is divided into 2 main sections. The first section provides insight into the behaviour and expectations of the different stakeholder groups associated with shopping centres, primarily owners and managers, tenants and customers which have initially been presented in D 2.2 (Woods et al., 2014). In addition to these three main groups an additional stakeholder group is presented, community. The second section provides background information about what is typical retail activity and links this activity to the shopping centre types presented in the CommONEnergy shopping centre definition (Bointner et al., 2014). In Chapter 3 the reader is provided with an analysis of architectural and aesthetic quality in shopping centres, the analysis is supported by data from the questionnaires which was initially presented in D 2.2 (Woods et al., 2014). Chapter 4 provides an analysis of socio-cultural aspects associated with shopping centres through the use of the OPEN HOUSE sustainability assessment tool. This has been adapted to an allow analysis of the needs of shopping centres, and provides a list of indicators which are relevant when planning the retrofitting of shopping centres.

Each section ends with a short summary and conclusions from the results presented. The report concludes with a discussion about the potentials for reductions in energy use associated with the three main areas presented in the report.

2.   Methodology

The data and analysis used in this report is based on three main methods, questionnaires, interviews and literature reviews. In addition the OPEN HOUSE method was used. An overall thorough description of methodology including aims, how of the questionnaires were developed, collection data processes, reviewing literature, conducting in-depth and semi-structured interviews, and the way analysis has been carried out is found in the methodology chapter in the project report 2.2 (Woods et al., 2014). The following sections provide a short summary based on the description found in the aforementioned report, specifying why these aspects were relevant for this report.

2.1.   Questionnaires

Quantitative research methodology has been used to provide data on a broad number of questions relating to sustainability in shopping centres. In the project, questionnaires have been used to provide quantifiable data used as a means to understand, compare and analyse for instance respondents' opinions, experience and preferences. The method used to collect and analyse the data from the questionnaires described in detail in report 2.2 ensures validity and repeatability of the study. The questionnaire data gathered has for the most part been used in relation to systemic inefficiencies described in report 2.2. In this report questions concerning aspects related to architectural and aesthetic aspects have been included. The data was also used during the definition of indicators for OPEN HOUSE.

Owners & Managers   Tenants   Customers

Figure 1 – A consistent colour palette helps identify the three stakeholder groups within the survey results from the three questionnaires.

2.2.   Interviews

The CommON*Energy* project is also investigating aspects that are based on subjective experience and taste, and we are therefore dealing with subjective data that cannot easily be quantified (Woods, et al., 2014); see also Thomsen and Eikemo 2010). The data from the questionnaire does not give in-depth information on the respondents' motivations and personal perceptions. The data from the questionnaires was therefore supported by data from interviews with the three main stakeholder groups, owners and managers, tenants and customers. Qualitative in-depth interviews with the different stakeholders have been performed. Qualitative methods enables the informants to elaborate on the answers they

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give (Neuman, 2000), thus giving more holistic and nuanced information than would otherwise have been presented through quantitative methods. Qualitative methods provide a way to explore attitudes and the causes of attitudes, further addressing complex issues where causal relationships are not easily identified (Kvale, 1996).

2.3. Literature review

The following chapters are all, to some extent, based on literature reviews from the different subject fields associated with the aims of the analysis. A literature review discusses currently published information and allows a researcher to look at previous findings to gauge the validity of the work and its current standing, what the findings are and if new information has come to light. Information from a literature review may be used to discuss new findings and statistics.

The literature review considers the available information about typical functional patterns in today's shopping centres. The review highlights the most relevant points and provides background information for understanding the needs and activities associated with the four main stakeholder groups; customers, tenants, managers and community. Earlier findings and theory also provides information to support the presentation of the seven main shopping centre types defined in this study. The literature review offers different understandings of how typical functional patterns have been studied. In addition to the literature review the analysis of typical functional patterns is based on data provided by the questionnaires and feedback from stakeholders provided during in-depth interviews (Woods et al., 2014).

2.4. OPEN HOUSE: A List of Indicators

In order to assess energy inefficiencies in shopping centres in a structured way and at the same time address potential energy inefficiencies with regards to sustainability indicators, the OPEN HOUSE[1] sustainability assessment tool has been used as a basis in Chapter 5 of this report. The OPEN HOUSE sustainability assessment tool was developed for the evaluation of new office buildings, but the indicators presented in this report serve as a suitable platform and first step in developing indicators for commercial buildings. The primary OPEN HOUSE indicators will be further developed at a later stage of the CommON*Energy* project, and will be adapted and enhanced to match the needs of evaluating the sustainability of refurbishment measures taking place in shopping centres. A further description of the indicators, a brief description of the EU FP7 project "OPEN HOUSE" and the methodology behind developing the indicators is presented in chapter 5.

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[1] http://www.openhouse-fp7.eu/

3.   Typical Functional Patterns in Shopping Centres

3.1.   Aim

The aim in the following chapter is to define and further elaborate on typical functional patterns associated with four main stakeholder groups; customers; tenants; management and community. The purpose is to identify a range of aspects that are significant to the main stakeholder groups, ones that may influence deep retrofitting and design processes in the different categories of shopping centres previously defined in the report 2.1 (Bointner, et al., 2014).

Typical functional patterns may be defined as aspects establishing a framework to understand the activities within the shopping centre and its relationship with the surrounding environment on a day to day basis as well as during different times of the year. The definition of functional patterns provides a basis for understanding the general use of shopping centres, functionally, socially, and technically; but it is not specifically related to energy efficiency or sustainability issues. An understanding of the typical functional patterns found in shopping centres will make it possible to derive relevant performance indicators which are important when planning, designing, refurbishing, locating and managing a shopping centre.

The typical functional patterns identified may also be useful in building management and control strategies. The boundaries of this section will primarily consider two main areas which influence the planning, retrofitting and facility management of modern shopping centres.
- Social and human factors
- Planning and design factors

The retail economic factors are discussed more in-depth in the report 2.2 (Woods, et al., 2014).

To achieve a useful understanding of the everyday life in shopping centres, one which may be used in relation to the majority of users involved in shopping centres, typical functional patterns for four main user groups have been described; customers, tenants, managers, and community. Community has been included in addition to the three main stakeholder groups mentioned in D 2.1 (Bointner, et al., 2014) and D 2.2 (Woods et al., 2014), and which were the focus of the questionnaires. Community is included because it offers a context to understand much of the activity which takes place in shopping centres, for example the catchment area and transport network.

3.2. What are typical functional patterns?

Factors which are influencing the growth and development of shopping centres in Europe are: changes in demographics, an increase in disposable income, the demand for convenience and the desire for a greater selection of goods (ICSC, 2008). These are influencing activities and therefore functional patterns associated with all the stakeholder groups. This is represented by the growth in the number of retail types since the 1950's and 60's when shopping centres first became an established retail form. The large number of shopping centres which now exist means many European customers have a choice of shopping centres when they decide to go shopping. This causes managers and owners to think more about:

- form
- function
- retail mix

When aiming to achieve maximum customer satisfaction in an extremely competitive market.

Shopping centres are about customer satisfaction and therefore an understanding of their typically functional patterns, as well as any attempts at improvements in shopping centres has traditionally started with the customer. There are a number of established models used to analyse activity related to customer satisfaction in shopping centres. Functional congruity models dominate studies about customer satisfaction (Merrilees and Grace, 2003); these are based on the perceived discrepancy between the functional attributes of a shopping centre and the consumer's desires and expectations in relation to those attributes. The problem with this kind of model is that it assumes that consumer satisfaction is directly related to function and ignores the possibility that a certain amount of shopping relates to self-satisfaction. The congruity model may be usefully expanded to include consumption motives and emotions, thereby allowing the inclusion of factors which relate to entertainment and leisure (Merrilees and Grace, 2003).

Amongst retail geographers there has been a tendency to over emphasise the importance of size when considering the functionality of retail systems. The assumption has been that shopping centres exist in order to supply consumers with a large number of goods and services. Early theorists such as Christaller (1933) suggested that larger centres can provide all the functions supplied by smaller centres (Potter, 1980). However this ignores the effect of specialisation and customer desires that are not directly associated with function. Typical functional patterns are therefore based on function, needs and desires related to self-satisfaction and entertainment amongst customers. The retail trade has increasingly shown interest in consumer segments rather than the total consumer group and shopping centres have promoted the fragmentation of consumer patterns by serving the various segments. Speciality shopping centres have developed and the mix of tenants has been managed to the benefit of developers and tenants (Dawson, 1983).

The expectations about what is to be achieved through the activity of shopping are continually changing, and this influences the form and function of shopping centres. Around 1945 shopping was mainly about buying a commodity. During the 1960's and 1970's the focus was on the services available and in the 1990's shopping became about obtaining an

experience. Today, shopping is often associated with collecting aspects of a lifestyle which will contribute to a persons' mental well-being. Shopping has increasingly become about providing a memorable, fulfilling experience and shopping centres aim to provide the environment where this may be achieved (Coleman, 2006). All the aforementioned aspects are part of today's shopping centres, we are still interested in commodities and services, and shopping centres are therefore complex physical and social systems which mean different things to different people. An understanding of the typical functional patterns in shopping centres should take this into account.

3.3. Stakeholder description

In this section about typical functional patterns in shopping centres the main four stakeholder groups associated with shopping centres are presented. These are customers, tenants, managers, and communities.

3.3.1. Customers

The consumer may be described as a "linchpin" within the European economy with consumption accounting for approximately 60% of the GDP in Europe in 2006-07 (ICSC, 2008). Customers: may be broadly defined as those who shop. There is importantly more than one kind of customer, with different habits, desires, aims and spending power. Different customer groups may be broadly categorised by gender, age, life-style habits and socio-economic background. Customer typology is identified according to purchasing method, and this is often characterised elements such as: '*spending power*', 'how to buy' and '*how much time*'. A number of factors drive customer satisfaction and choice of shopping centres (Tronconi, 2010):

- selection of goods or brands
- atmosphere
- convenience
- restaurants
- communal areas
- promotional activities and events
- location

These aspects also define buildings, influencing the design and layout of shopping centres. A comfortable and agreeable atmosphere depends on the building and interior design. Shopping centres are therefore not only functional, but also emphasize design and aesthetic quality. Shopping centres aim to encourage customers to spend more time in the shopping centres, and this is done by providing opportunities to do more than just shop. Retailers have always sought to encourage customers to linger[2]. However the continuing focus on

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[2] See the flaneurs of the 18th and 19th century, Baudelaire, C. (1995) *The Painter of Modern Life and Essays*. London. Phaidon.

these aspects is causing improved architectural quality, with the creation of common spaces which are increasingly large and pleasant, and with introduction of more aesthetic elements which are not just about a more efficient business, but are intended to create a pleasant atmosphere (Malaspina, 2008).

In addition to the main factors mentioned above which drive customer satisfaction, a number of other features influence customer use and interest in shopping centres, though these may vary according to shopping centre type[3]. According to the results of the CommON*Energy* customer survey factors such as location and access to free parking are primary reasons for choosing to shop at a particular centre (Woods et al., 2014). Customers also suggested that a wide range of products was important to their choice of centre (Close to 60 %). The availability of well-known brands was also an influential factor. However few stated that the availability of sustainable products influenced shopping habits in Norway and Italy were the survey primarily took place. Cleanliness was important to customers, as was accessibility. Customers were in general content with the physical character of the shopping centres where the survey took place, but owners and managers emphasise the importance of architectural quality and meeting places when encouraging customer satisfaction.

3.3.2. Tenants

Shopping centres employ more than 4.0 million workers across Europe. The broader retail sector as a whole employs more than 19 million people (ISCS, 2008). Retail activity is therefore an important generator of jobs in Europe. Tenants lease retail and other property in shopping centres; they provide employment in the form of sales jobs and retail management in shopping centres. They also often work with food or the supply of services in the shopping centres, such as hairdressing, child care and shoe repairs. Tenants are often part of a consortium, managed by owners or a management company which provides the rules for common areas and outdoor spaces. The tenant mix in a shopping centre is a key source of shopping centre attractiveness, influencing the price-value ratio, the assortment of goods and services offered and the type of sales personnel employed there (Teller, 2008).

The tenant mix in a shopping centre will vary because of:
- Centre type – for example neighbourhood, regional, factory outlet
- Centre design – enclosed, open, multi-level
- Centre location – motorway intersection, city centre
- Retail environment – new town, shopping district, major metropolitan region
- Customer profile – social economic character of the trade area, ethnicity
(Dawson, 1983)

Tenants or retailers as they are also often known, often locate in one place or in a nearby geographical area. This spatial clustering results in retail agglomerations. The resulting agglomerations take the form of the different types of shopping centres described in CommONEnergy shopping centre definition (see appendix). This results in cumulative

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[3] Shopping centre types are presented in greater depth later in this chapter.

attraction; a given number of stores will do more business if they are located adjacent or in proximity to each other (Teller, 2008). The tenant mix in a shopping centre (number or brands tenants for each commercial type/category) is influenced by the factors mentioned above, and is decided by the owners or management company. The turnover of the stores in a shopping centre is typically 5% per year and the merchandising mix is updated every 5-7 years, depending on the natural turn-over of shops or because of centre renovation (Tronconi, 2010). Customers see the benefit of choosing a retail agglomeration (Teller, 2008). The choice is convenient for the customer because a shopping trip may become multipurpose, providing one solution to a number of retail needs and it also allows the inclusion of entertainment needs in a shopping trip. There are three main retail agglomerations which are based on how they are planned and constructed, which in turn influences how they managed and marketed as integrated entities, these are:

- Evolved retail agglomerations: for example retail clusters in central business districts, inner city locations or main streets. The ownership is fragmented among a number of companies or owners and cooperation amongst retailers and tenants is voluntary.
- Created retail agglomerations: for example regional and super-regional centres, which are consciously planned and built and then are managed and marketed centrally.
- Retail parks are purposely built and developed, but are not always managed and marketed as a single unit.

Retailers benefit from using the same infrastructure or services such as regional traffic infrastructure, public transport systems, building stock, public toilets and cash dispensers. Single retailers benefit from customer traffic not necessarily generated by them, they both compete for and appeal to the same customers (Teller, 2008).

3.3.3. Management

Management works with shopping centre support and operation, for example leasing, brokerage and maintenance. There are five main types of managers and their role and activities within the shopping centre vary according to these different types (CNCC, 2008).

- The *owner*, of the site to be built upon, the building or of the shop (the last one is rare)
- The *developer*, or investor, for example property companies, contractors or businessmen. They are usually independent companies linked to the site where the centre will be built, controlling development until the opening date, and then they hand over the running of the centre to financial or real estate companies.
- The *investor*, institutional investor or private equity; responsible for securing financing for their investments and defining project feasibility. Often they are real estate companies that operate in the retail sector and one of the main objectives is to maintain the property and manage their own real estate assets (including shopping centres). They make use of specific professionals, with a high degree of experience and knowledge about the development of shopping centres.
- *Management companies*, offer specialized support, and work according to a contract. They manage all the functions and the activities associated with the shopping centre.

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🔲 *Facilities company*, provides products and services necessary for the operation of a shopping centre, such as security, cleaning and maintenance of common spaces or outdoor areas

A major aim for both owners and managers is increasing the attractiveness of the shopping centres that they are working with. Improving attractiveness for customers should lead to sales maximization for its tenants. Improving attractiveness and sales maximisation dominates all strategic, tactical and management issues. Shopping centre attractiveness affects the price of rental spaces and how effectively the shopping centre is able to get its tenants to cooperate in marketing efforts. Typical management tasks are (Teller, 2008):

🔲 Choosing tenants
🔲 Making decisions about the location of tenants within the shopping centre
🔲 Marketing activities
🔲 Coordination of infrastructure services, for example security and cleaning, opening hours,
🔲 maintenance – repair and decoration,
🔲 incoming and outgoing traffic, parking and logistics

3.3.4. Community

Community is defined as the social and physical framework around the shopping centre. The community helps to define the type of shopping centre by influencing the planning and developing of shopping centres. For example congested city centres can cause difficulties when potential customers are trying to reach shops and traditional meeting places (squares, bars). This provides a need for easily accessible out of town regional or super-regional centres. The success of a shopping centre often depends of the community around it, but a new commercial centre may be welcomed or greeted negatively by the community. In general, these aspects can be summarized according two main themes (Contin, 2010).

🔲 The opinion in favour of the centre, considers the possibility of re-evaluation of the district and the territory, a new understanding of the place, new services and infrastructure.
🔲 The adverse opinion fears a negative impact on the area, for example an increase in vehicular traffic, a possible crisis for the neighbourhood shops, or a lack of an alternative space for the free time.

There are two aspects which have direct consequences for a successful relationship between the community and the shopping centre, catchment and transport and traffic. These are briefly summarized below.

Catchment area

The catchment area is the geographic area from which a shopping centre attracts its main customers, prospective or existing. There is within the retail sector a maximum distance beyond which a customer will decide not to shop because of transportation costs and time wasted due to travel. The distance that the customer is willing to travel is influenced by their retail needs, and it is not always possible to simply substitute one kind of retail format with

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another even if this happens to be closer[4]. Catchment area analysis allows the identification sales volumes and weak branch locations. Existing locations may also be evaluated Catchment area analysis includes:

- ▣ The definition of the catchment area, for example, accessibility within walking distance to a shopping centre or transport links.
- ▣ Spatial levels of analysis, for example road sections, micro-markets, or zip code areas.
- ▣ Data selection e.g. Market data, customer data, socio-demographic data[5].

On average, people make about 200 shopping trips per year (ISCS, 2006). The choice of shopping centre is influenced by several factors: distance, the retail options available and competition between them, as well as the size of the shopping centres. There are four main trends associated with customer choice (Engebretsen, et al., 2010):

1. The likelihood that a customer will choose a shopping centre decreases the longer the distance the customer has to travel.
2. The larger centre is, the more likely it is that the customer will choose this centre.
3. Competition in the market - the number of centres available will reduce the likelihood that a customer will choose a particular centre.
4. The more dominant the shopping centre is in the market, the more likely it is that customer will choose this centre

The majority of the owners and managers who responded to the CommONEnergy questionnaire stated that the shopping centre that they were associated with was located either in the town centre almost 40 %, or on the urban perimeter (slightly less ca 38%). However a number of respondents stated that the shopping centre was both on the urban perimeter and in the suburbs. This points to a confusion about the terms used, suburbs are often also on the urban perimeter, and to the problem defining what kind of area the shopping centre is associated with. They may be, for example in the cases of Brent Cross, UK and City Syd, Norway, close to the perimeter of the city and major road networks, but they are also associated with suburban housing areas.
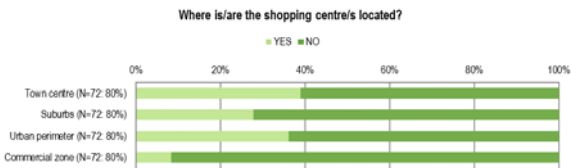

Figure 2 – Owners and Managers questionnaire: "Where is/are the shopping centre/s located?"

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[4] www.autoritedelaconcurrence.fr/.../fiche1_concentr

[5] http://www.zuelch-consulting.de/en/catchment-area-analysis.aspx

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It is therefore more accurate to combine the results from the shopping centres on the urban perimeter, suburbs and commercial zone and state that the majority of shopping centres associated with the questionnaire are located on the outskirts of towns and cities, but the number located in the town centre is significant (Figure 2).

Transport and traffic

Shopping centres often influence the communities close to where they are located. They are part of their catchment areas and they collect customers and workers there. Shopping centres can encourage economic growth in an area, by providing the community with jobs and income. They can also cause economic decline, in for example already established town centre shopping districts. Local, regional and national authorities provide regulations which are intended to support the development of shopping centres and limit the negative impact of the centres on the surrounding community. For example in Norway a number of local municipalities, particularly the larger municipalities, have a municipal plans for localization of retail and other service functions in addition to county council plans and national regulations[6].

Local planning regulations often aim at reducing car traffic. Local municipalities in Norway are worried that the local road network will be overloaded and there is an expectation amongst many municipalities that retail creates traffic (Tennøy, et al., 2010). According to the ISCS the amount of travel associated with retail is growing faster than for any other trip purpose. In 2005 over 60% of shopping trips took place by car. There is a decline in walking to the shops but pedestrians still account for more than a quarter of shopping trips. In addition freight journeys for retail purposes grew by over 15% between 1996 and 2006 (ISCS, 2006). Norwegian statistics from 2010 do not indicate a significant reduction in car based shopping trips. In Norway, 70% of shoppers use cars when doing their shopping. There is most car use in rural areas. Car use decreases and cycling and pedestrian activity increases the closer the shopper lives to the city centre (Engebretsen, et al., 2010). The length of the journey is also reduced if the shopper is resident in the town centre.

In 2006 the ISCS predicted that car travel would continue to be the dominant mode of transport. Over the last 30 years, average journey lengths have increased by nearly 50% for shopping purposes. They also predict that that travel cost will rise because fuel costs and fares are rising, and that this is indirectly caused by growing traffic congestion. Rising labour costs will also influence public transport and freight costs (ISCS, 2006). There is therefore pressure on the transport network around shopping centres and the suggestion is that the pressure will continue to increase. Shopping centres require sustainable transport solutions that relieve pressure on transport systems and are attractive to customer and workers encouraging them to choose other means of transport when travelling to shopping centres.

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[6]   http://www.regjeringen.no/nb/dep/md/dok/veiledninger/2000/t-1317-planer-og-bestemmelser-for-kjopes.html?id=275119

http://www.lovdata.no/cgi-wift/ldles?doc=/sf/sf/sf-20080627-0742.html

Oslo kommune (2003) Kommunedelplan for lokalisering av varehandel og andre servicefunksjoner.

Skien Kommune (2007) Kommuneplanens arealdel Skien kommune 2007-2020.

Figure 3 – Brent Cross, London, UK, buses and bus station

The future localisation of shopping centres must be multidimensional, based on information about the settlement pattern, urban structure in addition to awareness about the centre type, centre size and centre's reach (Engebretsen, et al., 2010).

Parking

Parking is associated with traffic issues around shopping centres, because centres are not only about providing space for retail units they are also about providing space for cars (Bointner, et al., 2014). A Dutch study of 80 town centre shopping centres suggests that the retail industry over estimates the importance of free city centre parking, and that there is no statistical connection between parking capacity and retail turnover. Free parking places are often used by employees whilst they are at work and not by customers. The same study suggests that there is a connection between parking fees and the number of customers. Higher parking fees cause shorter parking times and more potential customers[7]. The report also suggests that parking facilities are not the most important aspect when choosing a shopping centre.

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[7] http://www.citylab.com/work/2012/11/what-cities-stand-lose-fiscal-cliff/3907/ The report specifies that the same results do not apply to out of town shopping centres.

Figure 4 – Parking at Brent Cross, London, UK

According to 2000 respondents on a shopping street in London and in a major shopping centre, a broad and varied range of stores and a good general atmosphere was more important than parking spaces. In addition visitors to fifteen large shopping areas in London where asked what was the most important reason to shop there and only 6 % answered that parking was the most important reason[8].

The results from the CommONEnergy Survey presented in the report D 2.2 (Woods, et al., 2014) suggest that parking is a more important aspect for customers, but that the response to the questions was influenced by the location of the shopping centre where the survey took place (Figure 5). All three shopping centres lie on the outskirts of the cities. More than 30 % of customers said that free parking was important to their choice of shopping centre; however location, the range of products and the price of the products were the most important factors when choosing a place to shop. Out of town shopping is still largely dependent on cars and car parking.

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[8] http://www.citylab.com/work/2012/11/what-cities-stand-lose-fiscal-cliff/3907/

When choosing where to shop, what influences your choice of shopping centre? Select the 5 most important areas:

Figure 5 – Customers questionnaire. Excerpt from the answers to the question "When choosing where to shop, what influences your choice of shopping centre?"

3.4. Retail activity

Retail activity or shopping has an impact on many levels, it provides goods and services and it provides jobs and income within the fields of both production and consumption. It offers economic growth and development on community, regional and national level. This understanding of typical functional patterns therefore has the need for customer satisfaction and an understanding of shopping as a complex social activity as its starting point.

Retail activity is on the rise. In Europe, the retail sector was the 4th fastest growing economic sector between 2000 – 2005, caused by, or coinciding with rapid growth in the European shopping centre industry (ICSC, 2008). Just about everything is growing, the number of customers, the amount that they spend and the size of the shopping centres where the retail activity is taking place. During a weekend a large shopping centre can have over a 100,000 visitors. Only football stadiums, railway stations and airports have a similarly intense use over short periods of time. In addition to customers, shopping centres have to cater for a large number of staff, up to 5000 people depending on the size of the centre (Coleman, 2006). Shopping centres also generate a large amount of traffic, from private vehicles, the delivery of goods and services, and from public transport.

Among the shopping centres who participated in the CommONEnergy survey the majority were middle sized shopping centres, 20,000 up to 80,000 m², with 50 to 100 tenants (Figure 6). A large number of the smaller shopping centres also participated. These results show that although the retail sector is growing, there still exist a large number of smaller and middle sized shopping centres. These shopping centres are catering to needs among customers, which indicate that size is not everything. Shopping centres from Norway and Sweden dominated the survey

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Figure 6 – Owners and Managers questionnaire: Net floor area, Number of visiting customers and number of tenants last year.

3.4.1. Why do we shop and who does the shopping?

Retail activity originates from fulfilling consumer wants, needs and desires in a context of scarcity (O'Brien et al., 2013). A basic description of the activity of shopping is that it is an activity in which a customer browses goods and services that are presented by one or more retailers with the intent of buying a suitable selection. Shopping is also about selecting goods based on quality or price, but consumer response to price is based on an evaluation of the products benefit or utility, which also corresponds to their notion of value (Kyoung-Non & Schumann, 2001). Price is therefore not the only factor which influences what we buy. Shopping is also influenced by desire and imagination which are sustained by what we believe others want from us, and expectations about their response. This may be due to the high points in the gift giving calendar such as Christmas and birthdays, or on attempts to gain the attention of the opposite sex. However expectations may be much more mundane, based on acts of routine devotion (Miller, 1998), which means shopping for and with family or friends, for food and washing powder or for clothes ever growing children.

Shopping means different things to different consumer groups. Women traditionally dominate global spending (Woods et al., 2014)[9]. However shoppers can include all social groups and age ranges (Coleman, 2006). Social trends influence the way different groups are shopping. For instance men are participating more and more in what has the traditionally been considered a female activity (Coleman, 2006). Shopping activities also depend on other variables, such as family structure (O'Brien, et al., 2013)[10]. During consumer targeting, retailers may group customers in distinct age segments and or income ranges/buying power

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[9] Women dominate the data gathered from customers in the CommONEnergy, project see presentation, page 39 (Woods, et al., 2014).

[10] Women shopping with children are likely to behave differently from women shopping without children, or men shopping with children (O'Brien, et al., 2013).

segments. Retailers have realized that non-monetary factors such as accompanying children influence the consumer's choice of where to shop. Tendencies such as more complex family structures, the increase in number of divorces, remarriages, later child birth, more singletons and child-free couples are changing the traditional age segments and regrouping the shopper types and these factors are influencing the way retailers act. Another important factor is that people live longer and are more active later in life[11]. Modern shoppers are attracted to centres that recognize and cater to their specific lifestyle. These aspects promote the introduction of new super-regional centres which offer a multitude of mixed uses including offices, residential units, hotels and theatres, new product ranges and shops and how shops are grouped and presented. By attempting to cater to specialist groups instead of trying to please all tastes, retailers have sought to and developed new markets where none previously existed (O'Brien, et al., 2013).

3.4.2. When do we shop?

We do not shop all the time, there are more and less popular times to shop during a day or week, some groups shop more than others and there are certain periods of the year when more shopping takes place. In Northern European countries most shopping takes place during the four months with least natural lighting; October, November, December and January (Coleman, 2006). This emphasizes the need for good artificial lighting (Woods, et al., 2014). The first enclosed shopping centre was the Southdale centre, in Edina, Minnesota. The enclosing of shopping centres was made possible in the 1950's because of new air-conditioning technology which allowed the enclosing of large spaces, but it was not just the need to develop larger shopping spaces which encouraged enclosed shopping centres, the climatic extremes encountered in Minnesota encouraged the development of ideal shopping conditions all year round. Victor Gruen, the architect who developed the Southdale centre believed that customers who feel comfortable will spend more time shopping and therefore spend more money. Climatic control was also kinder to the merchandise, reducing the effects of sunlight and dust. This aspect is popular among tenants (Coleman, 2006).

Today, shopping centres often offer a climate controlled environment to shop in, and shopping is generally perceived as an indoor experience, leading to high expectations about comfort levels amongst customers (Shove, et al., 2013). Shoppers are therefore no longer always put off by the weather when shopping in shopping centres. However retail activity is still to some extent seasonal, for example Christmas is typically a peak selling season for retailers. In the U.S.A the Christmas shopping season starts as early as September. In the UK and Ireland, the season starts from around mid-November. During the "holiday season" in 2012 the retail industry in the USA generated approximately three million billion U.S. dollars. These sales reflected about 19.3 percent of the retail industries total sales that year and approximately 720 thousand employees were hired to compensate for the holiday

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[11] According to the Future Foundation grouping all people over sixty in one into one homogenous group gives the wrong impression of them (Grosvenor, 2002).

rush[12]. Other periods with shopping focus are the twice yearly sales. Sales are often used to introduce new product, clear out inventories, attract traffic, and to give a temporary lift to retail activity[13].

Familiarity and travel have raised the customer's expectations about the retail experience and what is available, causing an increase in numbers of shopping centres, new types to be developed that are exist alongside the already existing shopping centre types (Coleman, 2006). Shopping centres are competing with other shopping centres and they are competing with the internet shopping. Shopping centres and stores need therefore to offer a better experience than can be found by their competitors. This means a wide range of products and plenty of space to present them attractively. Another way of dealing with this is by providing a wide range of leisure activities. Shoppers do not just shop in shopping centres and leisure is, according to one CommONEnergy informant, a big growth area. He suggested that leisure could be defined as "*food, restaurants, cinemas, and other leisure activities such as gyms, extreme experience.*" The same informant suggested that online activity was a competitor, but that shopping centres are increasingly focusing on activities which cannot be done online.

"*You can't eat online. From a shopping centre perspective it is increasingly important that we encourage people to come here not just to shop and that is almost the very origins of the market or the town centre or the city centre. So we are going back to that, so that we have a more comprehensive offer.*"

Shopping has traditionally been understood as a social activity (Miller, 1998). Shopping centres are social places, where customers can meet friends and family. Shopping centres, by improving the leisure opportunities, are increasing the opportunities for social activity.

Opening hours and Weekends
Opening hours significantly influence the use and management of shopping centres, and these vary considerably between the different EU countries and from shopping centre to shopping centre. In Norway, the opening hours are nationally regulated which limits the shopping possibilities significantly, especially on Sundays, public holidays and late at night[14]. In general, an extension of shop opening hours has proven to have a positive effect on total retail sales (in the sense it increases sales). The increase in consumption resulting from deregulating shop opening hours has been demonstrated by several academic studies (Goos, 2005).
Examples of opening hours from shopping centres participating in the CommON*Energy* project:

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[12] http://www.statista.com/topics/991/us-christmas-season/

[13] http://www.inc.com/encyclopedia/sales-promotion.html

[14] http://www.visitnorway.com

City Syd, Norway	weekdays 09 – 21, Saturdays 09 – 20. Sunday open in December
Brent Cross, UK	weekdays 10 – 20, Saturdays 09 - 20, Sundays 12 - 18
Donauzentrum, Austria	weekdays 09 – 20, Saturdays 09 – 18

According to ICSC's survey of European retail space, the majority of Western European countries have restrictions associated with their opening hours. For example in Austria all stores except the those found in airports and railway stations are closed on Sundays, and opening hours vary according to region. In Greece stores are closed on Sundays except in petrol stations and in tourist areas. In the UK there are few restrictions and 24 hour opening is becoming more common place. In a number of Eastern European countries it is stated that 24 hour opening is increasingly common and that there are few restrictions associated with opening hours (ICSC, 2008).

The owners and managers questionnaire asked respondents what the shopping centre opening hours were per day. Figure 7 provides an overview of the opening hours associated with the data collected through the survey. How many days per week the shopping centres are open is presented and the average number of opening hours on a week day. It shows that few of the Norwegian centres are open on Sundays, whereas the majority of other countries participating in the survey allowed Sunday opening. Average opening hours varied, from 8 to 17 hours a day. This difference in opening hours will influence the number of customers visiting the shopping centres and the potentially the amount of energy used (see chapter 2).
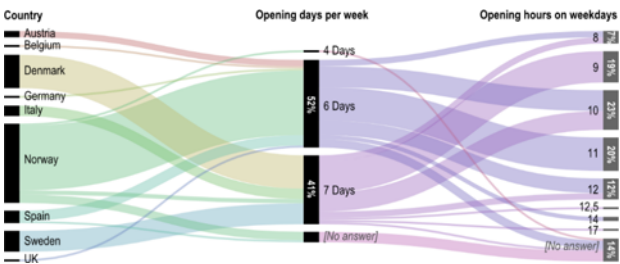
Figure 7 – Opening hours associated with data collected through the survey

Online shopping
Another factor which is a growing international trend and is increasingly influencing when we shop is online shopping. According to Bellman, Lohse and Johnson (1999), people who are more time- constrained tend to buy online more frequently. Catalogues have existed since the late 1800's, and there are similarities to online shopping, but advances in technology allowing online shopping and improved delivery services, have meant that the process of

shopping over a long distance is now much quicker. Advances in technology will not necessarily cause the replacement of traditional shopping activity, but it is influencing how we shop. We may expect technology to be integrated into traditional formats, for example enabling shoppers to be better informed about prices, offers and ranges (Coleman, 2006). A shopping centre manager who was interviewed suggested that shopping centres need to be bigger to allow stores to provide displays that can compete with what people see on the internet, "*they need to have showrooms where they can show the wider range of products.*" Comparison shopping shop may take place virtually on the internet and in real shops. Goods that have been sourced on the internet are increasingly given an in-store testing.

There is no suggestion that the number of shopping trips has been reduced because of online shopping, on the contrary it was suggested early in the report that we are visiting shopping centres more often than before. Part of the reason for this is that shopping is a leisure activity that cannot easily be replaced by online shopping.

3.4.3. Choosing a Shopping Centre

In the next section a number of different shopping centres are selected and presented according to the types described in the CommON*Energy* shopping centre definition (see appendix 1) (Bointner et, al., 2014). The CommON*Energy* definition gives a general overview of what may be expected in terms of for example size, location and kind of store. The shopping centres presented in this section are examples of types which may be found within the general categories presented in the definition. The description of the different types indicates the kind of shopping which takes places, which is expected to influence the choice of shopping centre and functional patterns. The examples used are demo-cases and reference buildings which are part of the CommON*Energy* project, but other relevant examples are also presented.

The customers' selection of where to shop is based on their needs in relation to what they plan to shop for, for example food, (convenience shopping) or clothes and electrical goods (comparison shopping) (see shopping centre terminology in the appendix). In addition the choices are based on the typical functional patterns associated with the shopping centre, for example, opening hours and who they will meet there (customer group, catchment area). Other factors which may influence their choices are location, architecture and design. Traditionally, the most common type is found among the smallest of the three suggested types, the neighbourhood centre, which provides convenience- oriented merchandise, and is located within close proximity to homes and other personal services such as libraries and schools. It is often unnecessary to use a car when shopping at a neighbourhood centre. Pedestrian shopping is an option. On the other end of the scale are the larger regional and super-regional centres which began to be developed during the 1980's. These centres provide opportunities for leisure activities in addition to comparison shopping and are often located on the outskirts of the city, shopping is primarily car-based. The majority of the types described are enclosed shopping centres. A centrally managed enclosed shopping centre is understood as allowing easier management and the saving of resources. This kind of centre also provides greater opportunities for atmospheric or sensory control.

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3.5. Shopping centre types

The following types of shopping centre are presented in the next sections:
- neighbourhood centres
- community centres
- strip malls and precincts
- retail parks and factory outlets
- shopping centre
- regional centre
- super-regional centre
- speciality centre

3.5.1. Neighbourhood centres

The neighbourhood centre's function is to provide convenience goods and personal services. The key tenant is often a supermarket. A local retail function is reinforced by planned services nearby, such a library or primary school. The physical form may vary between for example enclosed air-conditioned spaces or precincts. The sizes range from 5000 to 10,000 m^2. A customer will do daily shopping in a neighbourhood centre; which is often located in close proximity to home and this is understood as saving time. A neighbourhood centre provides a more domestic atmosphere and personal services. International retailers are rediscovering the possibilities associated with small scale local centres. For example, Walmart in the USA has recently announced its intention to dedicate more resources to the opening of neighbourhood stores.

Table 1 – Typology of a neighbourhood shopping centre

Location	Town centre
Typical purpose	Convenience shopping
Type of retail units and tenants	Supermarket or hypermarket and or smaller retail units
Customers and catchment area	Local neighbourhood catchment area

Table 2 – Description of a neighbourhood centre, Byåsen butikksenter, Trondheim, Norway

Byåsen butikksenter, Trondheim, Norway

Location	The Byåsen neighbourhood, a suburb of Trondheim. The population of Trondheim is 182,000.
Typical purpose	Convenience-oriented goods and services
Type of retail units and tenants	REMA 1000 supermarket, 11 stores, café, hairdresser, solarium, bank, estate agent and dentist .
Customers and catchment	Local neighbourhood

3.5.2. The community centre

The community centre is similar in size and function to the neighbourhood centre. The community centre also provides convenience-oriented goods, but with a greater variety of shops than in a neighbourhood centre. The anchor shop is a supermarket or hypermarket, sometimes with a mini-anchor of electronic products or sportswear. It provides a wider range of apparel and other soft goods than neighbourhood centres. The suggested size is 10,000 to 30,000 m^2. In North America community centres were a feature of suburban development and they are not so common in Europe. Community centres which were developed were a product of the planned decentralisation of metropolitan regions. They were often built at a major transport intersection. Shopping is car or public transport-based.

Ex-Officine Guglielmetti, Genoa, Italy
An example of a community centre is the "Ex Officine Guglielmetti" situated in Genoa which comprises of a Coop grocery store covering approximately 4000 m^2. The centre will in the

near future be renovated and expanded. The surrounding area is also under transformation. The stores and services will include a grocery store and other medium sized and smaller shops. The redevelopment will also include a hotel with 150 rooms, parking lots (below and above ground) and a plaza for the neighbourhood citizens.

Table 3 – Description of a community centre, Ex-Officine Guglielmetti, Genoa, Italy

Ex-Officine Guglielmetti, Genoa, Italy	
Location	In the vicinity of the Valbisagno neighbourhood.
Typical purpose	Focus on convenience-oriented goods with a slightly greater variety of shops than in a neighbourhood centre.
Type of retail units and tenants	Supermarket COOP, 20 stores plus a fitness centre
Customers and catchment	Local neighbourhood and Genoa district

San Donato, Florence, Italy
The San Donato centre opened in 2011 in Florence, Italy is a community centre, with a Coop supermarket. It is situated in close proximity to a university and a new residential area. The redevelopment of an existing building functions well in a popular housing district with a high population density. The stores are: a supermarket, an electronic products store and a clothing store (anchor), which all face the central square and a gym and a multiplex theatre.

Table 4 – Description of a community centre, San Donato, Firenze, Italy

San Donato, Firenze, Italy

Location	Florence, Italy. Located in a highly populated area close to a university and newly built residential unit.
Typical purpose	Focus on convenience-oriented goods with a slightly greater variety of shops than in a neighbourhood centre. The anchor shop is a supermarket.
Type of retail units and tenants	The anchor shops are: a supermarket, electronic products and clothing stores, plus a gym and a multiplex theatre.
Customers and catchment	Popular district with a high population density

The merchandising mix at San Donato aims at young people and busy customers; and has a refreshment area inside where people can eat the products they have already bought. This new format has won a EHI Retail Design Awards at the Euroshop2014 (three-yearly exhibition by the retail industry in Dusseldorf, Germany). The centre received the prize because it offers a new model, with innovative values, a new 'social retail' or a supermarket which is open to social, educational and cultural events, and supports 'food education'. It also provides an example of an existing building which has been renovated with a positive impact on the community.

3.5.3. Strip mall and shopping precincts

Another of the smaller shopping centre types is the *strip mall* or *shopping precinct* which often takes the form of an attached row of stores or service outlets managed as a coherent retail entity, with on-site parking usually located in front of the stores. Open canopies may connect the store fronts, but a strip mall does not have enclosed walk ways linking stores. A strip mall may be configured in a straight line or have an "L" or "U" shape. The tenants provide a narrow mix of goods and personal services to a limited trade area.

3.5.4. Retail Park and Factory Outlets

The retail park is located in suburban areas and is an aggregation of medium-large shops, such as hypermarkets, furniture stores or household goods, outlets, department stores, DIY stores. Each store has an independent entrance and the buildings are separated from each other, but may be connected with outdoor pedestrian areas or walkway. There are no closed covered galleries. This layout limits management costs and permits lower rents. Off-street paved parking surrounds the outside perimeter. Retail parks offer leading brands and low prices to customers who accept the lack of air conditioning and the 'open' format.

The factory outlets are similar to the retail parks: they are also an aggregation of multiple stores that sell inventory, returns, and surplus production (not to be confused with the factory shop). Usually the park includes fashion brands and the aim is to reach a large catchment area. These malls encourage fashion tourism and often bring together a number of famous clothing brands.

Table 5 – Typology of Retail Park and Factory Outlet

Location	Out-of-town
Typical purpose	Convenience or household shopping, comparison shopping and leisure
Type of retail units and tenants	Hypermarkets, clothing, electrical, hardware
Customers and catchment area	Broad local and regional catchment area

Parco *Prato centre, Tuscany, Italy

The Parco *Prato centre is a retail park in Tuscany. It brings together a number of brands, a supermarket and services, and it stands next to a multiplex cinema and restaurants. This centre also has a large indoor-outdoor common area, including a large covered arcade and square. The Parco*Prato shopping centre was opened in November 2009. The promoter, Coop Cooperative, has worked in closely with Prato's Municipality to achieve a low environmental impact. The building and plants are designed to reduce overheads and energy consumption. There is a photovoltaic plant of 732.7 kW on the roof, supplying the energy needs of the Coop supermarket (exclusively). The centre provides electric vehicles charging stations; help for people with a disability (for example the 'Easy move' trolley), an area dedicated to the sorting and storage of waste oil, and a multimedia space for young people, called 'We Meet'.

Table 6 – Description of a retail park, Parco Prato, San Guisto, Prato, Italy

PARCO*Prato, Italy	
Location	San Giusto, Prato, Tuscany
Typical purpose	Convenience and comparison shopping, as well as leisure
Type of retail unit and services	30 stores including 3 anchor stores (Coop, Decathlon, Euronics)
Customers and catchment	Prato suburb catchment area

3.5.5. The Regional Centre

This type of centre often focuses on comparison shopping with retailers selling fashion apparel, accessories and shoes, home furnishings, electronics, general merchandise, toys, gifts and other discretionary goods, plus a variety of other services. Its main attraction often is the combination of anchors stores, generally two and sometimes three, for example traditional department stores or large-format discount stores. A regional centre is often enclosed with an inward orientation. Stores are connected by common areas/walkways or "malls", flanked on one or both sides by a number of entrances. Regional centres are commonly multi-levelled with escalators, stairs and elevators between levels. Parking is off-street paved parking surrounding the outside perimeter, on the roof or in multi-storey car parks. A regional centre may be located on the urban outskirts or in downtown, city centre areas of major metropolitan areas.

Table 7 – Typology of a regional centre

Location	Out-of-town shopping
Typical purpose	Comparison shopping
Type of retail units and tenants	One or more department store, plus smaller retail units
Customers and catchment area	Regional catchment area

Sesto San Giovanni, Milan, Italy

An example is the Sarca commercial centre in Sesto San Giovanni, Milan, Italy. It is situated in one of the most densely populated areas in the hinterland of Milan, on one of the main lines/roads between Milan and Sesto San Giovanni. The Centro Sarca catchment area is rooted in the surrounding area, providing shopping and evening entertainment. A Didit AD investigation indicates more than 150.000 visitors/week and almost 8 million visitors/year[15]. There are 85 shops, a large food court, and a multiplex cinema with 10 theatres. The centre is easily reached by tram and metro from Milan. The Centrosarca Consortium in Sesto San Giovanni, in 2014 has particularly aimed to promote loyalty to the mall itself.

Table 8 – Example of a regional centre, Centro Sarca, Sesto San Giovanni, Milan, Italy

Centro Sarca, Milan, Italy	
Location	Sesto San Giovanni, Milan. Good tram and metro connections from Milan.
Typical purpose	Comparison shopping and leisure
Type of retail units and tenants	The centre includes 85 shops and a large food court in addition to a multiplex cinema with 10 theatres.
Customers and catchment	The Centro Sarca is a reference point for shopping and evening entertainment for the local area, and is regionally important with more than 150.000 visitors/week and almost 8 million visitors/year

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[15] source: http://diditadv.biz/i_frequentatori.html

City Syd, Trondheim, Norway

City Syd shopping mall is a suburban car-dependent shopping centre, on the outskirts of the city of Trondheim, which is the third largest city in Norway with a population of 182,000 inhabitants. The E6 motorway which is the main north to south route in Norway runs along the western side of the shopping centre. Opened in 1987 and covering an area of 28,500 m^2, City Syd was redeveloped in 2000 and it is now 38,000 m^2 on three floors, with 1,000 outdoor parking spaces. It currently houses 70 stores.

Table 9 – Description of a regional centre, City Syd, Trondheim, Norway

City Syd, Trondheim, Norway	
Location	Located in the suburban outskirts of Trondheim. It is one of the largest shopping centres in the region and in central Norway. The main access to the centre is via E6.
Typical purpose	Car-dependent shopping centre. Caters to a well-developed market.
Type of retail units and tenants	70 stores including the Coop OBS supermarket
Customers and catchment	4,2 million visitors in 2012. The primary catchment area is the adjacent city of Trondheim, but it has a large catchment area attracting customers from all over central Norway.

3.5.6. The Super-Regional Centre

A super-regional centre is similar to a regional centre, but larger in size, and with a more extensive number of anchors and/or destination retailers. Super-regional centres often include a greater breadth of stores and merchandise, a larger food court and wider range of food stores and services. It may also offer a more comprehensive mix of entertainment activities and dining options. As in regional centres, there are often three or more anchors, including mini-anchors. Physically super-regional and regional centres are similar, they are enclosed, frequently with multiple-levels, with an inward orientation of the stores (and sometimes outward looking as well) connected by common areas/walkways or "malls", flanked on one or both sides by a number of entrances. They are often multi-level with escalators, stairs and elevators between levels. There may be also retail units outside the main centre such as auto service, theatres, restaurants and kiosks. In addition to out-door ground floor level parking, parking may also be structured/decked or even underground to accommodate the sheer size and volume of traffic to the centre with access provided at several locations. Size and type of location differentiate between regional and super-regional centres. Super-regional centres are often situated on mass transit lines (e.g. subway, LRT, bus) and along major highway corridors. Customers will often travel a long way to find their favourite brands or a luxury department store. Super-regional centres may have customers from outside the region.

Table 10 – Typology of a super-regional shopping centre

Location	Out-of-town shopping
Typical purpose	Comparison shopping and leisure
Type of retail units and tenants	Several department stores, plus smaller retail units
Customers and catchment area	Local, national and international catchment

Brent Cross, London-Barnet, UK

Brent Cross is a super-regional centre situated at the junction of the M1 motorway and the London North Circular. The centre is well positioned to serve the 2 million people within its core catchment area who spend just under £9.9 bn on non-grocery items. Brent Cross has one of the largest retail catchments in the UK with an annual footfall of 15 million visitors. Owned by Hammerson and Standard Life, the shopping centre offers 84,200 m^2 GLA with 118 tenants on two floors. Although it is smaller than more recent shopping centres such as the MetroCentre, Bluewater, Lakeside and Westfield London, it has one of the largest incomes per unit area of retail space in the UK.

Table 11 – Description of a super-regional shopping centre, Brent Cross, London, UK

Brent Cross, London, UK	
Location	Serving the local public in north London, but also easily accessible alongside the M1 motorway, serving a core catchment area of 2 million people. Brent Cross has one of the largest retail catchments in the UK
Typical purpose	Comparison shopping
Type of retail units and tenants	84,200 m^2 GLA with 118 tenants. 2 anchors, John Lewis and Fenwick
Customers and catchment	Local and regional area, 15 million visitors per year

Donauzentrum, Wien, Austria

A typical example of a super-regional shopping centre is Donauzentrum located in Wien, one of the largest cities in Europe. The shopping centre hosts 260 shops and a cinema centre. The centre caters to approximately 1.9 million people living within a 60 minute catchment area. The number of visitors yearly amounts to 18.1 million.

Table 12 – Example of a super-regional shopping centre, Donauzentrum, Wien, Austria

Donauzentrum, Vienna, Austria

Location	Located in Wien. 1.9 million people are within 60 minutes radius.
Typical purpose	A super-regional shopping centre with a mix of stores and leisure. The centre features 260 stores and a cinema.
Type of retail units and tenants	Comparison shopping and leisure
Customers and catchment	Broad catchment area, 18.1 million visitors per year

Westfield Stratford City, London, UK

Westfield Stratford City, London, UK is a super-regional centre. It has approximately 300 shops and 70 restaurants/places to eat and drink, 5.000 under-cover parking lots (fee required), a seventeen screen multiplex cinema and two hotels; it is one of the largest urban shopping centres in Europe in terms of size. In terms of retail space it is the 3rd largest shopping centre in the United Kingdom. The MetroCentre, Newcastle and the Trafford Centre, Manchester are larger.

Table 13 – Example of a super-regional shopping centre, Westfield Stratford City, London, UK

Westfield Stratford City, London, UK	
Location	South East region of England, the catchment area has 4 million people. The Centre is connected to Central and Jubilee Underground lines, as well as the DLR, London Overground and mainline services. 58 trains per hour stop at Westfield Stratford City's two railway stations, including high-speed services from Stratford International, to London St Pancras and stations in Kent. The bus interchange and the main Stratford bus station are serviced by 20 different bus routes.
Typical purpose	Comparison shopping and leisure
Type of retail units and tenants	300 stores and 70 restaurants, 17 screen cinema and 350 room hotel. Anchor stores – John Lewis, Marks&Spencer, Waitrose
Customers and catchment	Local, regional and national catchment. In 2012 there were 47 million visitors

3.5.7. Speciality Centre

Speciality centres may closely resemble shopping malls or may be converted from one or more older buildings. They often cater to a tourist market and are found within a town centre (Freathy, 2003). Speciality centres focus on leisure activity drawing crowds for pleasure and recreation as well as to buy. They tend to be on a smaller scale, with retail units which also are smaller than those found in other kinds of shopping centres. They provide a specifically targeted collection of shops in unique environments which are intended to reinforce the character of the shops. Speciality centres started out during the 1980's as a retail environment for an elite end of the market with a greater amount of disposable income. Demographic changes and a change in public opinion, providing an interest in more individualistic shopping facilities has caused a number of speciality centres to be developed (Coleman, 2006). Covent Garden and the Royal Exchange in London, UK are examples of speciality centres.

Table 14 – Typology of Speciality centre

Location	Town centre
Typical purpose	Leisure and convenience shopping
Type of retail units and tenants	Traditional markets, smaller specialist retail units
Customers and catchment area	Local neighbourhood, tourism

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Mercado del Val - Valladolid

An example of a speciality centre is "Mercado del Val" in Valladolid. It is an iron market constructed during the last century and completed in 1882. The centre's architecture and location in the city centre make this building as a good example of a speciality centre.

Table 15 – Description of a speciality market, Mercado del Val, Valladolid, Spain

Mercado del Val

Location	Located in the centre of Valladolid City, Capital of Castilla y Leon region. Valladolid City is the driving force of a medium size urban area including 5000.000 inhabitants and the leading economic and commercial centre of the Northwest of Spain.
Typical purpose	Focus on leisure, pleasure and recreation as well as specialist goods.
Type of retail units and tenants	Small scale retail units
Customer and catchment	Local neighbourhood plus the city of Valladolid

3.6. Typical Functional Patterns: Summary and Conclusions

3.6.1. Summary

Shopping centres are designed to achieve maximum customer satisfaction. The understanding of typical functional patterns has therefore customer needs as its staring point. However typical functional patterns are not only about customers, there are other stakeholders who are important in the everyday activity in shopping centres and when aiming to achieve sustainable shopping centres. This chapter has therefore considered the roles and typical functional patterns associated with four stakeholder groups; customers; tenants; management and community. Stakeholders make up the "Who" in shopping centres, but the chapter has also considered the "What". Shopping centres are complex physical and social structures where a large number of activities take place every day, for example technical, sales related, sanitary, or transport activity. All these activities are all associated with the main activity which is shopping or retail activity, and make up the "What" in shopping centres. The requirements of retail activity have therefore been considered. The "Where" of shopping has also been described, this includes an overview of typical shopping centre types.

3.6.2. Conclusions

The main four main stakeholder groups; customers; tenants; management and community have different but interconnecting roles in shopping centres. Customers are a linchpin within the European economy, and therefore encouraging customers to spend time in shopping centres, so that they continue to support the economy, is a priority. Encouraging customers to choose their shopping centre is what tenants and managers do. Shopping means different things to different consumer groups, but the location, physical environment and the range of products available are primary factors which influence customers when they choose where to do their shopping. The tenant mix is also a factor which influences the choice. Tenants and customers see the benefit of retail agglomeration. A shopping trip to a shopping centre may become multipurpose, providing one solution to a number of retail and entertainment needs. Tenants benefit from using the same infrastructure or services and they benefit from customer traffic which is not necessarily generated by them. Owners and managers support the activities of customers and tenants. They aim to continually improve attractiveness for customers; this in turn leads to sales maximization for its tenants and profits for management and owners. Shopping centre attractiveness affects the price of rental spaces and how effectively the shopping centre is able to get its tenants to cooperate in marketing efforts.

An effective retrofit must therefore take into account the need to provide attractive solutions for customers, which in turn leads to the maximization of profits for management and tenants. The success of a shopping centre also depends on the community around it. A shopping centre provides jobs and services, but it may also have a negative impact on

already existing structures within the community. We also drive more and are consuming energy when travelling to shopping centres. A sustainable retrofit should therefore take into account the needs of the surrounding community.

The majority of us shop, and more and more shopping is taking place in shopping centres which are becoming larger. However we do not shop all the time and there is a wide range of types of shopping centres which are provided and chosen because of the different qualities which they offer. Why and when we shop influences our decisions about where we choose to shop. We have convenience needs, and we have comparison and entertainment needs. Smaller neighbourhood centres provide a convenient local solution, whilst regional and super-regional centres offer a broader shopping and entertainment opportunities, which we are willing to travel further to experience.

All of the aforementioned aspects are part of the typical functional patterns found in shopping centres. Typical functional patterns provide a framework to understand the activities within the shopping centre and its relationship with the surrounding environment on a day to day basis. This is background information which should be taken into account when planning the deep retrofitting of shopping centres, because shopping centres are not just technical systems they are social systems whose everyday functional patterns are based on supporting customer needs and desires, and thereby continuing the retail success of tenants, owners and managers.

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4. Architectural and Aesthetic Quality in Shopping Centres

4.1. Aim

The following chapter describes architectural and aesthetic qualities found in shopping centres in a context with user and occupant expectations and requirements. Relevant results from questionnaires and interviews are included and reflected upon. The activity takes into account the goal to develop future markets where good architecture contributes to low-energy use, attractive trading jobs and meeting spaces. In addition sustainable shopping centres are more than simply energy efficient, they are environments that are accessible to all sides of society irrespective of buying power, social class or disability. The chapter therefore discusses qualities in shopping centres relating to accessibility and universal design.

Architecture at its best is often understood as a combination of technology, functionality and aesthetics[16]. Report D 2.2 (Woods et al., 2014) and other upcoming reports from the CommON*Energy* project will consider the technology in shopping centres and the previous chapter has considered functional patterns in shopping centres, with focus on user behaviour and user needs. This chapter will look further at the functionality of shopping centre architecture, for example flexibility and universal design, as well as considering its aesthetic and architectural qualities.

4.2. Questionnaire

The results in the following chapter include a literature review and excerpts from the CommON*Energy* stakeholder questionnaires. In the following chapter the answers to questions about architectural and aesthetic quality for each of the three stakeholder groups will be presented and discussed in the context of current architectural and aesthetic shopping centres trends. Questions concerning aesthetic quality and architectural quality where purposely integrated in more than one question in order to gather as much information as possible related to use, requirements and expectations associated with the physical environment in shopping centres as a whole (see Figure 8). The aim is to be able to define the useful and irritating aspects and to suggest how these aspects might be further developed and improved upon.

"Architecture" and "Aesthetic pleasure" were two of the factors the customers were asked to consider. The results from the study showed that when asked to choose five out of 18 factors, few customers chose architecture and aesthetic qualities. Overall, 6.3 % chose

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[16] See Vitruvius, Alberti http://architecturaltheory.weebly.com/, http://www.ntnu.no/bpf

architecture and 11% chose aesthetic pleasure (see Figure 9). When asked to rate the "architecture and design" and the "aesthetic quality" of the specific centre, most customers rated their centre as "average" or "good".

When choosing where to shop, what influences your choice of shopping centre? Select the 5 most important areas:

■ YES ■ NO

	0%	20%	40%	60%	80%	100%

Location (N=726: 99%)
Energy efficiency (N=726: 99%)
Green building certification (N=726: 99%)
Low prices (N=726: 99%)
A wide range of products (N=726: 99%)
A wide range of organic/bio or free trade products (N=726: 99%)
Free car parking (N=726: 99%)
Good cycle access and cycle parking (N=726: 99%)
Good access to public transport (N=726: 99%)
Access to battery charging for electric cars (N=726: 99%)
Architecture (N=726: 99%)
Aesthetic pleasure (N=726: 99%)
Indoor climate (N=726: 99%)
Pleasant meeting places (N=726: 99%)
Entertainment opportunities (N=726: 99%)
Legibility/ easy orientation (N=726: 99%)
Accessibility indoors (N=726: 99%)
Well-known brands (N=726: 99%)

Figure 8 – Customers questionnaire: When choosing where to shop, what influences your choice of shopping centre? Select the 5 most important areas:

■ NOT VERY GOOD ■ AVERAGE ■ VERY GOOD ■ DON'T KNOW

Architecture and design (N=699: 95%)
Aesthetic quality (N=700: 95%)
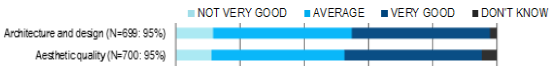
Figure 9 – Excerpt from the customer question, How would you rate the shopping centre in terms of..

Less than 10 % of the customers said yes to improve the "architecture and design". Intriguingly, the Italian and the Norwegian customers placed significantly less importance upon the architecture and aesthetics in shopping centres, relatively to the other nations represented, however few customers from countries outside responded to the customer questionnaire and it is therefore difficult to point to any clear tendencies.

4.3.   What is Architecture and Aesthetic Quality?

Aesthetics and architecture are complementary terms and they define our shopping surroundings at any given time, whether we choose to visit the local market or a regional shopping centre. Architecture derives from the Greek term "arkhitekton" meaning chief and builder, carpenter or mason. Architecture involves the art, practice and product associated with the planning design and construction of buildings and other structures which are often (although not often in the case of shopping centres) looked upon as cultural symbols and works of art (King, 1984).

Aesthetic quality may be understood as the "way things show themselves" and as long as there are visible differences in the way things look then a consideration of the aesthetic quality of art, architecture, nature and numerous other objects/things is inescapable (Danto, 2005). Aesthetic theory is closely associated with our appreciation of art objects and architecture is considered a field within the arts. Enlightenment philosopher Alexander Baumgarten, who first established a clear understanding of what aesthetic theory is, suggests that it is tied to the sensory experience and that a sensory experience does not have to be tied to objects (Baumgarten, 1988)[17]. Aesthetic quality is therefore associated with more than visual quality; sound smell, taste and texture all provide aesthetic experiences. The breath of the aesthetic experience is relevant in shopping centres where the senses are bombarded with sights, sounds, smells and objects to touch which are intend to attract and encourage our desire to shop.

Aesthetic and architectural quality in shopping centres may be associated with a decorative tradition in retail architecture, one that is particularly associated with shopping centre predecessors such as arcades and department stores (see Figure 10). Decorative or aesthetic elements in retail architecture are used to make shopping a pleasurable experience.

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[17] In Baumgarten's writings aesthetic theory is understood as "the science of sensory knowledge" (Baumgarten, 1988).

Figure 10 – Leeds City Market and The County Arcade, Leeds, UK

The majority of us have to shop sometime, and retailers have historically aimed at understanding and satisfying customer needs. The public likes places that look good and shopping centres with a strong self-image have a higher sales turnover, larger catchment area and better rental income than shopping centres with weaker self-images (Dennis et al., 2005). There is however no automatic association between shopping centres and architectural and aesthetic quality. Shopping centres are associated with retail activity, consumption, convenience and comparison. Design, decoration and luxury were associated with the pre-second world war retail experience. A period of economic decline experienced after the Second World War caused a simplification of retail architecture. Shopping centres of the 1960's and 70's were characterized by modernism and functionalism. The 1980's saw an up-swing in shopping centre design and contemporary shopping centres have a much greater focus on architecture and aesthetic quality (Woods, 2012).

Figure 11 – The Bullring, Birmingham, UK 2007 and 1964

Customers, as mentioned earlier, do not focus on architecture when choosing a shopping centre or when looking for aspects to improve. This suggests a lack of interest among customers, they are looking at the goods available when shopping and not the framework in which the goods are sold. It is suggested here that it also points to customer satisfaction; they are content with the physical structure in which they shop. If there had been an obvious problem associated with the three shopping centres where the survey took place, then the customers would have reacted to it.

For example the population in Birmingham has experience two versions of the Bullring shopping centre. The first Bullring shopping centre which opened in 1964 although popular in the beginning became very rundown and unpopular before it was demolished in 1999 and replaced by the presented Bullring shopping centre in 2004 (see Figure 11). Customers in today's Bullring are therefore able to compare the different qualities of the two shopping centres and in 2007 most of the customers saw the new building as an improvement, although many of the customers in the new Bullring had never visited the old shopping centre because of its poor reputation (Woods, 2012).

The response to the questionnaire is coloured by the different stakeholders who responded to it and the interests of those responding. For example Steen & Strøm the owner of 38 shopping centres in Scandinavia, is actively engaged in energy efficiency issues and interested in architecture and design. If we take away their data then for example architecture and design scores lower and cost scores higher as important factors when considering upgrading the shopping centre.

What do you see as the most important areas to be addressed when considering upgrading the shopping centre?
Select the 5 most important areas:
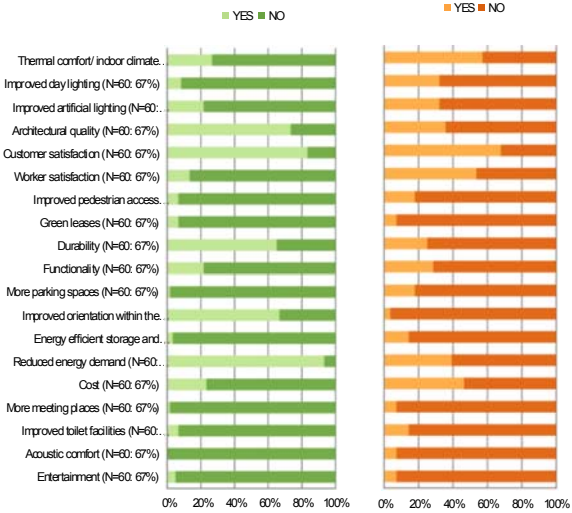
Figure 12 – Owners and managers questionnaire (Green) and tenants questionnaire (Orange): answers to question "What are the most important areas to be addressed when considering upgrading the shopping centre?"

However the tendency to focus on architecture and design, and to place less emphasis on cost was also evident during interviews with stakeholders. The overview of shopping centre types presented in the previous chapter also suggests a tendency towards increasing focus on architecture and design. This should be understood within the context of a competitive shopping centre market. There are a large number of shopping centres to choose from and although architecture is not the first thing customers think of when they choose a place to shop, owners and managers by providing attractive places to shop are using architecture to influence customer choice.

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Customers who responded to the customer questionnaire show little interest in architecture and design, but managers and owners who responded to the CommONEnergy questionnaire considered architecture and design to be one of the five most important factors when considering a shopping centre upgrade (see
Figure 12). There are a myriad of interactive elements and details which combine to create ambiance and individual identity for each centre. Many designs are derivative from the local culture and help to position a retail property comfortably within the context of its surrounding community. The very best shopping centres create a 'sense of place' that fixes that centre in the customer's mind as a special, specific place. Properly considered, these elements combine to define a shopping environment that will sustain itself through time and retail change (Altoon, 1996).

Since the 1970s corporate identities have been increasingly developed through skilful design principles (O'Brian, 2013). The task of differentiating themselves from the opposition leads to the production of unusual shopping environments and shops with individual personalities. While merchandise remains important, producing the right atmosphere to present it in, providing a strong visual identity is crucial. Shopping centres are changing from a fairly homogeneous, mass consumption market to one that is fragmented according to changing tastes, attitudes, aspirations and lifestyles; in this way reflecting a more multi-faceted society. Contemporary consumers have a higher level of education, are more sophisticated and more demanding, forcing the quality, styles, ambience, service and reputation to improve (O'Brian, 2013).

Tenants are, according to the results from the CommONEnergy survey, more interested in architecture than customers, but less interested than owners and managers. Over 35 % chose architecture and design as one of the main reasons for a shopping centre upgrade (
Figure 12). Customer satisfaction scores highest at almost 70 % and thermal quality also gained a high score at almost 60 %. Cost is also important. Customer satisfaction also gained a high score among owners and managers, over 80 % (
Figure 12). It is therefore suggested that when upgrading shopping centres customer satisfaction remains a primary concern, but that one of the actions approved by the stakeholders is improving the architecture and design in shopping centres.

4.3.1. Universal design

The principle of universal design in the design of modern buildings is to ensure accessibility for all. Universal design is the design of products and surroundings in a way which allows their use by everyone, to as great a degree as possible, without special adaption or special design. The use of the term universal design has been given different content by different technical and academic traditions, but the most important aspect which they all include is a more user focused approach to the design process. Universal design aims to find solutions with a high degree of usability, solutions that encourage equality independent of people's differences. A consideration of different experiences and uses of buildings is an important strategy that encourages the development of improved solutions for more people (Kjølle et

al. 2013). The consideration of user design involves not only the needs of those who are physically disabled, but includes a number of other indicators that must be strived for and implemented as far as possible. It supports the functionality of shopping centre architecture, takes into account a broad understanding of who the customer is and avoids excluding anyone from working in a shopping centre.

Customers were asked how they would rate the shopping centre in terms of user friendly design and orientation, and accessibility (ergonomics) and organisation (logistics). The shopping centres in the survey scored high, under 10 % said these aspects were bad.
To the question "what would you improve in the shopping centre", again less than 10 % suggested they would improve these aspects. This suggests that customers in the three shopping centres are not experiencing any problems, if the shopping centres had been inaccessible or difficult to orientate in, the customers would have given them a negative rating.
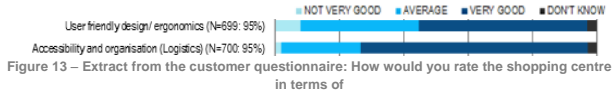
Figure 13 – Extract from the customer questionnaire: How would you rate the shopping centre in terms of

Figure 14 – Extract form the customer questionnaire: "what would you improve?"

Owners and managers and tenants were asked the same question about accessibility "How would you rate the shopping centre/s in terms of accessibility?" In general neither group of respondents are overly critical to the shopping centres accessibility, but tenants are more critical to the accessibility of shopping centres where they work than the owners and managers.

Nineteen different aspects are considered in this question. Amongst owners and managers only ten of these aspects received a score which was "Not Good", but the score was very low. Allergy free and outdoor meeting places were the aspects which met most criticism. Allergy free was the aspect which caused most puzzlement during interviews. The aspects included in the question are based on criteria which are fulfilled in hospitals and schools, and where allergies are an important consideration. Informants from Norway and the UK were not used to thinking in terms of allergies in shopping centres, with one Norwegian exception, where a latex allergy became a problem on Valentine's Day when a large number of red balloons had been hung up in the shopping centre to mark the day. It is therefore surprising that allergies score higher than other aspects, this is perhaps due to respondents thinking that this was an aspect that was not previously considered and should therefore be given more consideration, but this is only supposition.

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Figure 15 – City Syd, Trondheim, Norway, outdoor areas

Figure 16 – Brent Cross, London, UK, outdoor areas

Outdoor meeting places is an aspect both owners and managers (less than 10 %) and tenants are critical to (almost 50 %) (see Figure 17). Tenants were more critical than owners and managers, and this aspect was the one among the 19 areas, that they were most critical of. This may be due to the situation in the shopping centres were the respondents work/ are involved. There were not a large number of respondents to the questionnaires and interviews by tenants, but those that did respond were located at two of the demo-cases. City Syd has no outdoor meeting places and Ex-Officine Guglielmetti also has limited outdoor meeting places. The lack of outdoor meeting places directly affects the customer's response to the shopping centre and their own everyday working conditions. The more critical tone from the tenants may be seen as a result of having direct physical contact with the challenges arising from everyday interaction with the shopping centres, as workers and through feedback from their customers. The majority of the tenants who responded to the questionnaires and who were interviewed are in direct contact with customers on a daily basis. Owners and managers rate the shopping centres in terms of the actions taking place, not just about accessibility but in relation to all the questions where they were asked to rate the shopping centres. They know more about what is planned and what is in place and what the aims are, but there contact with the actual retail activity is often more limited.

Figure 15 and Figure 16 show the outdoor areas outside City Syd and Brent Cross, both shopping centres have at the present time limited outdoor facilities for customers and staff, but both shopping centres have plans to improve the current situation[18].

[18] http://commonenergyproject.eu/ and http://www.hammerson.com/media/press-releases/hammerson-and-standard-life-investments-brent-cross-cricklewood-regeneration-plans-approved/

How would you rate the shopping centre's accessibility in terms of ...

Figure 17 – Owners and managers questionnaire (Green) and tenants questionnaire (Orange): "How would you rate the shopping centre's accessibility in terms of ..." (Rate from 1, not good to 6, very good):

According to respondents to the three questionnaires, the shopping centres involved in the survey do not have serious problems with accessibility. They are legible, and although there are some doubts among tenants about how accessible they are to the visually and hearing impaired, and they are largely accessible to workers and customers with disabilities (see Figure 17). This is good news for the CommON*Energy* aim of achieving sustainable

shopping centres; the results indicate that there is no great need to set in special actions to improve the accessibility in shopping centres. However interviews with informants amongst owners and managers and tenants in Norway and the UK, suggest that the results are not so clear cut. This is because informants tended to be uncertain about what the term accessibility meant, what was meant by some of the nineteen different aspects and how they relate to activity in shopping centres. Some time was spent during interviews, particularly with tenants, explaining what the terms meant and pointing out their relationship to for example universal design. Once the question was explained informants did not become more critical to the shopping centres accessibility, but the lack of knowledge implies that accessibility is not actually an issue in many shopping centres and this suggests that shopping centres are perhaps not as good at accessibility as the results seem to imply.

The Emporia shopping centre, Malmø, Sweden which opened in 2012 is an example of a centre which has placed particular focus on user experience, accessibility and usability during the design and planning process (see Figure 18 and Figure 19). The centre has for example used colour, materials and signage to support legibility and it provides a large number of different solutions which allow customers to rest whilst at the centre, both indoors and outdoors[19].

Figure 18 – Emporia shopping centre Malmø, Sweden, use of colour, materials and signage to encourage legibility

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[19] http://husbanken.no/ , http://www.emporia.se/

Figure 19 – Emporia shopping centre, Malmø, Sweden, seating and resting areas

Universal design in existing buildings may be difficult to achieve to a full extent and it requires knowledge about the obstacles that need adjusting, what they consist of and how grave they are. Identification of obstacles requires complete and accurate records of hazards in the shopping centre. Carrying out such investigation will allow for an optimal universal design to be achieved and such an action should not be underrated despite positive feedback from owners, managers, tenants and customers.

There is a connection between usability, energy efficient technical solutions and aesthetic quality, but technical solutions which aim at achieving energy use reductions are often given priority. However one aspect does not have to exclude the other, achieving sustainable solutions requires that the connections between them are understood during planning (Kjølle et al., 2013). Technically both universal design and energy efficiency are both about building physics and building technology. For example, door and window solutions should fulfil both energy and accessibility requirements. In addition they should offer users aesthetic quality, thereby giving them an all-round positive experience of being in the place, in this case shopping centres.

4.3.2. The Concept and Layout

Form follows function to a large degree in shopping centres. The needs of retail activity and the requirements associated with the different stakeholders and their typical functional patterns actively influence shopping centre architecture.

There are typical types of shopping centres (see chapter 2) and there is a typology associated with the usage that different areas in shopping centres are put to, functional patterns and stakeholder groups are associated with the areas.

Table 16 – Typical Areas in Shopping Centres

Typology	Main usage				Location			
					Common areas	Shops and retail	Behind the scenes	Outdoors
Common Areas	Entrance	Main entrance	Side entrance	From car park	Benches, paths, and play areas	Within retail units and stalls	None	Benches, paths, and play areas
	Sanitary	Toilets	Child care					
	Parking	Entrance	Circulation	Parking				
Restaurants/ cafes	Entrance	Seating	Service	Food preparation	Atrium	Food serving in stores and retail	Kitchens, storage	Pavement cafes
Shops/ Retail/ Other	Entrance	Sales	Service	Staff rooms/ storage	Atrium, corridors	Main retail area	storage	Temporary/ permanent stalls
Behind the Scenes	Entrance	Merchandise	Staff		None	Storage, staff rooms and waste in some retail	Main areas	waste
	Storage	Merchandise	Waste					Delivery storage
	Technical rooms	Service	Staff					
	Circulation	Main horizontal circulation	Vertical circulation					
Outdoors	Restaurants/ cafes	Entrance	Seating	Service	Benches, paths, play areas and other	Temporary or permanent retail units, stalls	Delivery and waste storage	
	Parking	Entrance	Circulation	Parking				
	Resting/recreation	Entrance	Seating	Other				
	Delivery area							

Typologies may vary according to for example size and use found in the different types of centre presented earlier in this report, for example it may be expected that speciality centres will have smaller circulation areas and less storage space than regional centres, and some centres do not have restaurants, staff rooms or atriums. However if we take into account the variations found within the main shopping centre types, there are certain areas that may be considered standard for all shopping centre types and these are presented in Table 16.

This typology of typical areas in shopping centres may be considered in relation to the work concerning systemic inefficiencies in the Report D 2.2 (Woods et al., 2014) and the list of functions developed during the integrative modelling in work package 3. Table 16 describes the five main areas in shopping centres, their usage and different locations within a centre.

The table shows an overlap in usage for example not all retail takes place in clearly defined retail units; for example some takes place in common areas in temporary or permanent units. Restaurants and cafes may be found within retail units and on occasion stores may be found in restaurants and cafes. The table offers insight in the broad range of activities which take place in shopping centres, giving customer satisfaction requires a broad range of services from shops, toilets and deliveries, to technical rooms, child minders, cafes and car parks. This is highlighted by informants at Brent Cross shopping centre, who told us that the shopping centre "*is open 24-7*" and that "*most of our work takes place before the shopping centre is open to customers.*" The range of activity requires a complex and flexible physical structure, one that allows for amongst other things changing retail, demographic and technical needs.

Figure 20 – Brent Cross Shopping Centre Facades

Key points in shopping centre design are directing the pedestrian flow into the shopping centre and around the shopping centre. The retail sales volume of a store is often in direct proportion to the volume of pedestrian traffic passing through it. Centre design aims therefore at optimising customer movement past store-fronts but also avoids excessive customer movement (Dawson, 1983). Traditionally this has resulted in the placement of major anchor tenants at the ends of shopping centres, and entrances to the car parks along the sides of the centre.

The size of contemporary shopping centres provides challenges for shopping centre managers; larger regional and super-regional centres are not as easily legible as smaller or more compact neighbourhood or community centres. Management tries to make things easier by providing a clear arrangement of tenants, setting up directories, and the efficient provision of infrastructure services such as public toilets, cash dispensers and recreational areas. In city centres the location of tenants and services develops over time and may not result in a clear arrangement (Teller, 2008). Shopping centres have therefore the advantage of being planned under development allowing legible typologies which encourage customer satisfaction and maximize contact with tenants.

However older shopping centres which have developed and changed over a long period of time may not have the same clarity of design as more recently developed shopping centres. Brent Cross in North London opened in 1976. When the shopping centre opened it was constructed in a dumbbell shape running east-west parallel to the North Circular Road which

is a major access route in the north London area and brings customers to the shopping centre. The two largest stores (John Lewis and Fenwick) were at either end of the dumbbell shape (they are still in their original locations).

Figure 21 – Brent Cross Shopping Centre Roof

Brent Cross was first expanded and renovated in 1995, with additional shops and restaurants added on an arm running north from the middle of the existing centre. A multi-storey car park replaced the open parking area to the north. The outside of the centre has various facades showing the changes over time that the centre has gone through, and although the shopping centre on the inside, in the customer areas, is well organised and attractive, with one of the largest retail incomes per unit in the UK, the outside comes across as more chaotic. Customer satisfaction is looked after at Brent Cross, but interviews with retail workers and technical personnel show that behind the scenes the functionality of the shopping centre has been reduced over time. There are challenges in relation to the amount of storage space and access to it, as well as technical challenges in relation to the roof space, where new technical installations are continually being added because of the changing individual needs of retail units within the shopping centre. Brent Cross will be part of a multi-million pound redevelopment starting in 2015. This will potentially improve the physical challenges that the centre currently faces[20].

Brent Cross is not the only elderly shopping centre in Europe and it is suggested here that the challenges associated with Brent Cross may be found within a wide number of European shopping centres.

Figure 22 shows that according to the questionnaire answered by owners and managers, 40% of respondents were associated with shopping centres built before 1990 and another 12% were associated with shopping centres built before 2000. Therefore, over 60 % of the shopping centre building stock is over ten years old and will be upgraded in the near future and questions about providing sustainable solutions which are flexible allowing changes over time are appropriate.

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[20] http://www.hammerson.com/property/shopping-centres/brent-cross/

When was the shopping centre/s built?

Figure 22 – Owners and managers questionnaire: When was the shopping centre/s built?

4.3.3. Functionality and Flexibility

A shopping centre is in constant change. The aim in the face of competition is to appear new, different and fresh to customers. Just as merchandise changes from year to year and season to season, and department stores redesign their interior presentations, retail units/stores must be refreshed and sometimes replaced. As the previous Brent Cross example shows, shopping centre buildings are prone to constant flux, adjusting to requirements associated with the retail trade, demography and other influences from the wider society. This influences shopping centre architecture and requires shopping centres to be highly flexible. Efforts to improve energy efficiency and provide sustainable solutions for shopping centres must take this tendency towards regular change into account, by providing systems that may be easily moved, reused or redeveloped.

Studies promoting more adaptable buildings suggest that structural adaptability is more important today than it was 30-40 years ago when terms such as generality, flexibility and elasticity were introduced. Today an increasingly developed information and communication society, as well as major changes in building dynamics due to strong market competition are increasing the need for adaptability (Arge et al., 2002). Adaptable buildings may also be called environmentally friendly buildings, because it requires less resources and energy to adapt them to new user requirements, than buildings that are not accessible for change. However the cost is still the main aspect influencing the choice of solution when owners, managers and tenants look to invest in measures that provide adaptable buildings (Ibid, 2002).

Within the field of facility management a distinction is often made between the technical lifetime of a building's various layers, building elements or zones. British architect Frank Duffy (1990) first defined adaptability in a design characteristic which encompasses time and layers, through a concept called "shearing layers". The concept offers an analysis of buildings and building components in terms of layers of longevity in order to facilitate the accommodation of technological and organisational change. Brand (1994) elaborates on his understanding of buildings as "layers of change", by identifying six layers: site, structure, skin (envelope), services, space plan and stuff. Other literature that has broken buildings into layers distinguishes between plot, supporting structure, building walls and roofs, different installations and fittings, i.e. internal partition walls, furniture etc. (Schmidt 2009). In his book "How buildings learn" Brand notices that some buildings are able to adapt because there is little exchange between the different layers, which means that changes in one area can be

isolated from changes in other regions, i.e. provided that services which change more frequently are not obstructed by slower layers such as the building structure. The provision of easy physical access to systems and components can also greatly ease a transformation process. The interaction of systems and processes within a building to a great extent influences its adaptability in refurbishment processes (Slaughter 2001).

Another approach to increase facility flexibility is through prefabrication of major components which may ease the installation and replacement of those elements over time. By going a step further in the design and enabling interchangeable system components, greater flexibility can be achieved in the placement that allows for re-composition of different components when changes are needed, i.e. by a new tenant. Examples of possible interchangeable components are internal partitions, electrical layouts in raised floors, and fittings in modular ceilings. A third design approach which is often used to improve flexibility in a building is to design components with certain overcapacity, in order to enable changes without replacing, or extending current capabilities (Slaughter 2001). One example is buildings with higher structural capacities than currently required, providing opportunities for building additions to be made at a later date. Another example is oversizing of HVAC systems, to meet future predictions such as changes to the use and functional requirements of conditioned spaces. Designing physical components and systems which can easily grow, or be removed is another option.

Owners and managers who responded to the CommON*Energy* questionnaire were asked if the shopping centre or centres which they were associated with had been upgraded, over 60% answered yes. As Figure 23 shows, it may be assumed that the shopping centres which have not been up-graded are mostly amongst the newer building stock (see figure 24).

Has the shopping centre/s been rehabilitated/ upgraded?

Figure 23 – Owners and managers questionnaire: "Has the shopping centre been rehabilitated/upgraded?"
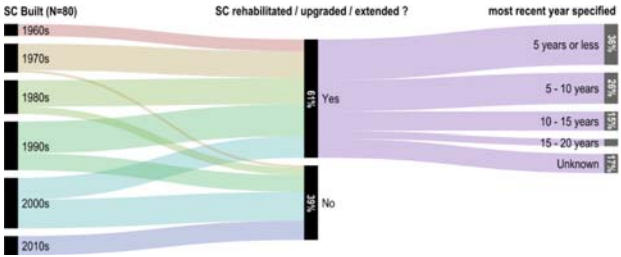
Figure 24 – Owners and managers questionnaire, answers to question "When was the shopping centre last rehabilitated/upgraded?

In addition the respondents were asked when the shopping centres were upgraded. Among those who have renovated/upgraded, the majority were upgraded within the last 10 years. In the open text associated with this question some shopping centre owners and managers mentioned that they regularly upgrade their shopping centres. What the owners and managers mean by an upgrade or rehabilitation varies, a large number mention building extensions and refurbishment, others mention upgrades to ventilation systems and lighting (Figure 25).
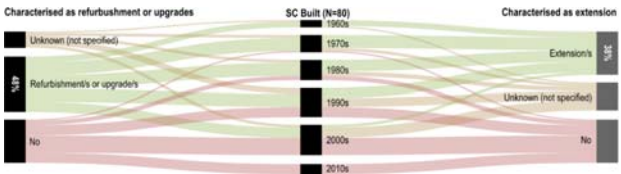
Figure 25 – Owners and managers questionnaire: Interpretation of the follow up question where respondents are asked to describe the actions taken. Several replies could be characterised as multiple refurbishments and extensions to the original centre.

One detailed description points to a number of actions aiming at reduced energy use:

"*Additional insulation of roof/walls. New windows/doors u-value less than 0.8. Upgrading the heating/ventilation system. Heat pump solutions. The heat recovery of condenser. Frequency control (inverters) of heating/ventilation systems. Central building management control solutions (iBEMS). Demand controlled and low energy lighting. Revolving doors. Temperate buffer zones. Air curtains. Automatic snow melting plants. Exterior shading. Demand control of ventilation / heating.*"

This activity is closely associated with the flexible needs of shopping centre buildings, but the results from the questionnaires show no clear relationship between the upgrades completed and energy efficient upgrades.

4.3.4. Future Architecture and Design

The management companies have plans for the appropriate use of the building and its technical systems, providing procedures for efficient everyday maintenance of the building. As part of the CommON*Energy* questionnaires owners and managers were asked "*What are the most important areas to be addressed when considering upgrading the shopping centre?*" and they were asked to choose the 5 most important from a list of 19 possible factors. Their response is based on their managerial interests and suggests existing and future focus for management when working towards retrofitting shopping centres (see figure 12). According to figure 12 customer satisfaction, architectural quality and reduced energy demand, are the areas of importance. Unexpectedly the majority of owners and managers did not choose cost. Durability and improved orientation in the building also scored high. The response suggests that the sustainable shopping centres of the future will have high architectural quality with focus on legibility, durability and energy use. Customer satisfaction will remain at the core of running a successful shopping centre.

Figure 26 – Emporia shopping centre, Malmø, Sweden, the green roof in use

Tenants consider customer satisfaction the most important factor when considering an upgrade, they also emphasise worker satisfaction and thermal comfort. Cost is important, as is reduced energy demand. Architecture and design does not rank amongst the five most important areas when considering upgrading shopping centres (see figure 12). When considering factors within the physical environment which they would like improved tenants are therefore most interested in energy reduction and thermal comfort. Thermal comfort may be associated with customer and worker satisfaction, as tenants see a direct link between their work in the shopping centres and the temperature and air quality.

Tenants were also asked "*Would you expect a decrease in overheads due to reduced energy use/costs within the shopping centre?*" More than 80 % answered yes to this question. They therefore see a direct relationship between energy use and the overheads

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which they pay. Cost is also a factor when considering upgrading and this influences managers and owners when making plans to upgrade a shopping centre, maximizing tenant profits remains an important factor.
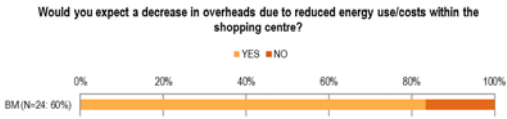

Figure 27 – Tenant questionnaire: Would you expect a decrease in overheads due to reduced energy use/costs within the shopping centre?

4.4. Architectural and Aesthetic Quality in Shopping Centres: Summary and Conclusions

4.4.1. Summary

Architecture encompasses technology, functionality and aesthetics. In this chapter architectural and aesthetic qualities have been considered in context with user and occupant expectations and requirements. The focus has been functionality, continuing the theme started in chapter 2 (typical functional patterns) and architectural and aesthetic quality. Technology has played a role, but will receive more focus in the rest of the CommON*Energy* project. Architecture relates to a built structure encompassing aspects from early planning through design and finalizing the structure itself. Aesthetics involves the way things present themselves and includes visual quality, sounds, taste, smell and texture. Architecture and aesthetics in shopping centres is continuing a long retail tradition which has been, and still is, about pleasing the customer, providing places that are comfortable, legible and enjoyable. Places that encourage the customer to stay a long time and which support the main activity which is shopping. Shopping centre predecessors such as arcades, market halls and department stores were often decorative and luxurious and contemporary shopping centres are continuing this tradition (Woods, et al., 2014). When considering the architectural form of shopping centres we have primarily analysed four main areas, universal design, concept and lay-out, functionality and flexibility and future design. Shopping centres are understood as supporting a wide number of services and activities, requiring a functional design which is flexible, allowing a number of internal and/or external changes over time.

4.4.2. Conclusions

The retail market has changed from a fairly homogeneous, mass consumption market to one that is fragmented according to for example taste and lifestyles, reflecting a various and changing society. Shopping centre architecture needs to meet needs of consumers who are increasingly sophisticated and demanding. During the rehabilitation process it is important to

keep in mind all the four main stakeholders groups, namely customers, management, tenants and community. An integrated design process is needed that takes into account the goal to develop future markets where good architecture contributes to low-energy use, attractive trading jobs and meeting spaces, thereby supporting the activities of all four groups. Universal design is the design of products and surroundings in a way which allows their use by everyone, ensuring accessibility for all. It requires knowledge about the obstacles that need adjusting, what they consist of and requires complete and accurate records of hazards in the shopping centre. Technically both universal design and energy efficiency are about building physics and building technology and one does not have to exclude the other. Sustainable planning requires the consideration of both in tandem, and at the same time keeping in mind aesthetic qualities.

Form follows function in shopping centres, as it does in many other buildings. Importantly in shopping centres form follows ever changing function in shopping centres. There is a need for a strong focus on adaptation of buildings, as well as a demand for spaces within the walls being adequately general and flexible both in terms of usage and energy consumption. More than 60 % of the shopping centre building stock associated with the results from the CommON*Energy* questionnaires is over ten years old, this suggests that a number will be upgraded within the near future and that sustainable solutions should be flexible allowing changes over time. This need for flexibility provides a challenge when providing architectural and aesthetic quality in shopping centres, functionality and technology should not be allowed to dominate at the cost of aesthetic quality because this will potentially reduce customer satisfaction.

Shopping centre architecture is based on a tradition for decoration, luxury and pleasing the customer. Architectural quality was given a high rating amongst a majority of owners and managers when asked what the most importance aspects were when considering a shopping centre upgrade. However customers and tenants do not focus on architecture and aesthetic quality in shopping centres. Amongst customers architecture and design did not score high as a reason for choosing a shopping centre and they were not critical of the architecture in the shopping centres where the survey took place, this was despite the somewhat outdated existing form of City Syd and Ex-Officine Guglielmetti who hosted the survey. It is suggested here that both of the aforementioned shopping centres have an established form and the architecture is known and understood, as long as there are not any declared problems with the architecture the customers will not react negatively to it. In shopping centres where there is greater focus on architecture and design, the response of the customers would perhaps have been different. Customer satisfaction is stated as one of the main reasons for a shopping centre upgrade by owners, managers and tenants. Customer satisfaction will remain at the core of running a successful shopping centre. Shopping centre owners and managers are the stakeholders with the most influence during the decision making process and within the boundaries set by the need to maximise profit; the response to the survey suggests that the sustainable shopping centres of the future will have high architectural quality with focus on legibility, durability and energy use.

5. An Analysis of Socio-cultural Aspects Related to Shopping Malls

5.1. Aim

Within this chapter the socio-cultural aspects related to shopping centres are investigated with regards to energy inefficiencies. Special focus is paid to inefficiencies between owners/managers, tenants/ customers and municipal authorities. The overall goal is to illustrate energy saving potentials while maintaining a good indoor environment and contributing to an efficient and environmentally friendly neighbourhood development through cooperation between owners/managers, tenants and municipal authorities.

5.2. The OPEN HOUSE Project

Sustainability assessments of buildings are gaining attention within the European Union where different assessment and certification systems exist. Therefore, in the EU FP7 research project "OPEN HOUSE[21]" a common European methodology was created to assess the sustainability of new buildings based on existing building certification schemes like the German certification scheme DGNB[22], BREEAM[23] from UK, HQE[24] from France, LEED[25] from US and existing European standards (e.g. EN ISO 13790, 2008; EN 16627, 2013; EN15978, 2011).

In a first step all existing assessment methods at international European and national levels were identified using a questionnaire which was sent to OPEN HOUSE partners. As a result important standards and state-of-the art assessment methods were identified and served as a basis for later analyse. During the next step the OPEN HOUSE indicators were developed by comparing existing international and European assessment methodologies and systems and analysing existing standards concerning the sustainable built environment.

After several workshops a list of 30 respectively 56 sustainability indicators, were divided into sub-indicators and set up for the OPEN HOUSE core system and full system (see OPEN HOUSE deliverable D1.3[26]) based on applicability and relevance. 30 indicators from the sustainability indicators are listed as "core indicators" to be used for "Quick and Basic"

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[21] http://www.openhouse-fp7.eu/
[22] http://www.dgnb.de/
[23] http://www.breeam.org/
[24] http://assohqe.org/hqe/
[25] http://www.usgbc.org/leed/
[26]http://www.openhousefp7.eu/assets/files/D1.3_Definition_of_indicators,_sustainability_performance_level s_and_procedures_to_evaluate_them.pdf

assessments prior to and early in the design process, while the full list of 56 "full system" indicators are proposed for a "Complete" assessment of the building if acquired.

The OPEN HOUSE methodology has been intensively tested in 65 case studies distributed in 35 European countries. The testing showed that the OPEN HOUSE methodology is applicable to both quick and complete assessment. As a result LCA benchmarks on a European level for "Quick and Basic" and "Complete "assessment could be found based on the case studies.

5.3.   List of indicators from OPEN HOUSE

The overall goal is to illustrate energy saving potentials while maintaining a good indoor environment and contribute to an efficient and environmentally friendly neighbourhood development by cooperation between owners/managers, tenants and municipal authorities.

The full list of different OPEN HOUSE indicators was categorized in the following six categories:
- Environmental indicators
- Social-functional indicators
- Economic Indicators
- Technical indicators
- Process Indicators
- Site indicators

5.3.1. Limitations regarding social-functional, technical, process and site-specific indicators and energetic inefficiencies

For a description of energy inefficiencies related to social-cultural aspects only "social-functional", "technical", "process" and "site" OPEN HOUSE indicators are considered. Later in the project (see WP5) all of these indicators are taken into account, adopted and enhanced by other important indicators to the specific needs of refurbishment of shopping centres. Due to the fact that energy plays a major role regarding the overall environmental, but also economic (and social impact), the results from D2.3 serve as a basis for the final overall weighting of the different sustainability indicators of WP5, even when the focus is not just be on energy but on sustainability. In addition to weighting of sustainability indicators the primary OPEN HOUSE weighting and social preferences will be included. Figure 28 illustrates the procedure to identify energy inefficiencies.
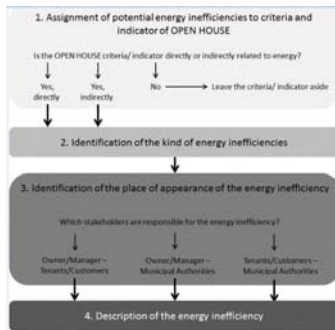
Figure 28 – Process of identifying possible energetic inefficiencies related to different sustainability criteria and indicators

Table 17 shows an excerpt of the OPEN HOUSE indicators. The social- functional and site-specific OPEN HOUSE indicators are summarized. The social-functional indicators are highlighted in red, the technical indicators are highlighted in grey, the process indicators are highlighted in purple and the site-specific indicators are highlighted in orange.

In a first step, the importance of energy inefficiencies related to the specific sustainability indicator is assessed. If the respective indicator relates to energy inefficiencies directly or indirectly the column "Related to energy inefficiencies" is marked by "yes", if the respective indicator does not relate to energy inefficiencies directly the mentioned column is marked by "no".

During this classification energy is not only defined as operational energy but also embodied energy. This means, that energy which is needed within the production phase is taken into account. The classification is based on literature (DGNB, 2012), (Grey, 2005), (Homolka, 2012), (Homolka, 2013), (Shhada, 2011), (Striebich, 2011), (Warrington, 2001) and discussions with experts.

Table 17 – Excerpt of OPEN HOUSE social-functional, technical, process and site specific indicators

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
Social-functional Indicators	2.1 Barrier-free Accessibility	—	Address the needs of people with disabilities, as well as the needs of older persons. Therefore the building must provide enough free places, areaways with	Yes, indirectly

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Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
			special width and length, planar movement areas and ramps (entrance etc.). People with sensoric limitations need tactile elements or inductive audio systems.	
	2.2 Personal Safety and Security of Users	2.2.1 Satisfaction of minimum health and safety requirements at the workplace	Assessing the prevention strategies and the preparedness of a building against accidents, disasters, users' health issues, damages and losses of building items.	Yes, indirectly
		2.2.2 Reduction of damage if an accident should occur		
		2.2.3 Measures preventing building users from crime		
	2.3 Thermal Comfort	2.3.1 Operative temperature	Provision of a comfortable thermal environment supporting productivity and well-being of building occupants, during summer and winter.	Yes, directly
		2.3.2 Radiant temperature asymmetry and floor temperature		
		2.3.3 Draught, air velocity		
		2.3.4 Humidity in indoor air		
	2.4 Indoor Air Quality	2.4.1 Occupancy-based ventilation rates	Determine building functionality and economics. IAQ affects building occupants and their ability to conduct their activities, creates positive or negative impressions on citizens, customers, clients and other visitors to the building.	Yes, directly
		2.4.2 Indoor air contamination with the most relevant indoor air pollutants		
		2.4.3 CO_2 concentration above outdoor level		
		2.4.4 Subjective reaction as classification of the indoor air quality		
		2.4.5 Occurrence of Radon		
	2.5 Water Quality	2.5.1 Constant water supply through the day/ year	Evaluation of water quality in a building is to protect building users' health from the adverse effects of any contamination of water intended for human consumption and produced by water systems installed in the building, by ensuring that it is wholesome and clean.	Yes, directly
		2.5.2 Use of Alternative water supply		
		2.5.3 Ozonation instead of chlorination for water disinfection		
	2.6 Acoustic Comfort	2.6.1. Indoor ambient noise levels in unoccupied staff/office areas	Achieve a low level interference and background noise with speech intelligibility in all rooms to avoid affecting use, health and capability of the users.	No
		2.6.2 Reverberation period		

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
	2.7 Visual Comfort	2.7.1 Availability of daylight throughout the building	Visual comfort means the influence of daylight in buildings respectively in an office, in healthcare and other reasons at any workplaces. The energy demand for illustration and cooling can be influenced.	Yes, indirectly
		2.7.2 Availability of daylight in regularly used working areas		
		2.7.3 View to the outside		
		2.7.4 Preventing glare in daylight		
		2.7.5 Preventing glare in artificial light		
		2.7.6 Light distribution in artificial lighting conditions		
		2.7.7 Colour rendering		
		2.7.8 Blinking and flashing lights		
	2.8 Operation Comfort	2.8.1 Ventilation	Factors that affect or determine the living environment (especially the influence of the user).	Yes, indirectly
		2.8.2 Shading		
		2.8.3 Glare prevention		
		2.8.4 Temperature during the heating period		
		2.8.5 Temperatures outdoor during the heating period		
		2.8.6 Regulation of daylight and artificial light		
		2.8.7 Ease of operation		
	2.9 Service Quality	2.9.1 Availability of services in the building, or direct proximity to the building	Service quality is a measure of how well the service level delivered in a building matches user expectations and provides functional quality in everyday processes of an office building	No
		2.9.2 Service integration in building connected outdoor areas		
	2.10 Electromagnetic Pollution	—	Taking into account the impacts of the electromagnetic pollution at the location.	No
	2.11 Public Accessibility	2.11.1 General public access to the building	Promotes communal life. Various usage stimulates the neighbourhood and increases the communication.	No
		2.11.2 External facilities open to the public		
	2.12 Noise from building and site	—	Calculating the likelihood of noise from the new building and site affecting nearby noise-sensitive buildings.	No

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
	2.13 Quality of the Design and Urban Development of the Building and Site	—	Planning competitions shall take place to attain the best solution for the architectural and constructive tasks. An expert jury can judge the best architectural solutions and integration into the urban context.	No
	2.14 Area Efficiency	—	Area efficiency is an index for the utilization of floor space inside buildings.	Yes, indirectly
	2.15 Conversion feasibility	—	The better a building can be converted with as little time and effort as possible, the better the attributed "Feasibility of Conversion" is evaluated. International market demands high flexibility and adaptability. This is also reflected in the use of a building. A sustainably designed building can easily be adapted to changing requirements with low resource consumption.	Yes, indirectly
	2.16 Bicycle Amenities	2.16.1 Number of bicycle parking spaces available for building users	In order to contribute to the development of an environmentally sound and energy-efficient mobility, people should be motivated and encouraged to modify their transportation habits by constructing new or improving existing infrastructure for bicycles, such as bike parking in the public space inside or outside of a building.	Yes, indirectly
		2.16.2 Distance to bicycle parking system from a main building entrance		
		2.16.3 Existence of facilities for bicycle comfort and security		
	2.17 Material Sourcing	—	Recognize and encourage the sourcing of environmentally and socially responsible products.	No
	2.18 Local materials – socially responsible sourcing	—	Assess whether socially responsible local sourcing has been planned, organized, implemented, documented and promoted.	No
Technical Indicators	4.2 Robustness	—	Is defined as the ability of a structure to undergo disproportionate or progressive collapse from a natural or man-made hazard.	Yes, indirectly
	4.3 Cleaning and Maintenance	—	The ease of cleaning and maintenance of the structure has a high impact on the costs and the environment of a building during the operating phase, extending the life cycle of building elements by optimal maintenance. Areas that can be cleaned easily require lower expenditures on cleansers and cause lower cleaning costs and a lower environmental impact.	Yes, indirectly

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
	4.4 Resistance against hail, storm high water and earthquake	—	To encourage developments in low risk areas regarding possible disasters which can occur from natural hazards such as hail, storm high water and earthquake. When development in high-risk areas cannot be avoided, to assess the protection level of buildings against possible disasters occurring from such natural hazards.	No
	4.5 Noise Protection	4.5.1 Airborne sound insulation with respect to exterior sound	Noise has a big impact on the health and comfort of people, so that appropriate noise protection should be achieved. Benefits of noise protection in office buildings are: avoiding the loss of concentration, protection of privacy and confidentiality, and consideration for people with limited hearing.	No
		4.5.2 Airborne sound insulation with respect to other working areas and to personal working areas (interior walls, ceilings, stairwell walls)		
		4.5.3 Insulation from impact sound with respect to other working areas and to personal working areas (ceilings, stairs, and stairway landings)		
		4.5.4 Insulation from sound created by building services (water system and other services)		
	4.6 Building Shell	4.6.1 Median thermal transmittance coefficients of building components Ü	Minimize the heating and cooling demand to condition building areas, simultaneously ensuring a high thermal comfort and avoiding structural damages.	Yes, directly
		4.6.2 Thermal Bridges		
		4.6.3 Air permeability class (window air-tightness)		
		4.6.4 Amount of condensation inside the structure		
		4.6.5 Air exchange n50 and if necessary q50		
		4.6.6 Solar heat protection		
	4.7 Ease of deconstruction, recycling and dismantling	4.7.1 Effort for dismantling /disassembly	Increasing the ease of deconstruction, recycling, and dismantling, avoidance of waste, in particular by reducing its amount and hazard.	Yes, indirectly
		4.7.2 Effort for sorting/separation		
		4.7.3 Verification of the inclusion of a recycling/disposal concept		

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Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
		with information about construction components in the certification application		
	5.1 Project briefing strategy	5.1.1 Project Brief	Encourages the consideration of sustainability issues during the preparation and planning of the project.	No
		5.1.2 Architectural competition		
	5.2 Integral planning	5.2.1 Multidisciplinary formation of the planning team	Integrated Planning requires project management before, during and after design, involving a multi-disciplinary team, collaborative and iterative work, aiming at optimising the sustainable performances of the building.	No
		5.2.2 Qualification of the Integrated Project Team		
		5.2.3 Design Charrette / Preparation of consultation		
		5.2.4 Integrated planning process		
		5.2.5 Participation of future building users and other relevant stakeholders / Community impact consultation		
	5.3 Building performance targets	5.3.1 Energy target	Planning a sustainable building requires a complex approach to set and manage the targets. The definition of targets and strategies needs a consistent, systematic consideration of sustainability throughout the building's design, construction and management.	Yes, indirectly
		5.3.2 Water target		
		5.3.3 Waste target		
		5.3.4 Optimisation of daylight and artificial lighting		
		5.3.5 Conversion, dismantling and recycling		
		5.3.6 Concept for ease of cleaning and maintenance		
	5.4 Evidence of sustainability	5.4.1 Integration of Sustainability Aspects during Bid Invitation	Assess whether the sustainability issues have been (not, partly or comprehensively) specifically addressed through individual or general requirements (must and target values) and integrated in the bid invitation documents (call for tenders).	No
		5.4.2 Integration of Sustainability Aspects during Awarding		
Process Indicators	5.5 Construction site impact/ construction process	5.5.1 Low-waste and recycling on construction site	The effects of the construction site on the environment are to be minimized while simultaneously protecting the health of all participants.	No
		5.5.2 Low-noise construction site		
		5.5.3 Low-dust construction		

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Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
		site		
		5.5.4 Environmental protection at the construction site		
	5.6 Quality of the execution contractors pre-qualification	—	Assess the quality of executing contractors.	No
	5.7 Quality assurance of construction execution	5.7.1 Documentation of the materials, auxiliary materials, and safety data sheets	The quality reached in the process of the construction execution shall be described, verified, and certified on the one hand to eliminate risks and deficiencies, and on the other hand to demonstrate the achieved quality to third parties.	No
		5.7.2 Measurements for quality control		
	5.8 Commissioning	—	Assess to what extent the advanced commissioning process has been planned, organized, implemented and documented in the building life cycle and whether the commissioning outcomes have been used for system improvements.	No
	5.9 Handover and Performance Evaluation	5.9.1 Handover & Documentation	Ensuring the performance of a building during its operation, thus reducing running costs and improving its environmental performance.	No
		5.9.2 Building Performance Improvement		
Site-specific Indicators	6.1 Risk at the site	6.1.1. Earthquakes	Avoid the development of buildings, roads or parking areas in high-risk areas, in inappropriate areas and to reduce the risk resulting from ground water and man-made-hazards.	No
		6.1.2. Landslides		
		6.1.3. Volcanic eruptions		
		6.1.4. Tsunamis		
		6.1.5. Extreme temperatures		
		6.1.6. Forest fires		
		6.1.7. Drought		
		6.1.8. Floods		
		6.1.9. Storms		
		6.1.10. Avalanches		
		6.1.11. Technological hazard/Chemical plants accidents		
		6.1.12. Technological hazard/Contaminant release and explosions		

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
		6.1.13. Technological hazard/Radioactive contamination from nuclear power plant accidents		
	6.2 Circumstances at the site	6.2.1. Outdoor Air Quality	Assess the conditions at the site which can have a determining effect on the health and well-being of people (stress, reduced productivity, long term health problems).	No
		6.2.22. Ambient Noise Level		
		6.2.3. Soil and building plot contamination		
		6.2.4. Occurrence of Radon		
		6.2..54. Urban Heat Island Effect		
	6.3 Options for Transportation	6.3.1 Accessibility of the nearest railroad station from a main building entrance	Definition of the effective and shortest distance in metres from a main building entrance to local public means of transportation.	Yes, indirectly
		(DGNB)		
		6.3.2 Accessibility of the nearest public local transportation stop (bus, rapid city train, tram, metro) (DGNB)		
		6.3.3 Availability of modern low emission transport options: city bicycle scheme, car club scheme, charging infrastructure for electric/hybrid vehicles, electric/hybrid bus lines		
	6.4 Image and Condition of the Location and Neighbourhood	6.4.1 Visual aspect of the surrounding landscape	Characterise image and condition of the neighbourhood in order to make this information available for a location study.	No
		6.4.2 Potential Synergies		
	6.5 Access to amenities	6.5.1 Vicinity Access to Gastronomy facilities	Measure the number and the vicinity of key amenities to the assessed building. Although this indicator relates to the site, it addresses social issues. The overall purpose is to reward community connectivity thereby helping reduce transport-related emissions and traffic congestion and promoting communal life.	No
		6.5.2 Vicinity Access to Local Supply facilities		
		6.5.3 Vicinity Access to Parks and Open Spaces		
		6.5.4 Vicinity Access to Education facilities		
		6.5.5 Vicinity Access to Public Administration facilities		

Category	OPEN HOUSE indicator	Sub-indicators	Description	Relation to energy inefficiencies
		6.5.6 Vicinity Access to Medical Care facilities		
		6.5.7 Vicinity Access to Sport facilities		
		6.5.8 Vicinity Access to Leisure facilities		
		6.5.9 Vicinity Access to Services		
	6.6 Adjacent media, Infrastructure, Development	6.6.1 Accessibility to networked energy	Alternatives for supply and sanitation shall serve as ecological goals, and financially release cities and communities. Alternate energy concepts (i.e. use of renewable energy sources) shall be suggested to the property owners and the handling of sewer water will be his/her responsibility. Another goal is flood prevention. To achieve property sustainability, certain technical requirements must be met at the site.	No
		6.6.2 Convenience for solar energy		
		6.6.3 Telecommunications connection		
		6.6.4 Rainwater seepage system		

5.3.2. Aspects of energy inefficiencies

After the classification (relation to energy inefficiencies: yes or no), the OPEN HOUSE indicators that are related to potential energy inefficiencies, are described in more detail concerning different aspects of energy inefficiencies. This means that the dependencies of owners/managers, tenants/customers and Municipal Authorities are analysed to illustrate energy saving potentials in shopping centres (see Table 18). The analysis is based on the results of the questionnaires for customers, tenants, owners and managers; literature (DGNB, 2012), (Grey, 2005), (Homolka, 2012), (Homolka, 2013), (Shhada, 2011), (Striebich, 2011), (Warrington, 2001) and discussions with experts.

Table 18 – Aspect of energy inefficiency related to OPEN HOUSE indicators

Category	OPEN HOUSE indicator	Aspect of Energy Inefficiencies
Social-functional Indicators	2.1 Barrier-free Accessibility	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding escalators and elevators are often not considered by owners/managers. => Too much energy is needed (e.g. escalators running during all the opening hours)
	2.2 Personal Safety and Security of Users	Owners/managers – Tenants/Customers: Electronic safety equipment (e.g. surveillance cameras) is often installed by both, tenants and owners/managers, but an overall security concept is mostly missing or not adequate.
	2.3 Thermal Comfort	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding thermal comfort (temperature, humidity,

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Category	OPEN HOUSE indicator	Aspect of Energy Inefficiencies
		velocity, radiant temperature) are often not considered by owners/managers although tenants believe that thermal comfort has a high influence on their working conditions and customer satisfaction. => Over-/underestimation (e.g. open door policy vs. heating/cooling) and choice of inaccurate technical equipment. Owners/managers – Municipal Authorities: Installations in shopping centres according to standards => Energy source according to regional context vs. independent energy source. Tenants/Customers – Municipal Authorities: Tenants/customers' needs are not matching national or local standards and are therefore not considered.
	2.4 Indoor Air Quality	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding indoor air quality are often not considered by owners/managers although it is very important for tenants/customers. => Over-/underestimation (e.g. open door policy vs. heating/cooling) and choice of inaccurate technical equipment => Ventilation rates are not defined by tenants Owners/managers – Municipal Authorities: Installations in shopping centres according to standards => ventilation rates according to standards and not regarding local and regional characteristics Tenants/Customers – Municipal Authorities: Tenants /customers' needs are not matching national or local standards and are therefore not considered (e.g. standard ventilation rates vs. ventilation rates adapted to CO_2 level or number of persons)
	2.5 Water Quality	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding water quality are often not considered by owners/managers. => Consideration of different types of water quality (e.g. black water, grey water, blue water) is needed for different use (energy needed for technical supply, water purification, water pump etc.) Owners/managers – Municipal Authorities: Installations in shopping centres according to standards => depending on the standards different types of water treatment and water uses (e.g. use of grey water) are not allowed (energy needed for technical supply, water purification, water pump etc.) Tenants/Customers – Municipal Authorities: Tenants and customers' needs are not matching national or local standards and are therefore not considered (e.g. standard water usage vs. lower/higher water demand) (energy needed for technical supply, water purification, water pump etc.)
	2.7 Visual Comfort	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding visual comfort are often not considered by owners/managers. => lighting equipment is not tailored to specific tenants needs => too much artificial lighting vs. natural lighting => substructure of the lighting equipment does not match the overall building energetic concept (e.g. suspended ceiling due to lighting needs; no possibility for radiant heating/cooling in ceiling) Owners/managers – Municipal Authorities: Installations in shopping centres according to standards => due to unknown tenants needs, a high security factor for the energy

Category	OPEN HOUSE indicator	Aspect of Energy Inefficiencies
		demand for lighting (and also cooling demand) is foreseen Tenants/Customers – Municipal Authorities: Artificial lighting equipment is not tailored to tenants needs but according to standards => increased energy consumption for lighting and therefore also increased cooling demand
	2.8 Operation Comfort	See also "2.3 Thermal Comfort" and "2.4 Indoor Air Quality"
	2.14 Area Efficiency	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding open spaces and corridors can lead to a reduced area efficiency and therefore to an increase in the energy demand
	2.15 Conversion feasibility	Owners/managers – Tenants/Customers: The conversion feasibility is often not considered during planning and also often not known in early planning phases. => increased energy demand due to security factors => inadequate technical equipment and energetic concept
	2.16 Bicycle Amenities	Owners/managers – Tenants/Customers: Often bicycle parking and special bike paths are not considered and supported by the owners/managers as the majority usually travel by car/motorbike to the shopping centre => increased energy demand for transportation Tenants/Customers – Municipal Authorities: Sometimes the infrastructure (e.g. bicycle paths) is not provided by the municipal authority
Technical Indicators	4.2 Robustness	Owners/managers – Tenants/Customers: The aspect "robustness of building products" is two sided. On the one hand a more robust product can lead to a decrease in the energy demand for replacement. On the other hand, due to the short intervals of tenants' retail shopping concepts (often about 5 years) sometimes a less robust product would be also sufficient
	4.3 Cleaning and Maintenance	Owners/managers – Tenants/Customers: Tenants/customers' needs regarding cleaning and maintenance can often lead to inefficiencies. Due to the fact, that tenants profit from low operational energy for cleaning and maintenance and not the owners/managers directly, this issue is often not addressed and therefore not optimized over the lifecycle of a building
	4.6 Building Shell	See "2.3 Thermal Comfort"
	4.7 Ease of deconstruction, recycling and dismantling	Owners/managers – Tenants/Customers: Ease of deconstruction, recycling and dismantling is often not considered. Due to the short lifetime of tenants' retail shopping concepts (often about 5 years) the energy needed for End of life can play a role regarding the overall energy demand Owners/managers – Municipal Authorities: Due to non-existent End of life concepts for materials, often there is an increase in the energy demand for municipal bodies
Process Indicators	5.3 Building performance targets	Owners/managers – Tenants/Customers: Due to missing building performance targets (waste, energy, etc.) and effective monitoring systems, energy inefficiencies can occur. The energetic building concept cannot be adapted based on the energy consumption of the tenants

Category	OPEN HOUSE indicator	Aspect of Energy Inefficiencies
Site-specific Indicators	6.3 Options for Transportation	Tenants/ Customers – Municipal Authorities: Reduced energy needed for transport due to public transport systems. Public transport infrastructure is sometimes missing as the customers often use the car/motorbike to travel to the shopping centre.

5.4. An Analysis of Socio-Cultural Aspects Related to Shopping Malls: Summary and Conclusions

5.4.1. Summary

There are some social-cultural and functional aspects that can result in energy inefficiencies. Most of these aspects can be improved through good cooperation between owners/managers, tenants/ customers and municipal authorities. Therefore during the early planning stages of refurbishment projects pre-studies should be performed (economic studies related to the kind of customers and their expectations, energetic studies, studies regarding the infrastructure, etc.). These studies can serve as a basis for design and refurbishment decisions. Also flexibility and future events should be addressed in those studies in order to provide a picture of potential future tendencies and their effect on the energetic building concept.

The evaluation of the questionnaires for customers, tenants and management/owner show some contradictory results. Therefore it is very difficult to take these into account when considering energy inefficiencies. On the one hand most tenants do not expect a decrease in overheads due to reduced energy use; on the other hand most tenants think that the main reasons for an energy efficient upgrade are the reducing overheads (see Figure 29 and Figure 30).
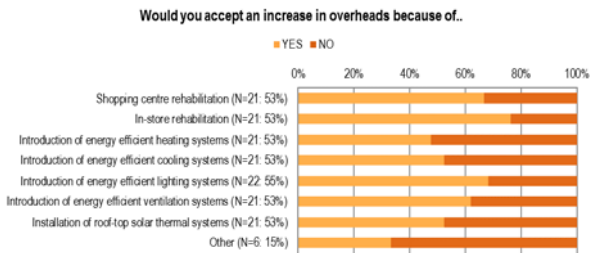
Figure 29 – Tenants questionnaire: Would you accept an increase in overheads because of:

Figure 30 – Excerpt from the tenants questionnaire: 12.   **What in your opinion are the main reasons for an energy efficient upgrade of store facilities?**

Nevertheless the results of the questionnaires indicate a high interest concerning energy efficiency both by customers (energy efficiency in shopping centre is very important to almost 80% of respondents) and tenants and their willingness to introduce e.g. an energy efficient heating system, cooling system etc. For example most tenants (almost 70%) are willing to accept an increase in overheads due to the introduction of energy efficient lighting systems (Figure 31).
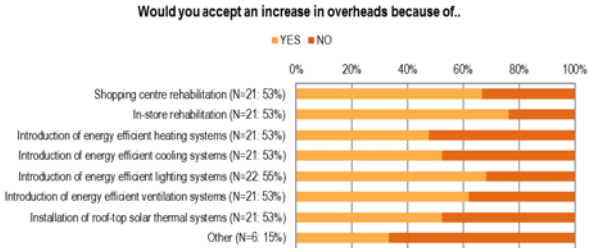

Figure 31 – Tenants questionnaire: Would you accept an increase in overheads because of:

5.4.2. Conclusion

In order to avoid the previously stated energy inefficiencies, a change in the planning of the refurbishment of shopping centres is proposed. Due to the high complexity and large number of persons involved, an integral planning approach should be chosen. An Integral planning approach refers to the entire life cycle of a shopping centre. It begins with the development of the refurbishment of a shopping centre and ends with the demolition, HVAC, etc. Thereby, single problems are not solved in isolated way, but in context with other important topics. This integral planning team should not only consist of a technical experts (architects, engineers), but also – depending on the topic, and if possible – tenant representatives and the municipal authorities should be involved in the decision making process in order to try to satisfy the requirements of all parties. The greatest potential exists during the early planning stages. Furthermore special focus should be paid to capture the

needs of actual tenants and customers. Tenant and customer requirements are crucial for the understanding of the energy demand, especially with regard to technical equipment because meeting actual demands may result in high energy savings. Owners/managers tend to choose robust equipment and a conservative technical design with high security factors to avoid any problems during the operation and conflicts with the tenants. However this choice of equipment can increase the energy needed over the whole lifecycle of a building. For an energy-efficient building a compromise between energy-efficient technology meeting the individual demands and robustness and security should be investigated.

6. Functional Patterns and Socio-Cultural Aspects: Conclusions

The aim of this report is to support the definition of successful retrofitting drivers for shopping centres. To achieve this, the analysis has taken into account shopping centres as buildings for retail activity, social interaction, venues for experience and their relationship with the community. In addition the goal was to derive performance indicators for shopping centres which encourage energy saving potentials and contribute to an efficient and environmentally friendly neighbourhood development where all four main stakeholder groups are in active collaboration.

In this report the focus has not been on technical problems and solutions, instead the report presents insight into shopping centres as social places with particular functional requirements. This has been achieved through a consideration of three main areas:

1. The typical function patterns found in and around shopping centres, including an analysis of the four main stakeholder groups, typical retail activity and an overview of different shopping centre types.
2. An analysis of architectural and aesthetic quality in shopping centres, based on data from the CommON*Energy* questionnaires, considering four main themes, universal design, concept and lay-out, functionality and flexibility and future architecture and design
3. The OPEN HOUSE sustainability assessment tool provides an analysis of the needs of shopping centres, and a list of indicators which are relevant when planning the retrofitting of shopping centres.

Two main questions were considered:

1) What are the typical functional patterns and socio-cultural aspects found in the European shopping centre building stock today?
2) What potentials exist in relation to the typical functional patterns for reductions in energy use?

There exist a number of different types of shopping centre, and seven shopping centre types are presented in the report. There exist a large number of different types because customer satisfaction and community needs vary. Shopping means different things to different consumer groups. Why and when we shop influences our decisions about where we choose to shop, for example convenience needs, or comparison and leisure needs. Different types of centre provide different solutions to shopping needs and the wide range of shopping centre types suggests that these needs are various. Shopping centres are essentially about customer satisfaction and typical functional patterns in shopping centres are about servicing customer needs and achieving customer satisfaction. Different types of retail activities have to be taken into consideration because they influence typical functional patterns in shopping centres and may therefore influence retrofitting and design processes in the different

categories of shopping centres. An effective retrofit must therefore take into account the need to provide attractive solutions for customers, as well as considering the maximization of profits for management and tenants and the needs of the surrounding community

Shopping centres are associated with a flexible architecture which takes into account the changing needs of the shopping centre and its customers. More than 60 % of the shopping centre building stock associated with the CommON*Energy* survey is over ten years old. This need for rehabilitation/redevelopment or redesign, will have implications for shopping centre architecture. The CommON*Energy* survey points to three important factors associated with shopping centre rehabilitation:

1. Shopping centres are known for their regular rehabilitation and over 60% of owners and managers said that they had rehabilitated shopping centres, although it varied when this was done and what was done.
2. There is no clear connection between the rehabilitation of the shopping centres that has taken place and upgrading to reduce energy use.
3. The survey amongst owners and managers indicates that achieving an energy use reduction is an important factor when considering an upgrade. More than 90% of respondents said that a reduction in energy was an important factor when considering a shopping centre upgrade.

Shopping centre architecture is developed for a particular function, supporting retail needs which in turn lead to customer satisfaction. Within the framework of technology, functionality and aesthetic quality which supports this function there exist potentials for energy use reductions. Shopping centres are influenced by taste and lifestyles and an ever changing society. Shopping centres are, as mentioned above, subject to regular changes and two aspects are therefore central:

- An integrated design process is needed that takes into account the goal to develop future markets where flexible architecture contributes to low-energy use in stores and shopping centres, which are attractive work places and places to shop.
- Thinking in terms of more than one system at the same time, an efficient and future orientated planning process develops several systems simultaneously. For example, universal design and energy efficiency are both about building physics and building technology and should be considered simultaneously.

In relation to the socio-cultural aspects found in shopping centres and in order to avoid energy inefficiencies, a change in the planning of the refurbishment of shopping centres is proposed. Due to the high complexity and large number of people involved, an integral planning approach should be chosen. An Integral planning approach refers to the entire life cycle of a shopping centre. It begins with the development of the refurbishment of a shopping centre and ends with the demolition, HVAC, etc. This avoids isolated problem-solving problems are seen context with other important topics in shopping centres. At an early stage in the planning process an integral planning team consisting of not only technical experts, but also, ideally, representatives from tenants, municipal authorities and the local community should be involved in the decision making process. Special focus should be paid

to engaging tenants and customers in a planning process. Tenant and customer requirements are crucial to understanding the reasons for energy demands.

There is a need for a strong focus on adaptation of building, elasticity, as well as a demand for spaces within the walls being adequately general and flexible both in terms of usage and energy consumption.

At the same time the need for flexibility is challenging in terms providing architectural and aesthetic quality in shopping centres. It is suggested here that the patchwork of solutions which is established in shopping centres over time may potentially reduce customer satisfaction. Owners and managers are aware of this problem and because customer satisfaction remains at the core of running a successful shopping centre they rate improving architecture and design as one of the main motivations for upgrading a shopping centre. Sustainable shopping centres of the future should therefore include architectural and aesthetic quality with focus on legibility, durability and energy use. Technology, functionality and flexibility should not be allowed to dominate at the cost of good architecture. Integrated design requires consideration and improvement of all systems simultaneously; this will allow the implementation of optimal solutions that are sustainable in the present and will continue to be so in the future.

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Appendix 1: The CommON*Energy* shopping centre definition

CommONEnergy definition of shopping centres: Bointner, R., Toleikyte, A., (2014) Shopping malls features in EU-28 + Norway, Deliverable 2.1 for CommONEnergy, 2014

Location	Type of development	Size	GLA [m²]	Anchor store	Trip purpose
Town Centre Shopping/ urban	Neighbourhood centre/ community centre	Small shopping centres	5,000 – 19,999 m²	Supermarket or hypermarket	Convenience shopping
	Speciality centre (market halls, historical buildings, other)		Usually 5,000 m² and above	Traditional markets, tourist shops	Leisure, convenience shopping
Out-of-Town Shopping/ suburban	Retail Park and Factory Outlets		5,000 – 30,000 m²	None	Household shopping, Comparison shopping, leisure
	Regional centre	Medium/ large shopping centres	20,000 – 79,999 m²	One or more department stores	Comparison shopping
	Super-regional centre	Very large shopping centres	80,000 m² and above	Several department stores, entertainment centres	Comparison shopping, leisure

Appendix 2 Shopping Centre Terminology

From Bointner, R., Toleikyte, A., (2014) Shopping malls features in EU-28 + Norway, Deliverable 2.1 for CommONEnergy, 2014

Enclosed shopping centres
Enclosed shopping centres provide retail opportunities within one environmentally controlled/ air conditioned building. Enclosed shopping centres protect customers, workers and merchandise from the out-door climate. Victor Gruen the architect, who pioneered the enclosed shopping centre during the 1950's, suggested that customers who feel comfortable will shop longer and spend more (Coleman, 2006).

Open shopping centres
Open shopping centres such as strip malls and shopping precincts include more than one retail unit which are attached to each other, but customers cannot go from store to store without going outside. Retail units are often in a row or a U-form with a central open courtyard. The first 1950's shopping centres had an open design. Contemporary shopping centre developments often offer more open designs. Examples are Oracle in Reading, UK and Beursplein in Rotterdam, The Netherlands.

Convenience shopping
Convenience shopping provides articles which are purchased regularly and often frequently (Dawson, 1983). Convenience goods are perishable goods provided by supermarkets or smaller grocery stores. It may be understood as daily shopping done at smaller neighbourhood centres, but convenience shopping may also be bulk shopping done at convenient intervals (Coleman, 2006).

Comparison shopping
Comparison shopping provides articles which are long term purchases usually bought at irregular intervals. Quality, price and style are important factors in the selection (Dawson, 1983).

Anchor stores
A key tenant or larger store, usually a department store in a shopping centre. In larger regional or super-regional centres containing more than one anchor store, they are commonly located as far as possible from each other to maximise the amount of exposure of smaller units. The Mall of the Emirates in Dubai has 10 anchor stores.

Leisure
Shopping may be understood to be a leisure activity, if it is not directly connected to a specific aim, such as purchasing long term or perishable merchandise. This kind of shopping has its fair share of negative associations. It is often seen as extreme shopping, an over the

top activity devoted to indulgence. Shopping in these terms is associated with materialism, hedonism and self-indulgence (Miller, 1998). Leisure in shopping centres may also be related to other activities not directly related to shopping, often found in larger regional and super-regional centres, such as going to the cinema, ice skating and bowling, but also visiting cafes and restaurants are leisure activities.

Hypermarket

A hypermarket is a store usually larger than 5,000 m^2, combining a supermarket and a department store including grocery and general merchandise, which allow customers to satisfy all their daily shopping needs in one place. A hypermarket often has a parking area and a restaurant.

A **market hall** is a covered space in which a market to buy and/or sell groceries, provisions or livestock is held. Historic market halls from the 19th or early 20th century, often a one- or two-story building, are usually covered by a cast iron or steel structure, varying from several hundred up to more than 10.000 square meters. A famous example is the Great Market Hall in Budapest.