

SUSTAINABLE BUILDING REFURBISHMENT

Master's Thesis
Haeyeon Ryu 2014

Sustainable building refurbishment

process based approaches
with the Hotel Klaus K refurbishment case.

Creative Sustainability master programme, Department of Architecture
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ABSTRACT

In 2009, the European Union and the G8 announced an objective to reduce greenhouse gas emissions by at least 80% below 1990 levels by 2050¹ and the Government of Finland adapted the target as part of an international effort. To achieve the target, immediate actions are required especially in the building sector as buildings consume 40% of end-use energy in Finland². According to 2050 roadmap by European Climate Foundation³, the emissions from houses and office buildings can be almost completely cut, by around 90% in 2050. In addition, a great deal of energy conservation can be achieved in the building sector through improving existing building stock (see Part A.1.3., Why refurbishment?). Accordingly, the refurbishment of existing buildings plays a significant role in contemporary urban environment for a sustainable environment.

The thesis analyses diverse approaches to sustainable refurbishment through methodological frameworks, market-available tools and several example cases. To apply studied approaches to a practical case, the Hotel Klaus K refurbishment is introduced with specific project conditions and local context. Interviews with project members involved in the refurbishment case help to understand the different roles and interests of each member and to examine the actual process of decision making. Based on the project analysis, the last part of the thesis suggests ideal processes and target and holistic scenarios for sustainable refurbishment in the Hotel Klaus K project.

In general, diverse stakeholders and project members are engaged in decision making process of a refurbishment project. Moreover, many constraints result from conditions of an existing building and residents which represent limitations to architects, preventing them from exerting the full capacity of free design. Architects should be able to understand the actual uses of existing buildings and residents and communicate with diverse project members from the initial phase of a project to the end of a refurbishment. Accordingly, the role of architects should be extended to include planning extra work and the process of sustainable refurbishment. Ultimately, the thesis aims to draw an innovative path towards sustainable refurbishment by extending the role of architects.

Yet, as sustainable refurbishment is still new in the field of construction (see Part B.1.4., Challenge), the scope of work and the process are not well organized. This thesis therefore tries to understand the differences between the conventional process of refurbishment and a more sustainable process. Targets, criteria and approaches to sustainable refurbishment should differ from other projects. Also, approaches towards sustainable refurbishment should vary to each building, as every building is unique, not only in its structure, technical system and typology but also in local context, incorporating surroundings and historical and cultural qualities.

1. European Climate Foundation. Roadmap 2050. web page. <http://www.roadmap2050.eu/project/roadmap-2050>

2. VTT(Technical Research Centre of Finland). 2012. Low carbon Finland 2050: clean energy technology strategies for society.

3. European Commission website. Roadmap 2050. webpage. http://ec.europa.eu/clima/policies/roadmap/perspective/index_en.htm

KEYWORDS

Building refurbishment, Sustainable architecture, Hotel Klaus K, RAKE building, Process design, Pre-design Phase, Role of architects.

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THESIS OBJECTIVES

- To understand approaches to refurbishment in a more sustainable way.
- To examine the implementation of frameworks to a practical case.
- To understand the different process of sustainable refurbishment from conventional one.
- To explore the extended role of architects in sustainable refurbishment and retrofit.

BACKGROUND

This thesis initiated from a practical renovation case 'Hotel Klaus K'. While the author engaged in the project as an interior architect, several questions arose as thesis questions. This thesis represents the entire journey in answering these questions :

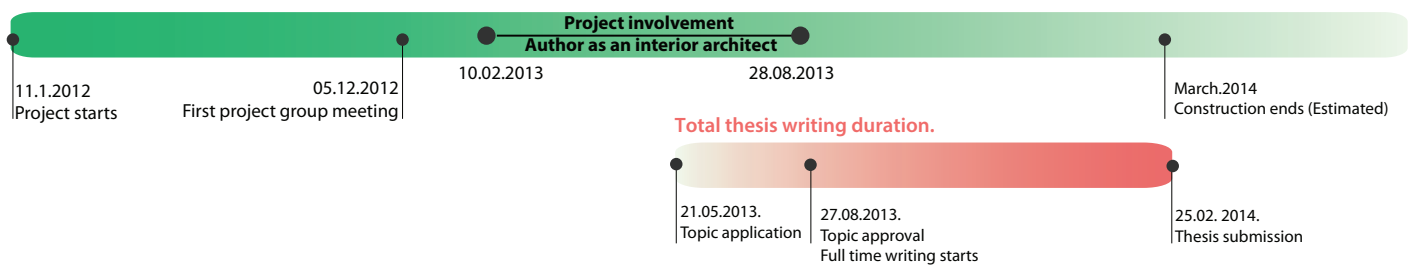
- How to steer the refurbishment project in more sustainable way?
- Who should take responsibility to initiate, pursue and preserve sustainable value throughout the project?

INTRODUCTION

TIMEFRAME

The first phase of the thesis is for a practical case, Hotel Klaus K refurbishment project when author engaged in the project as an interior architects from 10. February. 2013 to 28. August. 2013. The second phase is the actual thesis development period as an individual researcher outside of the project group from 21. May. 2013 to 30. January. 2014.

HOTEL KLAUS K extension project
Total Project duration 218 weeks.



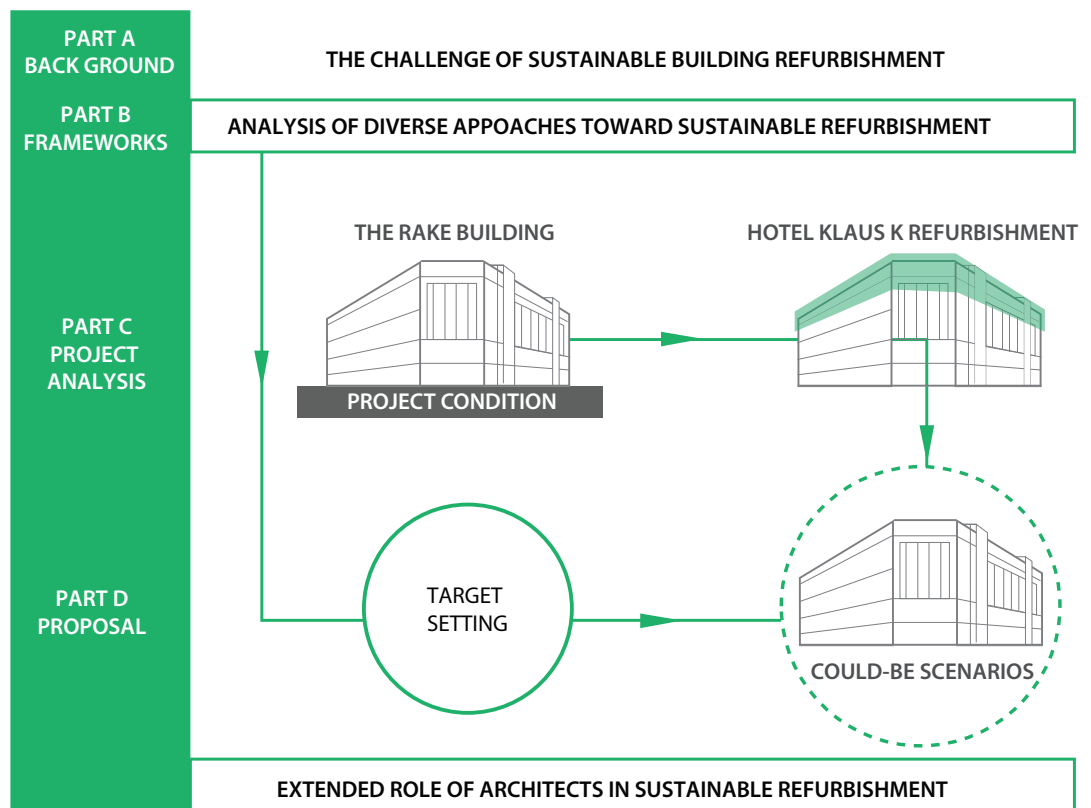
THESIS STRUCTURE

This thesis has been divided into four parts. PART A starts with terminology of building refurbishment and meaning of it, and draws a challenge about sustainable refurbishment.

PART B deals with theoretical, methodological approaches to sustainable refurbishment and retrofit in three categories which are Environment, Economic and Socio-culture. Each category will introduce practical cases in local context as a benchmark.

PART C analyses a thesis project, a refurbishment case of hotel Klaus K, located in the center of Helsinki. Background analysis including history of building and site study is conducted to find embedded value of the building. Through the refurbishment project in 2013, project specific conditions are introduced to examine the process of decision making and communication channels in a practical case.

The last part will re-organize the refurbishment case with the introduction of a sustainable approach from the architect's point of view. Target setting of sustainable project scenarios are presented to further explore the possibilities and the extended role of architect.



THESIS STRUCTURE

PART A. BUILDING REFURBISHMENT

1.1. Terminology

1.2. Life cycle of buildings

1.3. Why refurbishment?

**1.4. The challenge:
sustainable refurbishment**

1.1.Terminology

"Building work can be classified as either new build or refurbishment. New build is an easy concept to grasp, as it is a term applied to any work that is starting from scratch. Refurbishment, however, is a more difficult concept to generalize" (Riley, 2011, p5). The amount of work that is required in order to achieve definition will be very different on different projects. Since the scope of the project being examined here includes a combination of conversion, retrofit and conservation of a building, this thesis will mainly employ the term 'refurbishment, to include all these elements. Throughout, the following definitions will be utilized; these are based on Riley and Cotgrave (2005)¹ with some revision by the author:

REFURBISHMENT

"Extending the useful life of existing buildings through the adaptation of their basic forms to provide a new or updated version of the original structure. Refurbishment of buildings entails giving outdated buildings a new purpose with upgrading and reconfiguration that goes beyond the cosmetic" (Riley, 2011, p5).

The term, renovation, is often used as a synonym which generally elaborates to include the following terms.

RESTORATION

"The work of renewal and repair only and simply addresses dilapidation to avoid further degradation of the building" (Riley, 2011, p5).

REMODELING, FACE-LIFT, REFASHIONING

Aesthetic update centered work.

RETROFIT

"A retrofit essentially means fitting new and more modern systems into an existing building. The term is commonly associated with building services because a common phenomenon in buildings is that the life of the building structure and fabric will be considerably longer than that of the installed services" (Riley, 2011, p5). For example, an energy retrofit refers to the improvement of existing buildings with energy efficiency equipments that ensures energy conservation from the maintenance and operation of buildings.

CONVERSION

This is the alteration of the main use of a building while the main structure remains unchanged.

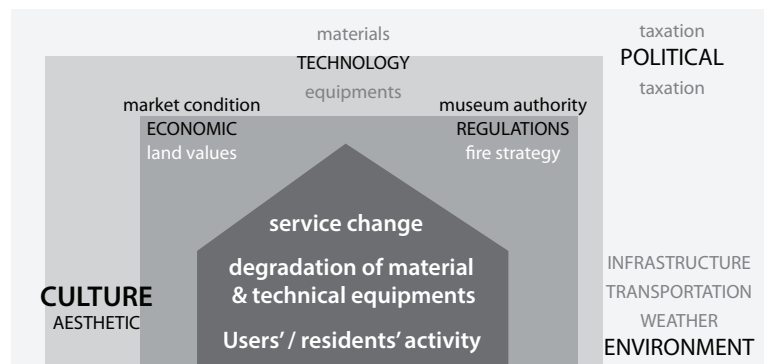
1.Riley, M., & Cotgrave, A. 2011. Construction Technology 3: The Technology of Refurbishment and Maintenance. p5.

1.2.Life cycle of building

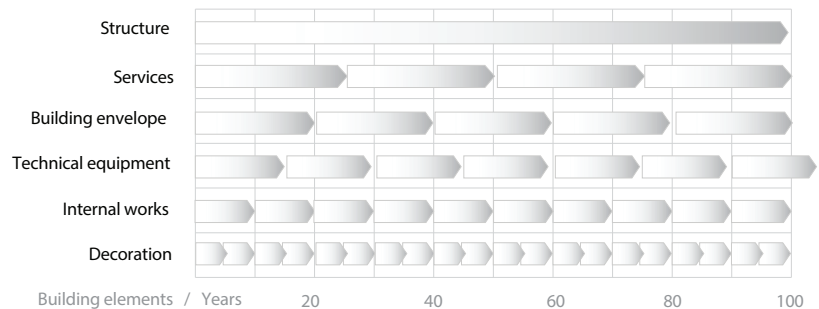
A building changes continuously and steadily after it is built. Buildings only exist once built and start to change right after physical involvement of residents (customers). If the occupants of the building keep changing, the needs of users therefore change and the function of the building should be able to follow the various needs. Therefore, a building must be built to accommodate change which means an architect should consider short- and long- term needs.

Yet, it is difficult to forecast long-term needs, since agents and events during the whole life cycle of a building cannot be accurately predicted. Change also comes to a building through various other means: by internal and external factors such as degradation of building components or increased value of the building stock (see diagram D.1.2-1).

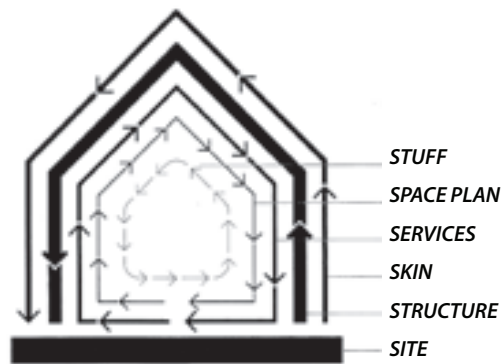
Accordingly, architectural interventions are necessary to extend the life cycle of building and meet the initial design life. These interventions range from maintenance, repair to the refurbishment happening at the end of the life cycle of each building element (see diagram D.1.2-2). Building components are necessary to update building performance to the level of designed performance to meet the expectation of residents.



D.1.2-1 Internal & External factors of change.
Author.



D.1.2-2 Life cycle of building elements.
Hegger,M.2009.Lecture Slide.



D. 1.2-3 Shearing layers of building
Because of the different rates of change of its components, a building is always tearing itself apart (Brand.1994. p13).

The diagram, shearing layer of buildings, categorizes the diverse components of building into 6 layers. The shearing layers concept views buildings as a set of components that evolve in different timescales. Each layer has certain scale life expectancy according to physical capacity of each component (see the Diagram D.1.2-3). Through the life cycle expectancy of each layer, architects are able to predict additional phases of change and design capacity for further alteration in advance even though there are certain limitations for accurate forecasting of change. Indeed, buildings should be built to change.

SITE

This is the geographical setting, the urban location and the legally defined lot, whose boundaries and context outlast generations of ephemeral buildings.

STRUCTURE

The foundation and load-bearing elements are perilous and expensive to change, so people don't. These are the building. Structural life ranges from thirty to three hundred years (but few buildings make it past sixty for other reasons).

SKIN

Exterior surfaces now change every twenty years or so, to keep up with fashion or technology, or for wholesale repair. Recent focus on energy costs has led to re-engineered skins that are air-tight and better-insulated.

SERVICES

These are the working guts of a building: communications wiring, electrical wiring, plumbing, fire sprinkler systems, HVAC (heating, ventilating, and air conditioning), and moving parts such as elevators and escalators. They wear out or obsolesce every seven to fifteen years. Many buildings are demolished early if their outdated systems are too deeply embedded to replace easily.

SPACE PLAN

The Interior layout: the placement of walls, ceilings, floors, and doors. Turbulent commercial space can change every three years or so; exceptionally quiet homes might remain the same for thirty years.

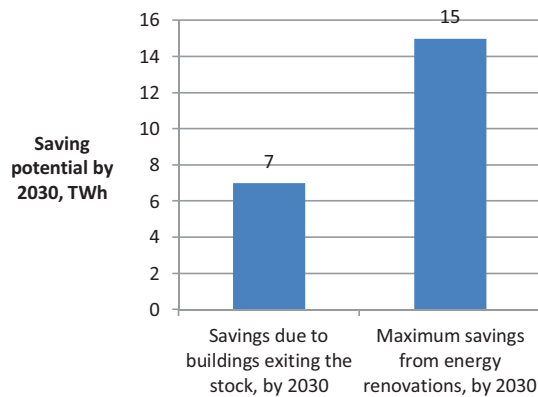
STUFF

Chairs, desks, phones, pictures; kitchen appliances, lamps, hairbrushes; all the things that switch around daily to monthly.

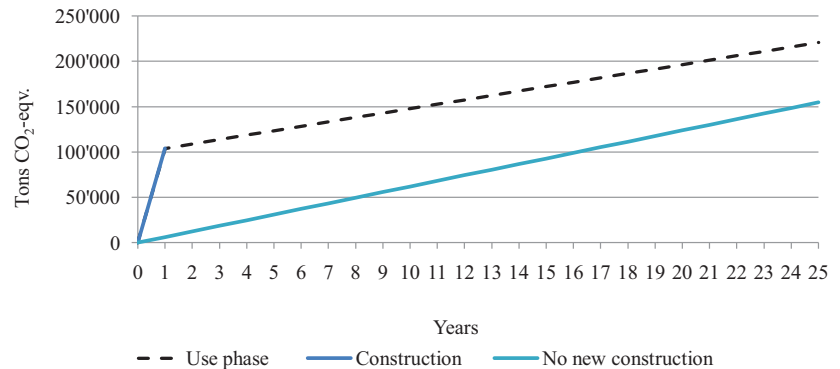
Brand, S. How buildings learn : what happens after they're built. 1994. p.13.

1.3. Why refurbishment?

Refurbishment of buildings in temporary urban environment.



D.1.3-1. Saving potential of GHG emissions in Finland for different factors. Annual savings in 2030 in Mt. Total GHGs in Finland in 2009 was 66 Mt (Häkkinen, 2012, p.207).



D.1.3-2 Total emissions of the residential area in Finland during the 25 year life cycle. Heinonen, 2011, p.1179.

"Refurbishment is needed due to the age of the existing building stock, the need to decrease the energy demand of existing buildings, infill development to limit urban sprawl and social issues in the need for rapid sustainable solutions: urban renewal" (Cronhjort, 2011).

Bloszies¹ also mentions that the reuse of old buildings is a critical component of smart growth and will lead to vibrant, diverse, and sustainable urban environments. It is impossible to stop the tendency of a growing city, but it is better to develop a denser city around crucial nodes than to allow urban sprawl in the notion of smart growth. According to Rasmussen (2011), urbanization is a recognized current Nordic megatrend. In Finland, compacting cities through urban infill development has been defined as a desirable target (Helsinki city planning office, 2013)².

The Diagram D.1.3-2 shows two aspects of total emissions of building. First one is the embodied CO₂ in building components and second one is from building operation. MPA (The concrete centre)³ points out that "Rather than knock down and start again, the option to recycle and re-use buildings

is being examined more carefully with a view to gaining cost and embodied CO₂ savings: it may prove more carbon efficient to reuse what is already built."

The reuse and repurpose of a building happens not only with old building but also in modern buildings. Many existing buildings built in conventional methods consume immense energy due to poor building performance such as insufficient insulation and old heating, ventilation systems.

"Whilst there is increasing recognition that green buildings outperform conventional buildings in terms of a variety of environmental, economic and social indicators. Yet, much less is known about how green building initiatives might be incorporated into existing buildings, which make up the bulk of the market. If the challenge of climate change is to be successfully addressed, therefore, this vast stock of older buildings (developed decades ago when sustainability was not a consideration) needs to be retrofitted" (Miller and Buys, 2008, p.553).

Accordingly, sustainable agenda and policy should retain existing building as cultural resources and valuable containers of human activity capable of being recycled for other uses.

1. Bloszies, C. 2012. Old buildings, new design : Architectural transformations.

2. Helsingin kaupunkisuunnitteluvirasto. 2013. HELSINGIN YLEISKAAVA Uudistava täydentäminen - purkava saneeraus. Helsingin kaupunkisuunnitteluviraston yleissuunnitteluosaston selvityksiä. 2013:9

3. MPA (The Concrete Centre). Refurbishment, re-use and renewal. Webpage. <http://www.concretecentre.com/sustainability/refurbishment.aspx>

1.4. The challenge

Sustainable refurbishment

In general, refurbishment of existing buildings is significantly more challenging than for a new construction. For a refurbishment project, an architect must make an assessment of the existing condition, both technical and aesthetic, before launching into conceptual design work. Unlike a new build design which starts on ground zero, refurbishment work starts in an existing frame and has more specific requirements and constraints which take time and effort to define. Accordingly, architects should prepare a feasibility study during a pre-design phase and convince potential merits of reclaiming an existing building to an owner or a developer.

"In existing multi-tenant commercial buildings, any sustainable refurbishment or technology upgrade requires the cooperation and participation of a wide range of stakeholders (i.e., owners, managers, occupants and contractors) who often must reside in the building during the potentially disruptive retrofitting process. Whilst there is the technological capacity, issues such as cost and tangible demand from consumers, organizations and policy-makers will determine the priority that industry places on retrofitting existing buildings for sustainability" (Miller, 2008, p.553).

Furthermore, there are certain limitations of free transformation of the space during refurbishment since the structural and technical components of the building are already set according to initial needs of the original residents. Bloszies also mentioned (2012, p.31)¹ that "the actual construction of a building that is a union of new and old is more challenging and often more expensive than an entirely new construction; the condition of the existing fabric that will be retained is difficult to evaluate, and therefore construction commences with increased financial risk that unforeseen deterioration and other technical issues might need to be addressed."

Despite of the potential of reducing greenhouse gas emissions through building refurbishment, attention to sustainable buildings more concentrates on new building constructions due to the constraints mentioned above and relatively small budget and short time frame of refurbishment projects than new constructions. Nevertheless, refurbishment is a crucial issue that needs consideration in order to address the challenge of climate change.

PART B.

DIVERSE APPROACHES TO SUSTAINABLE REFURBISHMENT

2.1. Life cycle assessment

2.2. Environmental assessment tools

2.3. Service life planning

2.4. Historic buildings

2.5. Business oriented approach

2.6. User-oriented approach

FOLLOWING APPROCHES ARE FOCUSED ON :



THE FINNISH CONTEXT



A REFURBISHMENT CASE



A HISTORIC BUILDING



HOTEL BUSINESS

A sustainable design often starts with developing a strategy to minimize the energy consumption of the building operation. However, to reach sustainable architecture, a broad range of aspects including social, cultural, economic and ecologic value should be taken into consideration. Accordingly, approaches to sustainable refurbishment should vary by each project according to not only the condition of building itself such as the physical capacity of structure and system, size, intended use of the building but also local context including location, surroundings, history, regulation and municipality. Also, project-specific conditions, for example budget, duration and project members, play a significant role in determining the criteria of building refurbishment.

Diverse approaches and criteria toward sustainable architecture exist, ranging from theoretical, methodological frameworks to market-available assessment tools. Which approaches are chosen and applied depends on the intention of the

project: whether it focuses on a business-oriented perspective, a planner's implementation or an end user's perspective. According to the project intention, the approach focuses on different phases of the life cycle of a building ranging from the planning phase to production, construction, maintenance and demolition of building. In each phase of the time frame, different aspects should be considered relating to energy and water use, the internal environment considering users' health and well-being, pollution, transport, materials, waste, ecology and management processes.

The following set of approaches was chosen by the author among various types that are generally accepted in the field. The chosen set is mainly applicable tools for the thesis project, Hotel Klaus K refurbishment, which the thesis will deal with in Parts C and D. Each approach is examined with reference cases as benchmarks for practical application.

2.1. Life cycle assessment

| PRODUCT STAGE | CONSTRUCTION PROCESS | USA STAGE | END OF LIFE STAGE |
|---------------------|-----------------------------|---------------|-----------------------------|
| Raw material supply | Transport | Use | De-construction, demolition |
| Transportation | Construction - installation | Maintenance | Transport |
| Manufacturing | Process | Repair | Waste processing |
| | | Replacement | Disposal |
| | | Refurbishment | |

D.2.1-1. Life cycle stage in a building.
Diagram by author text based on Häkkinen, 2012, p.25.

Life Cycle Assessment (LCA) is a methodology for estimating and assessing the environmental impact of a product through manufacturing, use and final disposal. EN 15978 (2011) defines a method for the environmental assessment of buildings. The standard presents the following life cycle stages for buildings (see the diagram D.3.1-1). As there is a clear interaction between all the stages of the life of a building, the application LCA enables the global environmental impact to be assessed effectively. Le Roux (2012) points out that the process of LCA starts from reliable and relevant data. The result requires an accurate description of the build assembly, and assumes that there is a reliable inventory database for the analysis. The LCA aims to measure environmental impact across the entire lifetime of a building and to ensure that improvements in one part of the life cycle do not shift the impact to another part.

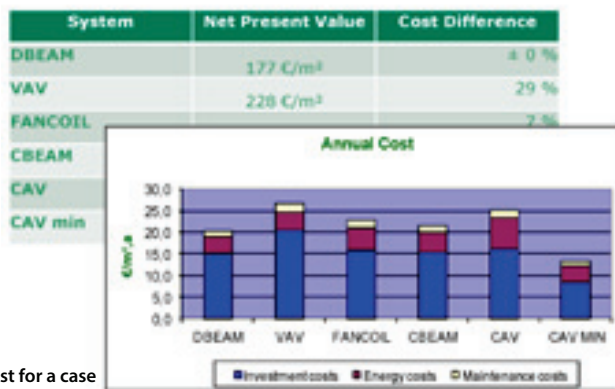
"Consequently LCA provides better decision support when optimizing environmentally favorable design solutions that consider the impacts caused during the entire lifetime of the building" (ENSLIC, 2010, p.6).

Life Cycle Cost analysis (LCC) includes not only the initial cost of building but also long-term costs such as heating, electric and maintenance costs by altering components during the life cycle of a building. Investors and tenants tend to prefer solutions with low investment as well as low running costs. Therefore, designers should attempt to find an optimal balance between economic and environmental aspects and convince the stakeholder to see the long-term perspective.

"For the economic part, not only does the usage phase have to be considered, but it is also very likely that investment models must be modified in order to connect the investor with the running costs, allowing the investing party to profit from good concepts during the usage phase" (Ostermeyer et el, 2013, p.1773).

Obviously, LCA and LCC are very promising as a set of tools to improve its sustainability performance in the building sector.

1. Kohler, N., et el. 2010. A life cycle approach to buildings: Principles-Calculations-Design tools.



D 2.1-2. Life cycle cost for a case in Stockholm.
Dooley, 2013. Lecture slide.

ADVANTAGE

The LCA and LCCA are applicable in refurbishment projects by diverse types of users in different stages of the process. The strongest advantage of the approach is that it enables relative comparison with objective value between different design options (D2.1-2). Also, the LCCA enables promotion of long term investment by compensating initial investment by long-term payback such as reducing building operation cost.

LIMITATION

According to a book, A life cycle approach to buildings¹, the biggest obstacle to use of LCA in the construction sector is the unavailability of adequate data for complete building description due to inconsistent basic data leading to uncertainty in the analysis of results; the dominance of the use phase focused on energy consumption of building operations, and altogether the effort required to completely describe the building has proved too much to convince the market of LCA advantages.

| TYPE OF USER | STAGE OF THE PROCESS | PURPOSE OF LCA USE |
|--|--|---|
| Consultants, Advising municipalities Urban designers | Preliminary phases | Setting targets at municipal level Defining zones where residential/office building is encouraged or prohibited |
| Property developers, Clients | Preliminary phases | Setting targets for development areas Choosing a building site Sizing a project Setting environmental targets in a programme |
| Architects | Early design/sketch and detailed design in collaboration with engineers. Design of a renovation project | Comparing design options (geometry/orientation, technical choices) |
| Engineers Consultants | Early design in collaboration with architects and detailed design. Design of renovation project | Comparing design options (geometry/orientation, technical choices) |

D 2.1-3. Application of LCA in the building sector
ENSLIC. 2010. The project result report. 7p.

2.2. Environmental assessment tools

Diverse assessment tools of environmental performance of building have been developed by various organizations in worldwide. Currently, various environmental assessment tools are commercially utilized as an international way of evaluating sustainable buildings despite limitations of the tools. Diagram 2.2-1 lists the front runners of commercially available environmental assessment tools. These audit and certify a building based on criteria system and utilize LCA methodology to various degrees. As shown in the right column, the criteria-based tools have different classification systems that score environmental impacts of building depends on its own parameters.

"It is difficult to make a relative comparison of diverse assessment tools as each tool utilizes different methods of evaluation influenced by different local categories. The choice of assessment tool depends on requirements such as the indicators of interest, the purpose of the study. Accordingly, some tools are more adapted to specific purposes than others." (ENSLIC, 2010)

As local context such as environmental condition and building regulation is a key issue of those tools, various organizations in many countries have tried to develop environmental assessment tools reflecting their own conditions (See the diagram D.2.2-2). Naturally, the national context-based tool is often selected for a practical project.

| NAME | ORGANIZATION | CLASSIFICATION SYSTEM |
|---|---|--|
|  BREEAM [®] | BREEAM Building Research Establishment (BRE) Great Britain. Launched in 1990. | Certified ≥ 33% Good ≥ 45% Very good ≥ 55% Excellent ≥ 70% Outstanding ≥ 85% |
|  LEED [®] | U.S. Green Building Council United States. Launched in 1998. | Certified ≥ 40p Silver ≥ 50p Gold ≥ 60p Platinum ≥ 80p |
|  DGNB | DGNB German sustainable building council Germany. Launched in 2008. | Bronze ≥ 50% Silver ≥ 65% Gold ≥ 80% |

D.2.2-1. Some Commercial assessment tools and certification system. Author.



D.2.2-2. Diverse international environmental assessment tools. Reed R. (2009)

ADVANTAGES

When we talk about sustainability for a refurbishment project, each member of a project group may argue about various criteria from different points of view. However, if we look into each criterion and parameters individually to set common targets: the process will take immense time and effort and it would be difficult to pay attention to every project member: this is the one of the main reasons that ready-made packages of criteria and certification system for sustainable building exist and are utilized in the field. Environmental assessment tools enable addition of international values of sustainability through auditing and certifying systems via utilizing the parameters of an established third party. As the added value enables compensation of the cost of consultation, the tools appeal to building owners and developers. Also, the labeling and certification system appeals to tenants which make the building more competitive in the real estate market. For the managing aspect of project, for architects and engineers, the certified building can be a good reference as an environmentally orientated project adding green value to a portfolio. Indeed, the system benefits larger-scale projects more than individual residential buildings or small refurbishments.

LIMITATIONS

Since refurbishment projects are strongly connected with local specific aspects, it is difficult to apply a standardized system to every case. For example, the Land use category of BREEAM criteria including site selection, mitigating ecological impact, long-term impact on biodiversity is hard to apply to refurbishments cases starting from existing building. Additionally, international-based criteria is hard to fit in the context of every country. For instance, an independent renewable energy source is not always a more sustainable way when district heating is already connected to the existing building in Helsinki. Edwards (2010), also, points out that as most of the criteria are based on quantitative systems, all issues and themes are reduced or equalized to numbering or percentage systems.

"A problematic issue with the structure is that a building does not necessarily have to score highly on all levels in order to obtain a high classification, which might unintentionally undermine certain themes. This can be problematic maintaining a holistic focus". (Gylling, 2011, p.2)

Moreover, if the decision-making to utilize the system comes later in the design phase, which commonly happens in practical cases, the system merely ends up as an evaluation system not contributing to the design process and may cause additional work for the evaluation process. Accordingly, the decision should be made in the pre-design phase to bring the system in early enough to check the possibility for more options.

2.2-1. BREEAM case study

The BREEAM-certified refurbishment project in Helsinki

It is more complicated to apply an environmental assessment tool to a refurbishment project since not every assessment tool has a distinct refurbishment scheme separate from new construction. Especially, if the scope of refurbishment is a part of building, it is more difficult to find a suitable tool to fit the case. Among the available assessment tools, the BREEAM from the Building Research Establishment in the UK has separated schemes for refurbishment and fit-out projects. The categories and main objectives are listed in diagram 2.2-3. There are different ways to weight each category depending on the particular characteristic of the project as per diagram 2.2-4.

The aim of this chapter is not to promote a specific tool or compare existing environmental assessment tools, but to inspect how to utilize them in refurbishment projects in Helsinki.

| BREEAM Section | Weighting (%) | |
|---------------------|--|-----------------------|
| | New buildings, extensions & major refurbishments | Building fit-out only |
| Management | 12 | 13 |
| Health & Well-being | 13 | 17 |
| Energy | 19 | 21 |
| Transport | 8 | 9 |
| Water | 6 | 7 |
| Materials | 12.5 | 14 |
| Waste | 7.5 | 8 |
| Land Use & Ecology | 10 | N/A |
| Pollution | 10 | 11 |
| Innovation | 10 | 10 |

D3.2-3. Environmental weightings. BREEAM. 2009.p35.

| | |
|--|--|
| Management <ul style="list-style-type: none"> · Commissioning · Construction site impacts · Building User Guide | Waste <ul style="list-style-type: none"> · Construction waste · Recycled aggregates · Recycling facilities |
| Health and Wellbeing <ul style="list-style-type: none"> · Daylight · Occupant thermal comfort · Acoustics · Indoor air and water quality · Lighting | Pollution <ul style="list-style-type: none"> · Refrigerant use and leakage · Flood risk · NOx emissions · Watercourse pollution · External light and noise pollution |
| Energy <ul style="list-style-type: none"> · CO2 emissions · Low or zero carbon technologies · Energy sub metering · Energy efficient building systems | Land Use and Ecology <ul style="list-style-type: none"> · Site selection · Protection of ecological features · Mitigation/enhancement of ecological value |
| Transport <ul style="list-style-type: none"> · Public transport network connectivity · Pedestrian and Cyclist facilities · Access to amenities · Travel plans and information | Materials <ul style="list-style-type: none"> · Embodied life cycle impact of materials · Materials re-use · Responsible sourcing · Robustness |
| Water <ul style="list-style-type: none"> · Water consumption · Leak detection · Water re-use and recycling | Innovation <ul style="list-style-type: none"> · Exemplary performance levels · Use of BREEAM-accredited professionals |

D3.2-4. Summary of BREEAM categories and main issues for a new or refurbished building.¹

1. BREEAM Europe Commercial. 2009. Assessor Manual. p35.

2. Definition of FIT OUT
"The design and completion of shell space (i.e. empty floor space bounded by walls but not specifically adapted to the requirements of its occupants) with the specific interior partitioning, floor, ceiling, mechanical, electrical, and environmental requirements of its occupants included. Definition from University of Colorado. BREEAM. International New Construction." Technical Manual. 2013. p330.

3. <http://www.granlund.fi/en/news/havis-business-center-receives-breeam-certification/>

PROJECT SUMMARY

Title : HAVIS BUSINESS CENTER (City block)

Location : Unioninkatu 20-22, Helsinki

Scope : Refurbishment, Property Development.
40 000 m2 Gross

Tool : BREEAM Europe Commercial 2009
Office Fit-out - Update

Score : Project Update Score = 45.49%.

This equates to a BREEAM rating of Good

Commissioner : Sponda Oyj

Auditor : Insinnoritoimisto Olof. Granlund oy

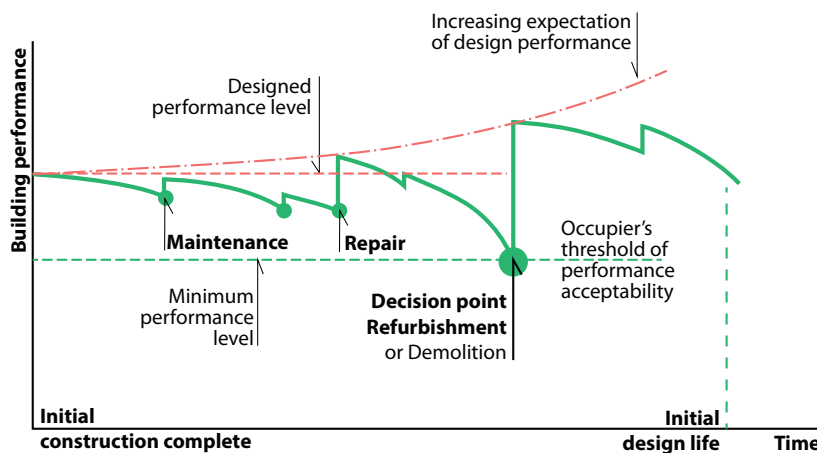
The Havis Business Center, an office building in the heart of Helsinki, is the first refurbished site in the capital to receive the BREEAM environmental classification. The building received the BREEAM Fit Out environmental certification with a rating of "Good". Granlund provided the BREEAM consulting and HVAC design services as part of the project. The project used the BREEAM Fit-Out² environmental classification system because it is suitable for a refurbishment of an existing building that does not include a major renovation, such as changes to the facade or HVAC systems. The Fit Out classification provides an extensive assessment of a building's social and environmental impacts and includes all other BREEAM categories except for the "Land Use and Ecology" category. The credits for this category are not assessed because a Fit Out project is not expected to have an impact on the building's land use or green areas. The LEED Commercial Interiors criterion is similar, but we selected the BREEAM Fit Out system because it is more flexible. A BREEAM Fit Out building can have various tenants whose space is included in the assessment where the property owner owns the certification, whereas the LEED Commercial Interiors certification is owned by an individual tenant. This means that each tenant is required to apply for his or her own certification. This also means that the certification will cease to be valid should the tenant move out of the premises.

text from the Granlund website³



Image 3.2-1. Havis Business Center.
Akkitehtitoimisto Design Team Oy

2.3. Service life planning



D. 2.3-1. Life cycle of a building
Riley, M (2011) revised by Author.

Service life planning is a design process which seeks to ensure, as far as possible, that the service life of a building will equal or exceed its design life while taking into account and optimizing the life cycle costs of the building. The approach of service life planning is to ensure a proposed design life has a structured response in establishing its service life normally from a reference or estimated service life framework. Then, in turn, to secure a life-cycle cost profile (or Whole-life cost when called for) whilst addressing environmental factors such as life cycle assessment and service life care and end of life considerations including obsolescence and embodied energy recovery.

ISO 15686-1¹

The design process of service life planning is strongly linked with sustainable buildings and its refurbishment. According to Happio (2008b), the number of refurbishments caused by obsolescence is increasing as the requirements of tenants grow. Growing number of refurbishments caused by obsolescence has huge environmental impact. If a product is replaced before its service life is finished, the remaining service life is wasted. Accordingly, the ultimate objective of the forecasting the service life of building is to exceed the required design life with adequate reliability. Trinius and Sjöström², also mentioned that "Service life planning comprises a model for the determination of a reasonable expected service life for buildings and components, and it establishes a routine for the assessment of design alternatives. A design option is considered reasonable when it meets or exceeds performance requirements over time."

1. International Standard Organization (ISO) 15686-1 Buildings and constructed assets - Service life planning: Part 1, General principles and framework

2. Trinius, W., & Sjöström, C. 2005. Service life planning and performance requirements. p173.

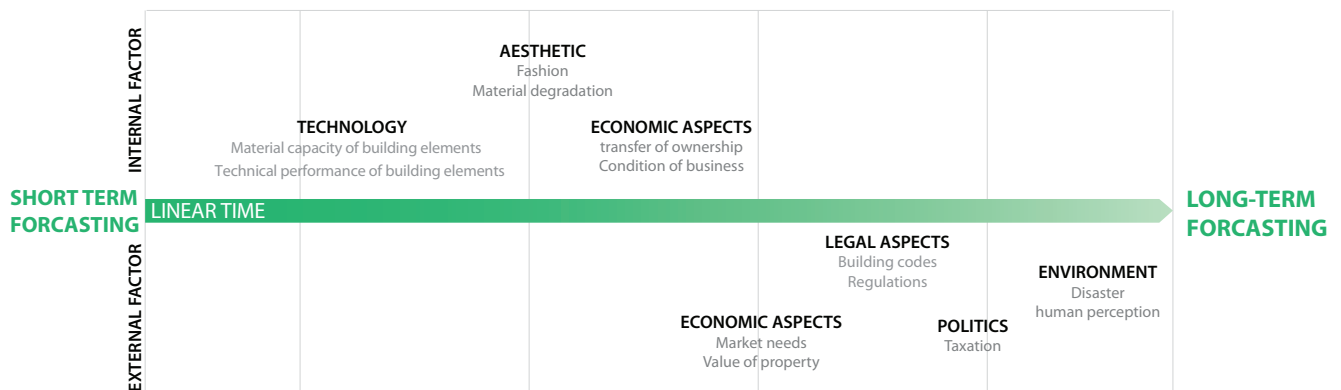
3. Government of South Australia. 2012. Service life planning considerations for buildings. p 2.

LIMITATION

A building consists of various material and separated products which all have a different service life. There are accessible and inaccessible parts of building components. During the service life of the building, repair or maintenance of building components should be planned at the end of the expected service life of the accessible parts and inaccessible parts of building components should have longer or same service life with other parts of building. Both aspects of accessible and inaccessible parts of a building should be carefully considered in the design process of building which requires design planning to be integrated with service design planning.

"Ecologically sustainable design requires that service life considerations be integrated in the design process to reduce the environmental impact by encouraging the conservation of finite resources and the selection of appropriate materials and construction methods" (Kohler, N., Moffatt, S. 2003)

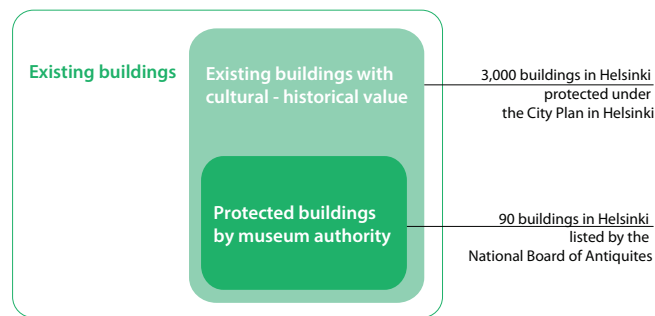
Current standards provide guidance and frameworks for service life planning, and also for forecasting service life, which is based on either prediction or estimation. There are several factors, or agents that affect the service life of a building during its lifetime (Haapio 2008). The certainty of these influencing factors vary by specific building components, agents and time framing (see diagram D.2.1.-2). It is rarely possible to forecast service life with any degree of certainty. A research conducted by Government of South Australia³ points out that integrated design planning with service life planning should include projection of the associated maintenance and replacement needs and timings. Accordingly, accessibility for maintenance and modularity of building components for instance detachable ceiling panels should be taken into consideration in building design phases. Also, the reusability and recyclability of the buildings components should be taken into account and discussed more openly when the service life of each building component is estimated.



D.2.3-2. Influencing factors of change of buildings. Author.

2.4. Historic buildings

Can historic building save on energy consumption?



D 2.4-1: Historic building in Helsinki. Author.

Old buildings are valueable and attractive which are able to represent architecture in terms of certain eras and contain various layers of history. Yet, not every building unique in terms of architecture or preservation is considered as a cultural heritage. In this case, modernization of the existing building through active retrofit of building components and new building construction after demolition of the old building can be examined before refurbishment as an environmentally friendly solution. Now, society is facing a new era of sustainability and the construction field is taking action in the form of creating energy efficient buildings. According to the 3encult (2010, p.1), old buildings are not energy efficient and are substantial contributors to greenhouse gas (GHG) emissions and rising energy bills. The question remains, then of "how to approach an historic building considering current standards, legislation and protection of cultural heritage and also the possibilities of their improving from the point of view of sustainability and environmental quality" (Mancik and Ruzicka, 2012).

"At present, the protection of cultural heritage has taken on substantial importance. Cultural heritage is no longer about the preservation of symbolic heritage or the importance of a single profession; it is an essential part of the living environment and the fulfilment of societal needs" (ECTP, 2008)¹.

LIMITATION

The urban built heritage conservation has more complex problems. As there are various regulations and restrictions to preserving and protecting cultural heritage, it is hard to apply a similar approach of energy-efficient retrofit to historic buildings as to other conventional buildings.

In Helsinki, there are 90 buildings listed as cultural heritage by National board of antiquities (Museovirasto)³ and over 3,000 buildings are protected by the Helsinki City Museum (Helsingin Kaupungin museo)⁴ related cultural environment (see diagram D.2.4-1). The following thesis project, Hotel Klaus K is located in the RAKE building in the protected area listed in the national register of culturally significant buildings and sites by National Board of Antiquities from 2009. Therefore, there are limitations for structural change especially for improvement of the building envelope which would otherwise have huge capacity for energy saving.

"There are other legal and economic issues that make it problematic to preserve old buildings. For instance, old buildings should follow new fire code requirements which are complex and expensive; even local institutions have special rules for historic buildings. Also, in the case of some buildings located rising value of real-estate, market needs bigger or higher building unless it is not protected by law" (Bloszies, 2012).

1. European Construction Technology Platform (ECTP). 2008. Vision 2030 & Strategic Research Agenda. Focus Area Cultural Heritage.Public Version #3.

2.3encult. 2011. Efficient ENergy for EU Cultural Heritage Publishable summary.

3. <http://kulttuuriymparisto.nba.fi/netsovellus/rekisteriportaali/portti/default.aspx>

4. <http://www.hel.fi/hki/Museo/en/Cultural+Environment>

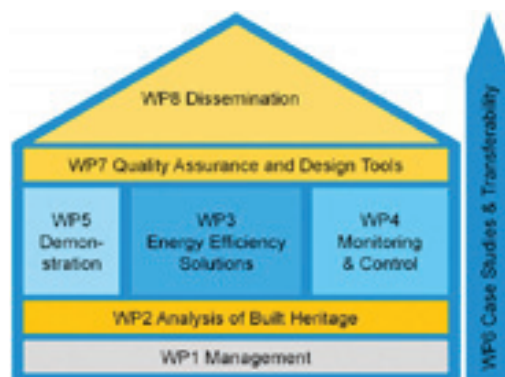
5. <http://www.3encult.eu/en/project/welcome/default.html>

2.4-1. A research case : 3encult

Efficient energy for EU cultural heritage

PROJECT SUMMARY

Title: Efficient Energy for EU Cultural Heritage
Instrument: FP7, Collaborative Project
Total Cost: 6,643,959.20
EC Contribution: 4,990,475.00
Duration: 42 months
Start Date: October 1st, 2010
Consortium: 22 partners from 10 countries
Project Web Site: www.3encult.eu



D 2.4-2: Structure of the project based on work packages.
3encult.

The project 3ENCULT bridges the gap between conservation of historic buildings and climate protection, which is not an antagonism at all. Historic buildings will only survive if maintained as living space. Energy efficient retrofit is useful for structural protection as well as for comfort reasons: comfort for users and comfort for heritage collections. (3encult.website)⁵

The joint task of conservation and energy efficient retrofit is highly interdisciplinary. The 3ENCULT partnership thus includes conservation, technical and urban development experts, industry partners, implementation experts and stakeholder associations. Furthermore, Local Case Study Teams bring together those individuals with hands on experience: building owners, architects and local offices for the protection of monuments. Starting with an analysis of the challenge and the needs for comprehensive diagnosis, the research investigates technical solutions for the energy enhancement as well as smart monitoring and control. It allows the demonstration of the developed solutions, while eight case studies gives stimulus for the solution development and successively feedback. The research, also, gathers the development of design tools, quality assurance as well as contributions to standards and knowledge transfer. (3encult.2011)²

2.4-2. A project case : *Bulevardi 6.Helsinki.*

Outsourced consultancy service for sustainable refurbishment

The building, Boulevard 6, is located in the heart of Helsinki. The property was built in 1888 for residential use initially. Today, the property is mainly used as office commercial spaces on the ground level including a restaurant. During 2010 and 2011, the property underwent extensive renovation work. The real-estate owner, RAKE OY, decided to take into account sustainable development principles in the renovation of the property which is based on the philosophy of the 143-year-old family company. This meant that the planning and execution of renovation considered financial, environmental and social factors. To be specific, sustainable construction aimed to reduce the cost of using the property as well as making the property a more attractive place for tenants to invest in. In addition to the economic benefits of the property, it enabled a reduced environmental impact through sustainable choices. Consideration was given to retention of the cultural and historical values of building, while the changes provided well-being and comfort for building users through updated modern technology.

Gaia Consulting Oy committed to analyze sustainable aspects of the refurbishment project. A consultant, Dr. Vanhanen, played a role as a sustainable agent during the entire process from the pre-design phase to the planning and construction phases. During the pre-design phase, the consultant checked all possibilities in diverse aspects including presenting all planning needs and marketing points of sustainability. During the design phase, after setting up the criteria of sustainability, he challenged planners to reconsider

PROJECT SUMMARY

Refurbishment project of Bulevardi 6

Building location: Bulevardi 6. HELSINKI.

Occupancy: Retail premises and Offices.

Net area: 22 000 m³

Built year: 1888

Real estate owner: Rake Real Estate Ltd

Commissioner: RAKE Oy

Consultant: Juha Vanhanen. Ph D. Engineer.

Managing director in GAIA.

Funding: TEKES Oy

Planning duration: October 2009 -April 2010.

Construction completion : 2011

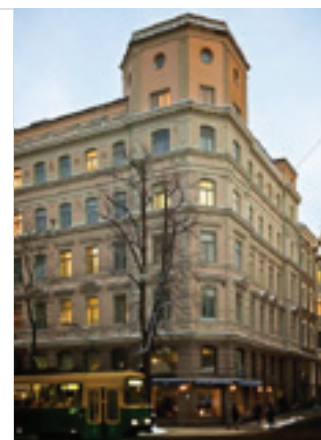
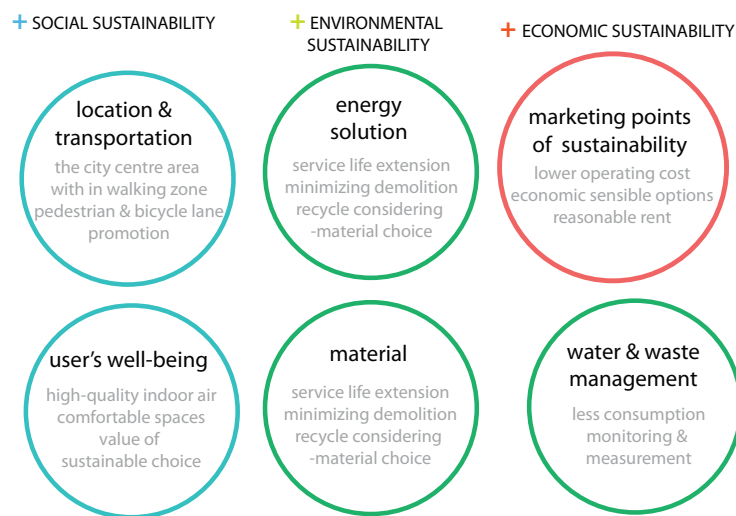


IMAGE.2.4-2. Bulevardi 6. Helsinki.
image from report of Gaia.¹

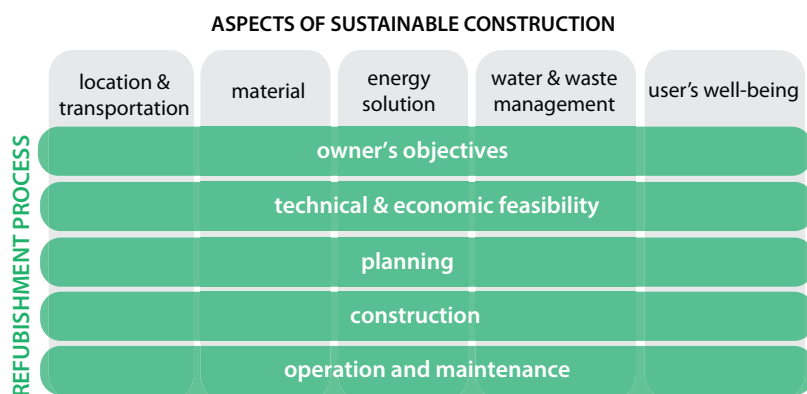
options and bring new ideas on how to make the building in a more environmentally friendly way. In addition, the project analysis with regard to marketing the benefits of sustainable development indicated that sustainable refurbishment would improve the value of property by lowering the cost of maintenance; thus the property would be a more attractive place to tenants to invest and create more revenue compared to conventional refurbishment. (based on the interview with Kenneth Cederberg, CEO of Rake Oy, owner of the Bulevardi 6 property, 07. November. 2013.)

1. Vehviläinen, I, Vanhanen, J. 2012. Sustainability in a historic context – Case Bulevardi 6 in Central Helsinki. Gaia Consulting Oy.

2. Vanhanen, J. et al. 2009. Kestävän korjausrakentamisen konseptointi liikeyritykselle. Kohteena Bulevardi 6. GAIA Consulting Oy.



D.2.4-3. Aim of Bulevardi 6 sustainable refurbishment. GAIA.²



D.2.4-4. Integration of sustainability in a refurbishment project GAIA.²

LIMITATION

Bulevardi 6 is a historical building with high cultural value. Yet, it brings restrictions to options for sustainable refurbishment as a protected area. For instance, Vehviläinen and Vanhanen, consultants of Gaia, mentioned that "an efficient heat recovery system was rejected because it was not possible to alter the roof profile of the building. Local renewable electricity production from solar panels on the roof was not possible for the same reason. The windows of the lowest floors of the building could not be changed to more energy efficient alternatives because that would have altered the view from outside."

Since the research project was oriented in a business-centred top-down approach, the result of the research received more positive feedback from the client, RAKE Oy, than the project architect or engineers. As the research was based on the perspective of investors and operators, it was rather focused on an economic point of view of sustainable construction such as marketing point rather than an applicable architectural guide for practical application (based on an interview with a project architect, Sarlotta Narjus, 12. November. 2014).

Additionally, it should be noted that the research project was only able to start with funding by TEKES, the Finnish funding agency for innovation. Indeed, consultancy services require extra budget and time for a project. Unfortunately, not every project invests for pre-research which means many refurbishment projects barely have the opportunity to see the full capacity of the project in sustainable way.

2.5. Business oriented approach

Sustainability in hotel-business

Why invest for a sustainable building?

How long to take back initial investment?

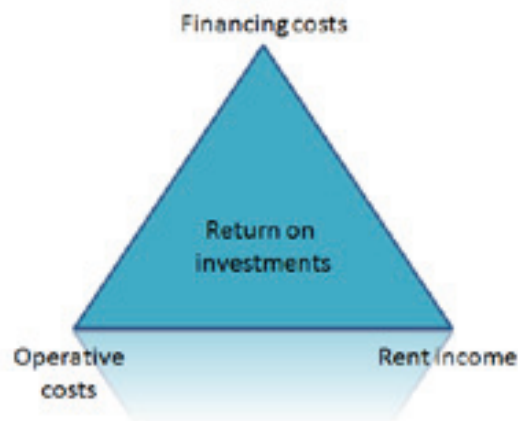
Why would a guest comes to the green hotel?

ECONOMIC SUSTAINABILITY

Economic possibility in investors' perspective is a crucial point of sustainable refurbishment. It is important to find a acceptable point of financing costs and available options considering long term payback (see diagram 2.5-1). To reduce economic burden in initial investment step by step based gradual change could be checked as alternative options. Baber (2005) mentions about economic sustainability in hotel business that since hotels are highly dependent on successful financial performance from continuous demand and minimal costs for survival, implementing sustainable options to hotels should be financially sound investments as costs are recovered in a comparatively short time while long-term savings are also significant.

It is also important to find benefits and motivating factors to investors such as less operating costs by reduced energy consumption of building and expected higher rent income. By promoting sustainable aspects of a building, value of the asset and competitiveness in the market can be increased.

"Positive promotion created by marketing, recognition and awards can increase demand or even make new markets available to hotels. By promoting and adhering to sustainable practices, hotels protect the very reason why guests come in the first place" (Baber, 2005, p.71).



D.2.5-1. Viewpoints to economic sustainability in buildings.
Vehviläinen, I., Vanhanen, J. 2012.

Hagart and Knoepfel (2008) highlight the following financial benefits:

- An average expected decrease in operating costs of between 8% and 9%
- An average increase in building value expected to be around 7.5%
- Occupancy rate expected to increase by 3.5%
- On average, rental yields expected to increase by 3%

SUSTAINABILITY IN THE HOTEL BUSINESS

"In order to be successful today, a company must guarantee sustainability not only from an economic point of view, they must also take ecological and ethical responsibility" (Scandic, 2004)

"Corporation sustainability also known as Corporate Social Responsibility (CRS) is a multidimensional concept. Environmental sustainability, alongside employee wellbeing and community development, is central to the concept of CSR. International hotel chains are thought to have made considerable progress in the domain of CRS" (Bohdanowicz, et al., 2011)

Erdogan (2007) mentioned that the environmental impacts of hotels are considerable compared to other commercial buildings due to higher-than-average consumption of energy and water and the production of large quantities of waste. Within the hospitality sector, an establishment can typically achieve a 20% reduction in energy use by implementing some simple efficiency measures. With additional investment in energy efficiency, Carbon Trust surveys¹ indicate that potential carbon savings of 6% are achievable from measures with a payback period of less than one year, rising to 12 -13 % for measures with payback periods of 1-2 years. Thus, from an environmental perspective, the hospitality sector has many viable opportunities to promote environmental sustainability.

Maintenance / Operators

Environmental and human resource management.

Human factor is the focal point of environmental sustainability especially in hotel business since employees are the best experts of each sector and actual doer. According to Carbon Trust (2007), most opportunities of reducing energy consumption in hospitality business are within the control of staff which is an ideal way of involving people and raising awareness of a sustainable business. Bohdanowicz (2011, p.801) also argues that improvement of awareness and responsibility of employees is significant since corporate greening activities entail extra-role behaviour which is neither required nor formally rewarded.

Many of hotel chains conducts education to increase awareness of sustainability to their employees in practice. One of the cases, will be introduced in following page.

1. Carbon Trust. 2007. Hospitality: saving energy without compromising service. p4.

2.5-1. Case study

SCANDIC hotel group



Image.2.5-1. Sustainability Live Report.
Scandic reports their energy savings on website.¹

Environmental awareness at Scandic started from 1993 and environmental sustainability has grown as the core concept of the hotel group. According to Scandic (SERECS)², "the hotel group is one of the leaders in sustainable corporate hospitality business practices, not only in operations but also construction and design by monitoring resource consumption, minimizing waste generation and upgrading the environmental awareness of their employees and customers."

Environmental report

In 1996, Scandic Hotels began to log electricity consumption, water usage, unsorted waste and volume of laundry through a system of reporting which it called Sustainability Indicator Reporting (World Travel and Tourism Council. 2009). According to Scandic (SERECS)², "daily environmental work is carried out in a number of different fields, such as resource efficiency, supplier alliances and waste management. All steps are measured in their data base system called HER (Hilton Environmental Reporting) as a part of the Hilton group, which gives the ability to communicate the results to guests, team members and other stakeholders. Each hotel has developed its own programme of measures for environmental improvements. Improvements, whether large or small, are always being implemented, all with the aim of ensuring a more sustainable society in the long term."

Human resource management

"Scandic puts greatest emphasis both on employee involvement and on the notion of change. Since 1994, for the human resource management, 5,000 team members of the hotel chain across Scandinavia received comprehensive environmental training, with a further 6,000 trained since then" (Scandic, 2004)². Bohdanowicz evaluates in a report³ that after extensive training and many years of environmental work, Scandic team members and management executives are well updated on the environmental impacts of chain operations, as well as appropriate strategies of environmental control and prevention.

Construction and design






In the building sector, all Scandic hotels in Sweden have carried the Nordic Eco labeling known as the Swan Eco Label since 2004. The eco labeling system takes a holistic view of the hotel's environmental work, with the criteria for achieving the eco label updated regularly to secure long-term environmental work. Also, Scandic has established its own standard for sustainable construction and refurbishment which is the Scandic Environmental Refurbishment Equipment and Construction Standard (SERECS); this provides very specific guidelines from the HVAC system to construction material selection (see diagram D.2.5-2).

1. <http://www.scandic-campaign.com/livereport>

2. Scandic Hotels AB. 2004. Scandic Environmental Refurbishment Equipment Construction Standard (SERECS) – Third edition.

3. Bohdanowicz, P., Simanic, B., Martinac, I., 2004. Environmental Training and Measures at Scandic Hotels,

Building materials

| Checked Out Not in be used! | Acceptable | Checked In |
|---|--|---|
| <ul style="list-style-type: none"> Insulation must not contain brominated flame retardants containin Borax or boric acid Expanded insulation material must not be produced using fluorinated propellants such as hydrofluorocarbon (HFC). Mineral insulation material must not be classified as carcinogenic under EU Directive 97/69/EC. | <ul style="list-style-type: none"> Danish or Norwegian indoor climate labelling, Finnish M1 labelling, Swedish P labelling, Danish 'pladekontrol' class E1 (also applies to laminate). Alternatively, a reported measurement of less than 0.13 mg/m3 air. If tropical woods are used, these must be FSCcertified or comply with the jmf forestry standard. For other types of wood, the manufacturer must guarantee that the raw materials do not come from forests with high biological and/or social value/must be able to state the type of wood and the country of production | <ul style="list-style-type: none"> Eco Label Type 1 <ul style="list-style-type: none">  The Nordic Swan A II kind of products (www.svanen.nu)  KRAV Ecological foods and textiles (www.krav.se)  The EU-flower All kind of products (europa.eu.int/comm/environment/ecolabel)  "Bra Miljöväl" All kind of products, even electricity (www.snf.se/bmv/)  FSC Forestry, wood, furniture (www.fsc-sverige.org) |

Checked out: The product is not acceptable and must not be installed in a Scandic hotel. Any deviations must be approved by the technical project manager at Scandic

Acceptable.

Checked in: Recommended for a sustainable future.

D.2.5-2. Scandic Environmental refurbishment equipment and construction standard.
- Third edition. P6 & 8.

Scandic Environmental Refurbishment Equipment Construction Standard (Scandic, 2004).²

This standard aims to act as a guarantee that all construction and renovation work is always on the cutting edge with regard to minimum environmental impact and forward-looking material selection; individual aesthetic or short-term interests will not jeopardise the company's path towards long-term sustainability.

The basic rules of the standard are :

- Re-use, renovate, recycle, re-construct should be the priority in any project.
- All materials and products used are to be documented.
- All materials shall be energy efficient and sustainable (manufacturing, transport, lifetime and recycling).
- Materials and constructions are to be chosen so that future demolition is easily done.
- Mixed materials should be avoided.
- Materials containing substances listed in the National Swedish Chemicals Inspectorate's Restricted list (www.kemi.se) or listed as "checked-out" material in this SERECS standard must not be used.
- Materials that emit potentially harmful or environmentally hazardous emissions, or which emit known allergens, must not be used.
- "Sorting at source" infrastructure in all newly refurbished hotels as well as an appropriate useful life and are easy to service.
- Eco-labelled materials should always be given priority for several reasons.

2.6. User-centric approach

'Design for people', 'Design with people', 'Design by people'

We have developed through the centuries to improve the life of residents.

- Architects

So, what could be different from conventional approach?

"Sustainable buildings are not merely optimized mechanical buildings with intelligent adjustment systems but constructions that imply and require quality in their environments to support and embrace life displayed in and around them" (Gylling, 2011, p.1).

A sustainable building is a built environment that is effective and adaptive to change of use over time. The needs of users are continuously change and buildings should able to support various requirements. Quality of building, accordingly, depends on the attribute to transcend changing times to supports users.

"Social dimensions of sustainability are clearly connected to human factors that require increasing attention to health, safety and comfort factors to provide the best level of users' comfort and satisfaction" (Jacqueline, 2008).

The users' comfort refers not only to physiological terms but also in psychological, behavioural and social senses. Hence, the level of optimizations of building performance should fit its user's understanding and needs. Architectural traditions have developed through the centuries to improve the life of residents. Consideration of aesthetic quality and comforts of users in terms of thermal, visual, acoustic elements and in-door air quality is nothing new in the field. In this context, what could be different in approach from conventional construction to sustainable refurbishment?

Attaianese (2012) mentions that the user-centric approach enlarges the view point toward sustainable building to maximize functionality and serviceability, as well as aesthetic quality, by reducing malicious impact on the environment; protecting the health, comfort and safety of workers, occupant, users, visitors and neighbors; preserving cultural values and heritage. According to Attaianese and Duca (2010), in the human-centric approach, human variability is an important design principle with a wide range of capabilities and limitations; this brings into focus the actual activities of individuals. Accordingly, during the design process, end-user involvement is one of the key aspects, from passive to active participation, which positively affects users' satisfaction. Architectural design, and building construction and management, can be enhanced by the consideration of the perspective of human factors (Lutzkendorf, 2007). Since end-users of a building play a critical role in the enhancement of functionality and serviceability of a building, analysing users' activities is a significant process in the pre-design phase. Specifically, where there is a specific group of residents or customers for a refurbishment project, user analysis via survey and observation enables generalization of the patterns of activities and the needs of occupants. The actual needs of users and building requirements can contribute to increasing building efficiency, by enhancing maintainability, serviceability and durability.

*Evidence-based design
Participatory design
Co-creation*

*What people expect for
a sustainable hotel?*

A human/user-centric approach is a broad term that needs to be more specific in order to be implemented in design process. There are diverse methods in a user-centric approach ranging from a passive to an active degree of user involvement and the various method of human-centric approaches can be implemented through diverse channels not only spatial change but also web-based information, prints and open events.

First, passive ways of user involvement may start with survey and observation of end-users to identify requirements and categorise their behaviour for design implementation. It can be referred to as evidence-based design, which accentuates the importance of using evidenced data in the design processes. Secondly, active user involvement in the design process may occur in user-participatory design or collective design. Robertson (2012) says that participatory design can be seen as a collaborative reflection and social interaction between multiple participants, the designers and the people typically referred to as users, in the design process. According to Sanders (2008) participatory design is most often referred to as co-design or co-creation.

HOTEL GUESTS' PERSPECTIVE

According to a report by Kang (2012), despite the opportunity to pursue sustainable business, some hotels are still hesitant to invest in green initiatives because they are not convinced whether or not such investments are financially beneficial. The concern follows the question, 'Is sustainable hotel more attractive to hotel guest?'. However, a study completed by Lonely Planet (2007) showed that 88% of travelers consider sustainable travel to be important.

"Consumer attitude towards visiting green hotels is positively determined by his/her environmental concern and guests will have a more positive attitude toward visiting green hotels when they are concerned about the environment" (Chen, 2013).

"Customers' willingness to pay for green initiatives may vary according to hotel types or segments (i.e., economy, mid-priced, and luxury segments). For instance, in the US hotel industry, luxury and mid-priced hotel guests are more willing to pay premiums for hotels' green practices than economy hotel guests" (Kang, 2012).

Consequently, it is important for hotel managers to understand the needs and wants of their guests and what specific factors they look for when selecting a hotel. This is especially important for those hoteliers that wish to attract new travelers, or tap into a niche market for example, environmentally friendly travelers (Michelle, 2008). Further discussion of user-oriented design approaches are introduced in the following chapter.

2.6-1. Case study

The Virgin hotels & Engine ; user experience design

PROJECT SUMMARY

Creating the distinct vision for new Virgin venture

- Commissioner: Virgin Hotel Group.
- Consultant: Engine. London. United Kingdom.
- Project location: New coming hotel in Chicago. United States.
- Project scope: Brand proposition, Service experience design, Hotel guest experience design. Customer journey mapping



Image 2.6-1
Visual guest scenarios. Engine.¹



Image 2.6-2
Net Promoter Scores to sustain improvement and innovation. Website of Engine²

Engine utilizes the Net Promoter Scores (NPS). While NPS provides the foundations of measuring experience and customer satisfaction, Service Design becomes the means by which an organisation can make sustained improvements to its services, beyond just fixing the basics. Through our work we have explored the progression of organisations moving from measurement to design-led change. (James S. 2013. Engine)²

1. <http://enginegroup.co.uk/work/virgin-hotels-new-venture-vision>

2. <http://enginegroup.co.uk/news-and-views/net-promoter-scores-improvement-and-innovation>

PROJECT DESCRIPTION

The Engine Group, a service design company based in London, worked for Virgin hotel to assist with the brand proposition and translate it into the design of the guest experience. Engine and the executive team of Virgin Hotels refined and developed this vision: how it could be translated into guests' experiences plus a series of valuable and differentiating signature services for the hotel brand. They explored the hospitality market and researched the needs and requirements of Virgin's target audience, understanding their core capabilities, attitudes, and hospitality and social requirements. Engine used these insights to develop key personas and a vision for the new service experience, with a range of strategies to bring it to life, such as creating a sense of belonging through participation and local interactions. The most appropriate and effective ideas were used to create a suite of distinct signature services. Engine then brought these to life through visualized guest scenarios (see image 3.6-1) and engaging communication materials, detailing each of the roles Virgin Hotels could play for their guests, from business support to providing forgotten or mislaid items. Engine produced visual and engaging descriptions of the final proposition: the brand story, the guest experience and how the new brand vision delivers unique experiences every step of the way. Engine and the Virgin team used the tactics to create a range of service features and touch point ideas across each opportunity area in the customer journey.

text from the Engine website.¹

DISCUSSION

Traditionally, planning for customer journey and experience design has been included in the work scope of the architects. Yet, according to diversification of customers' needs it is subdivided into service design as an independent field especially in big scale of commercial places especially in the retail, hospitality sector. As mentioned in the previous page, the process of service design varies from research to workshops and it has diverse channels from web-based applications to publications for instance it could be a scenario as the Engine planned for the Virgin hotel group. After all, it still remains as role of architects to interpret and connect free channel results to spatial plans.

According to an interview (28.Oct.2013) with Jaakko Wäänänen, CEO of Diagonal, one of the leading service design studios in Helsinki, the most challenging part of his work is to define scope of work and make tangible results to deliver to client. Service design entails massive research and field analysis which are channel free process at the beginning of a project. While it brings more possibility to innovation, the process is hard to be compensated especially in small scale of project. Hence, customers' point of view and end-users needs should be identified clearly as a beginning and center point of human-centered approaches.

PART C.

CASE ANALYSIS

3.1. History of the RAKE building

3.2. Urban context

3.3. Hotel Klaus K refurbishment case

3.4. The project group

Part C will analyze the following practical refurbishment case: Hotel Klaus K refurbishment project in the RAKE building, located in Helsinki. The analysis of a tangible refurbishment case is useful for exploring the actual process of a refurbishment work in the local context and applying various methodological and practical tools, discussed in Part B, to the project case.

The first section, History of the Rake Building, sheds light on how the building has been used and changed in the course of time. The second section analyzes the site and surroundings of the building to examine the embedded cultural and social values associated with the building and comprehend the local context. The third section, Hotel Klaus K Refurbishment Case, introduces the project case to shed light on the advantages and limitations of the project. The last section examines the views of the project members through interviews to clarify the communication channels and decision-making processes. Based on the analysis in Part C, Part D suggests an ideal process of sustainable refurbishment and a holistic scenario for similar projects.

3.1. History of the RAKE building

Data sources:

The text and pictures are based on a book by Heinämies (1985) and translated by author.

- Heinämies, K. 1985. *Rake Oy: n kiinteistö Kotkan korttelissa Erottajalla.*

- Kaikki Tiedot(Data sheet). 2013. 2008-357 : Ns.Raken talo. The Helsinki City Museum.

- Web site of Hotel Klaus K. <http://www.klauskhotel.com/en/the-history-of-klaus-k-hotel-in-helsinki/>.

- Web site of Rake Oy. <http://www.raketalo.fi/rakennushistoria/>.

More than 3,000 buildings are protected with historical cultural value under the City Plan in Helsinki. The RAKE building is one of the protected buildings that the Helsinki city museum has jurisdiction over. This building is located on the corner of Erottajankatu and Bulevardi, and it has a history of over 120 years, dating back to the 1880s. The site has been used for a school, a hardware shop, and a theatre. The premises of the property have been changed for various purposes through several expansions and refurbishment projects during the last century. The building plot consists of three separate parts. The four-storey building, located on Erottajankatu, was designed by architect Frans Sjöström; it served as a German girls' school in 1882. In 1897, the school was closed down and a printing house was established on that site, partly in the former school building and partly in a wooden building located on the corner of Bulevardi. Because of the conversion of building use, the first refurbishment took place in 1897–1900 on the Erottajankatu site, planned by the architect K. Holmgrenin. The renovation involved rearrangement of the room division to convert the larger areas, formerly used in the school, to separate rooms as well as upgrading of the electric and heating facilities.

When the operations of the printing house expanded, the architect Lars Sonck was commissioned to design a new factory building by the land owners Helsinki Kirjapaino and Kirjansitomo Oy; this project was completed on the Bulevardi site in 1912. At the



IMAGE 3.1-1. The Finnish first co-educational school in the 1880s. Valok, Charles Riis & Co, Helsinki city museum photo collection.

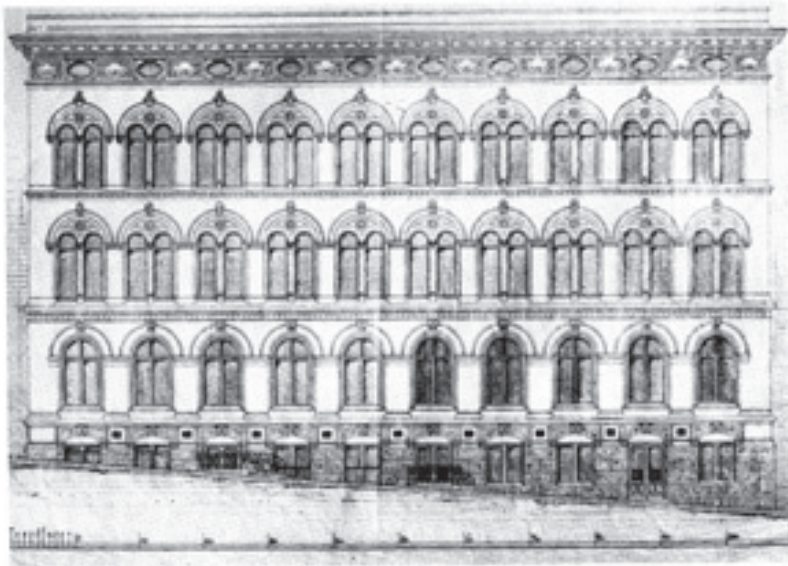


IMAGE 3.1-2. Proposal by Frans Sjöström. 1881.
Erottajankatu side Facade. Maistraatin arkisto.

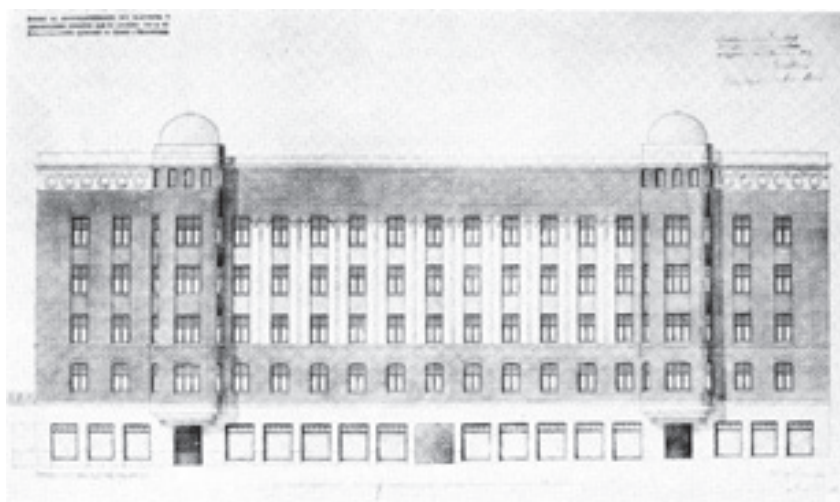


IMAGE 3.1-3. Proposal by Lars Sonck. 1911.
Bulevardi side Facade. Maistraatin arkisto.

same time, a third building was developed on the interior part of the plot as a printing press factory; during this development, the building located on Erottajankatu was refurbished as well. For example, the first floor premises were altered from their original school uses to create small retail spaces and staircases were arranged to create a new connection between the old and new parts of the building. The new building was almost the same size as the current building and was used for various purposes, e.g., factory, warehouse, office, restaurant and cafe, and retail premises. In 1917, the printing house sold the building to Rake Real Estate Oy.

In the early 1930s, Väimö Vähäkallio was commissioned to renovate the inner courtyard side of the building. The new part of the building and corridor enabled easy access to the retail facilities. He also renovated the façade on the Bulevardi and Erottajankatu sites. The existing windows at the ground level were replaced with entrances to allow direct entrance from the street to each of the retail premises.

In 1938, Architect Veikko Leisten undertook extensive renovation and extension of the real estate. During the 1940s, the buildings were occupied by new shopping premises, a hall in the inner court, a restaurant, and a hotel. At that point, based on the consensus at a board meeting of Rake Oy, an accommodation facility, named Klaus Kurki, was established by combining the premises of the restaurant and the former dormitory. In addition, the other rooms were newly remodeled, accompanied by facilities like sauna, barber shop, and hair salon services, etc. After the renovation, the extended hotel, including 63 rooms, all equipped with a toilet, and most with a bathroom, became a significant accommodation business in Helsinki, featuring an elegant dining hall and renovated rooms.

In 1942, the building was damaged by aerial bombing, but the damage was relatively minor and confined to the windows. During the 1940s and 1950s, owing to continuous conversion of the building and transfer of ownership, partial refurbishment works occurred continuously. In the early 1950s, the construction of a new building was proposed by the architect Aarne Erviä but was not realized for financial reasons. In the 1950s, the property had several tenants including Rautakonttori Oy, the National Board of Patents and Registration of Finland, Otto Wuorio Oy and Oy Fiskars Ab, the “Vanha Sali”, led by Sakari Jurkanin, and the theatre, led by Arena Jurkka.

In 1968, the building acquired new lifts and was connected to district heating. Owing to the demand for modernization and expansion, the hotel Klaus Kurki was retrofitted again in 1972. At that time, the building was occupied by a Mexican restaurant and other retail facilities on the ground level, a dance studio on the 3rd floor, some dental offices on the 5th floor, and several other offices.

During the refurbishment in 1984, massive technical retrofitting, involving a change of the ventilation system and water and sewage pipes and complete replacement or repair of elevators, was conducted. The old steam-heating system planned by Frans Sjöström during the initial construction was removed, and the roof structures were rebuilt. The old timber floors were coated with fire-resistant plasterboards and an automatic fire extinguishing system was installed throughout the building premises. The refurbishment was planned by Toivo Korhonen Ky (architects Pertti Kaarsalo and Tuulikki Kuhmonen). The project was also conducted by contractor and the construction company Mauri Rätty Oy, and Jouko Salone Oy was the developer. The interior design of majority of the assets (e.g.,



IMAGE 3.1-4.
The old department store and
the carpet sale department. 1967.

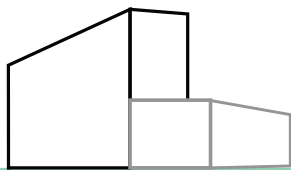
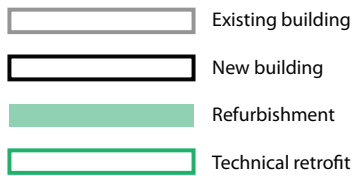
IMAGE 3.1-5.
After the renovated hotel room
in 1972.



IMAGE 3.1-6.
Renovation works in the 1984.
Valok.K.Hedenström.

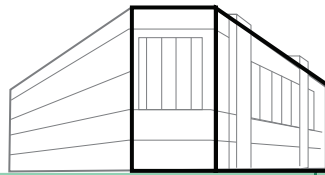
Bank AUSTRIA, The consultant J) was completed by Toivo Korhonen Ky, but the hotel's interior design was planned by Jukka Lahtinen TLP Oy and that of the restaurant, by British designer Ayala Abbot & Butters Ltd.

When the Klaus Kurki Hotel was run as a family business, the hotel underwent a massive refurbishment in 2005 worth 15 million Euros and the hotel was transformed into a design hotel and renamed as Klaus K. The refurbishment took place in the hotel and adjacent restaurants. Hotel rooms were retrofitted with upgraded air ventilation, air-conditioning units, and fan coils. With respect to structure change, two former small lift-shafts were merged to one large shaft and a new shaft was added next to the merged shaft; the inner-courtyard roof was replaced with a new skylight glass roof. A new access to the lower floor level (basement) was created and the old club restaurant was connected to the entrance area. A new ventilation-mechanical room and servant-kitchen area was built in the basement and a new ventilation shaft (and smoke extract shaft) was opened through the floors. The project was planned by the architectural firm SARC Oy (Antti-Matti Siikala and Sarlotta Narjus) and Swedish interior design office Stylt. As an extension of the refurbishment in the 2005, Hotel Klaus K planned an extension of the hotel in 2013 to convert the existing offices on the 6th and 7th floors to hotel rooms, planned by SARC Oy and interior design office dSign Vertti Kivi & Co. Currently, the building is owned by RAKE Oy and used as a commercial building by restaurants, stores, offices, and a hotel.



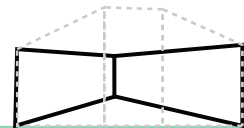
1882

4 stories of new building on Erottajankatu
by architect Frans Sjöström



1912

6 stories of new building on Bulevardi
by architect Lars Sonck

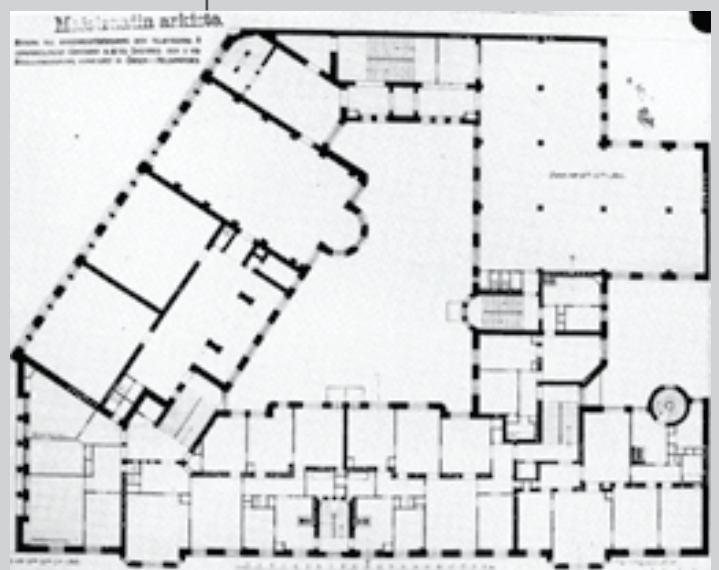
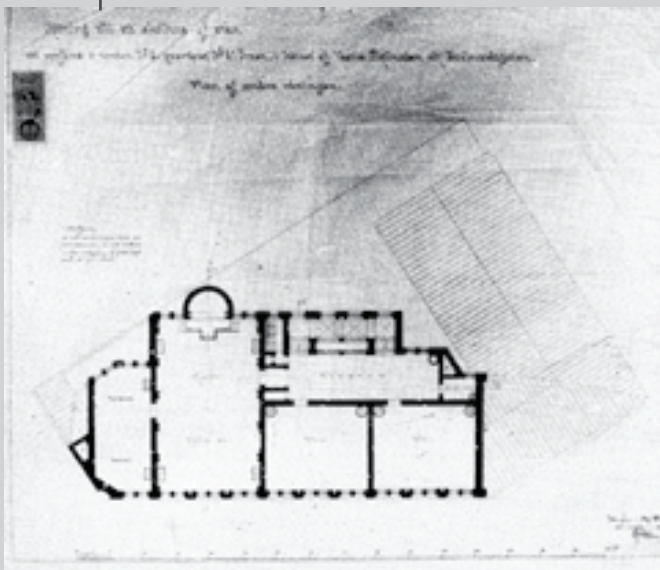


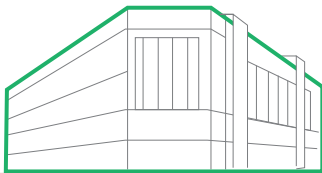
1930s

New building in courtyard side
by Väimo Vähäkallio

1897 Renovation. Architect K.Holmgrenin
Building changed from school to office & factory use

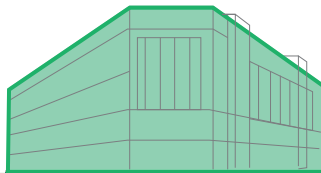
1938
Renovation. by architect Veikko Leisten
Helsingin Rakennusainekauppa Oy starts
accomodation business Klaus Kurki





1968

The building connected with district heating

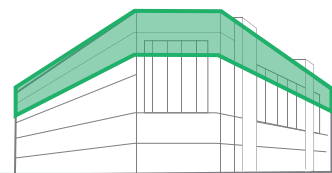


1984

Refurbishment by architect office Toivo Korhonen Ky. Massive technical retrofit and refurbishment including new roof structure

1972

Renovation of Klaus Kurki



2013

Hotel Klaus K refurbishment

2005

Klus K hotel refurbishment
Planned by architecture office Sarc Oy
& interior design by Stylt Trampoli AB



On glancing through the history of the building, there were at least seven massive recorded renovations, not including the on-going refurbishment project. The RAKE building has stood on the same plot for more than a century and is still loved by citizens, thereby accumulating social and cultural value. According to Cederberg, CEO of RAKE Oy, the building is located in the heart of the city, the economic value of the real estate has been increasing. Accordingly, the ownership and uses of the building have kept changing, resulting in various alterations to building. Time and again, the building has needed modernisation and retrofitting to be on par with technical improvements or social needs, e.g., alteration of the heating system to connect it to district heating in 1968. Usually, the reasons behind the changes were complicated internal and external issues. Now, the building is undergoing one more change – refurbishment of the Hotel Klaus K, and it is hard to predict what will follow.

3.2. Urban context

Embodied value of the RAKE building

CULTURAL BACKGROUND

The Esplanadi Park and the Bulevardi Avenue are protected districts according to the National Board of Antiquities (Museovirasto) and have been well preserved with respect to the historical and cultural characteristics for 200 years. According to the National Board of Antiquities (Museovirasto, 2009), the Esplanadi Park is the one of the first planned public parks in Helsinki, with a promenade that has been loved by citizens and tourists since the 1800s. Both the south and north sides of the street are scattered with historically significant buildings including the oldest residential and commercial buildings in the neo-renaissance architecture style

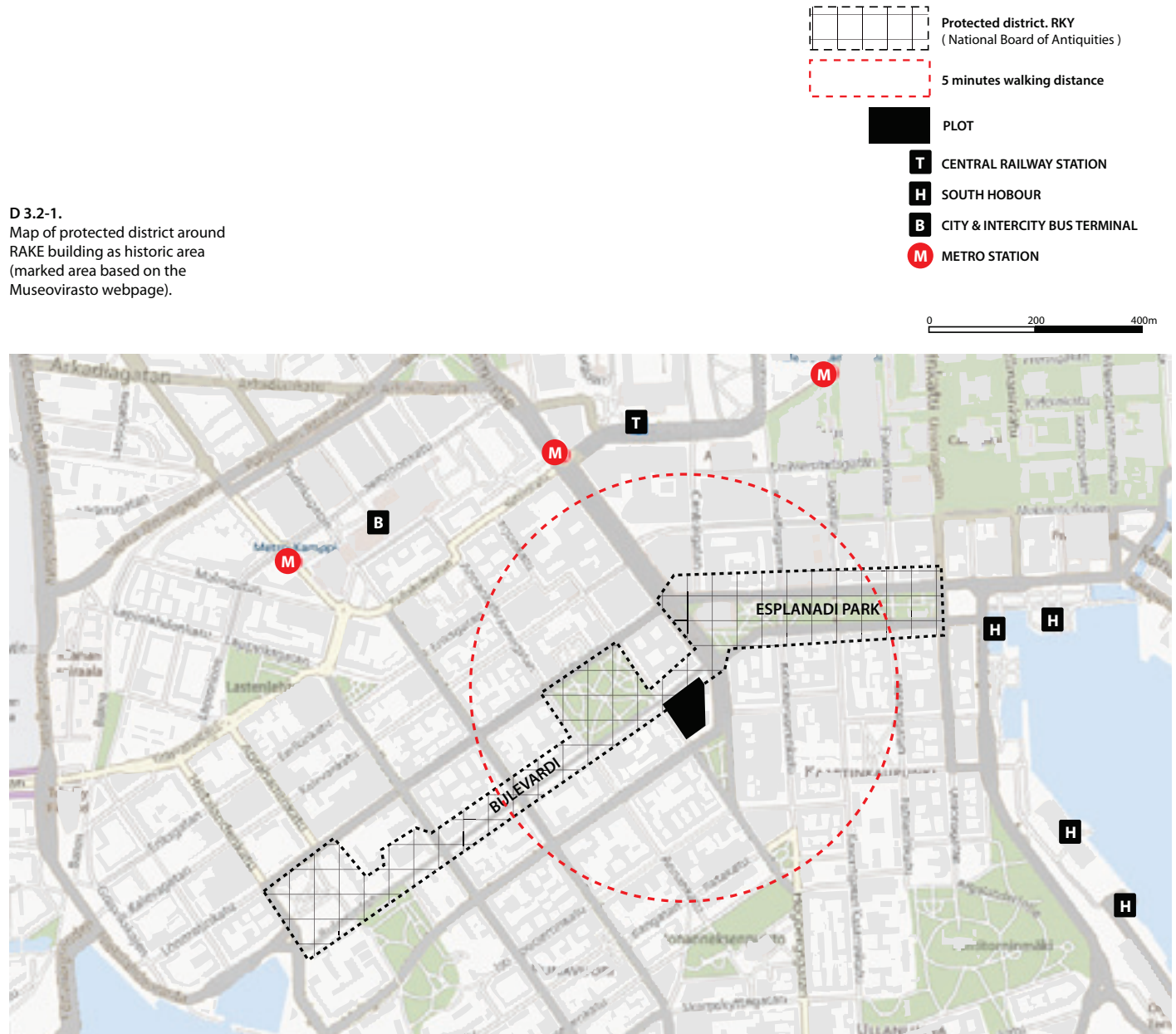
from the 1800s. The Bulevardi Avenue has many attractive residential buildings that feature the art nouveau style.

Nowadays, the street attracts diverse businesses ranging from cafes and restaurants to small retailers. The RAKE building is located in the middle of the Esplanadi Park and Bulevardi Street, and its balcony and terraces on the top floor, which are part of the on-going refurbishment project, provide a view of the entire area of the Bulevardi Street and Esplanadi Park at a glance.



Image 3.2-1.
Corner of the Erottajankatu and the Bulevardi Street is known as the RAKE corner due to the long history of the RAKE building.
Picture by author (19.10.2013)

D 3.2-1.
Map of protected district around
RAKE building as historic area
(marked area based on the
Museovirasto webpage).



TRAFFIC & AMENITY

The RAKE building is located in the centre of a commercial area and design district. It is easy to get public transportation since there are bus and tram stops within 50 meters. In addition, the train station, bus stops, and marine terminal are reachable in 10 minutes, on foot, for local travel. A variety of amenities can be found around the plot. The map of traffic and amenity (see next page) shows 'D-marked places' which are part of 'Design District Helsinki' which Hotel Klaus K is a member as a design hotel.

"Design District Helsinki, located in the centre of Helsinki, the Design District Helsinki plays a significant role in

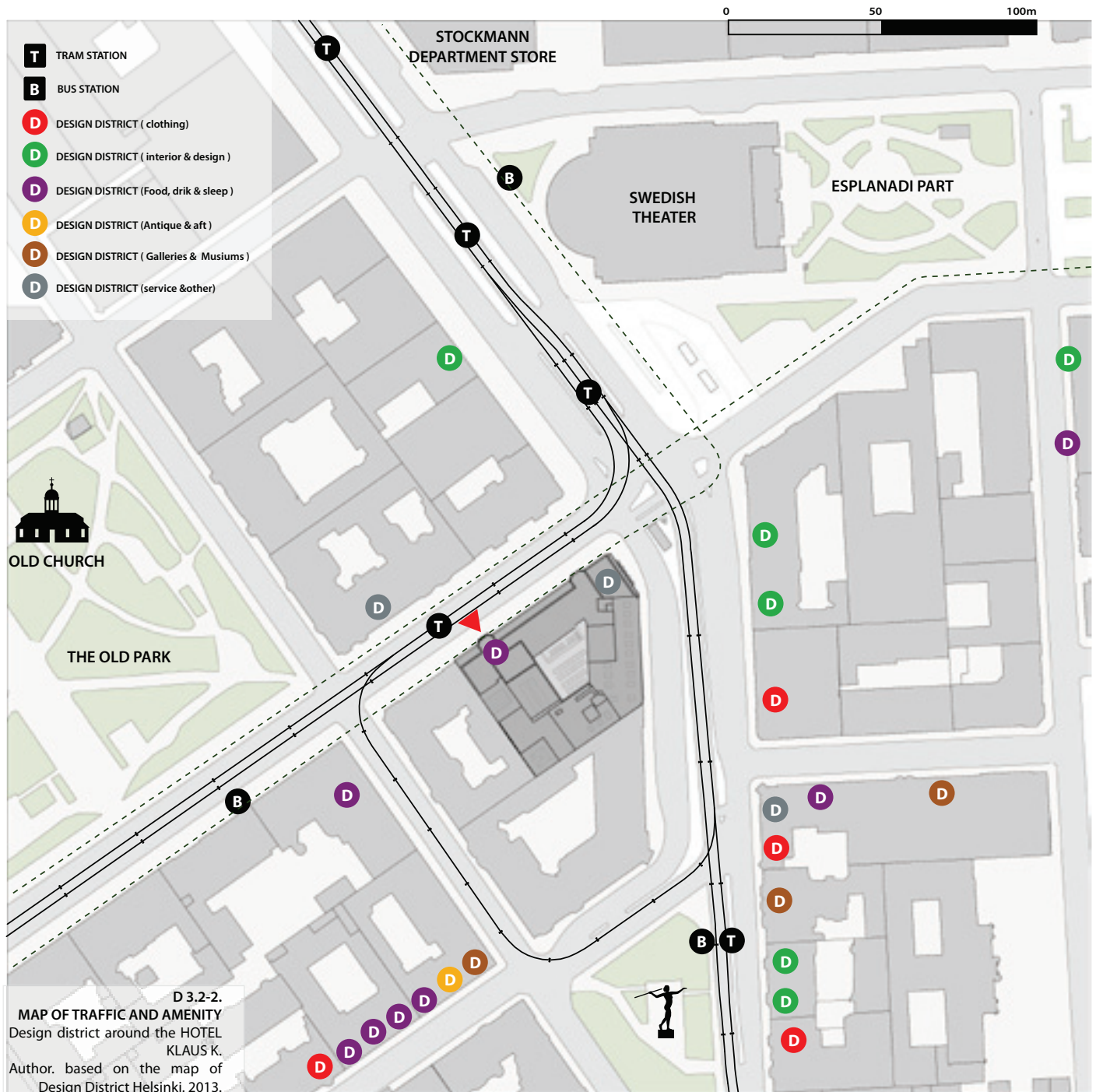
boosting Helsinki's reputation as a city of design. It is a cluster of creative businesses and a neighbourhood association that offers residents and visitors shopping, dining, accommodation, and experiences that presents the latest trends in Finnish design. It symbolises creativity, uniqueness, experiences, design, and Finnish urban culture" (Design District Helsinki, webpage)¹.

The district is often used as a venue for various events hosted by the city of Helsinki. For instance, design shops are open till late night for exhibitions and drinks on the "Night of the Arts" and the street becomes an open stage for the "Art goes Kapakka" event.

1.Design District Helsinki. Web page. <http://designkortteli.fi/design-district>



Image. 3.2-2.
The entrance of hotel.
Klaus K and the Bulevardi street.
Image from the website of Hotel
KlausK

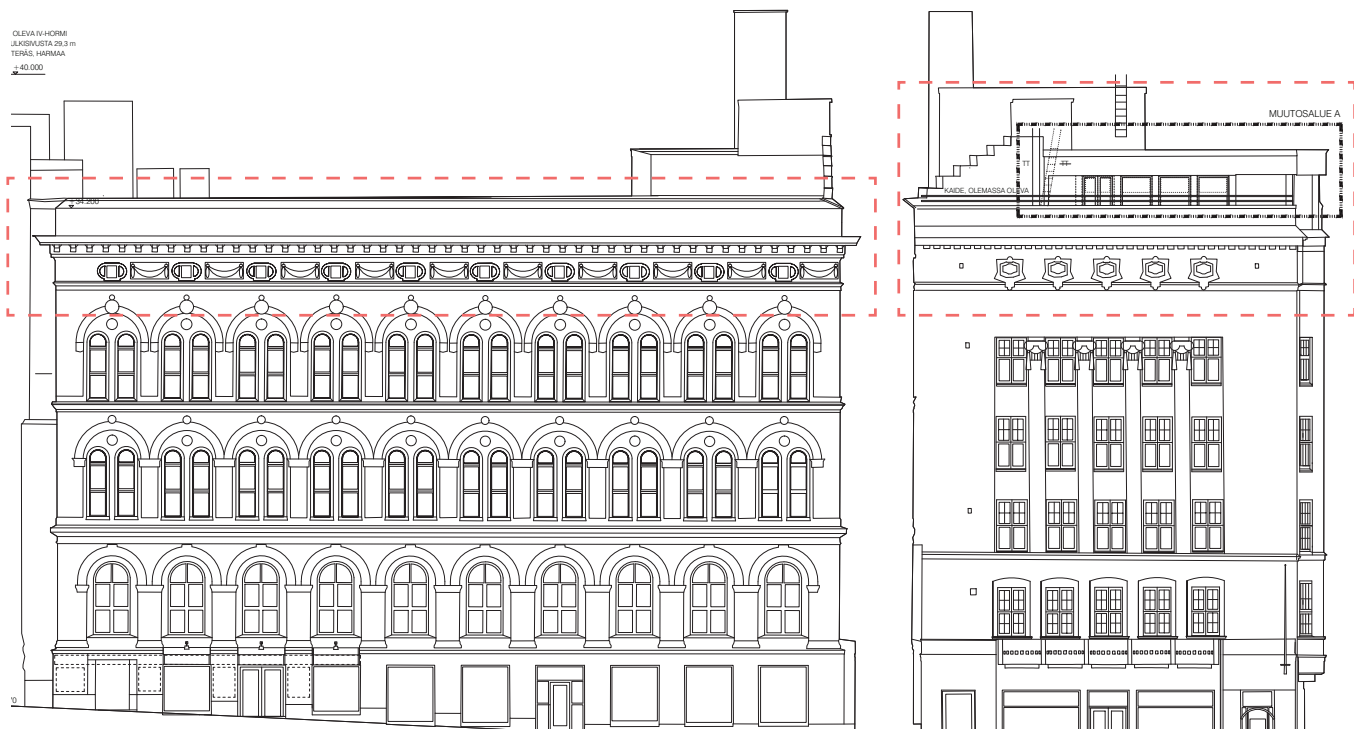


3.3. Hotel Klaus K refurbishment case

PROJECT SUMMARY

- Name of the project: The Hotel Klaus K refurbishment project
- Commissioner: Hotel Klaus K
- Planner: SARC Oy & dSign Vertti Kivi & Co.
- Location: RAKE-talo, Bulevardi 2-4, 00120 Helsinki, FINLAND.
- Administrative district: City of Helsinki, District 4, Kamppi, Block 61, Plot 3
- Project duration: 216 working days. 1.11.2012–18.03.2014
- Total area of building 13946 m² + technical rooms 1116 m².
- Project area: 1100 m² (6th floor) + 772 m² (7th floor) = 1872 m² (Total)

Drawing. 3.3-1. Elevation A
Facade on the Erottajankatu side.
Sarlotta Narjus. 2013. SARC Oy.



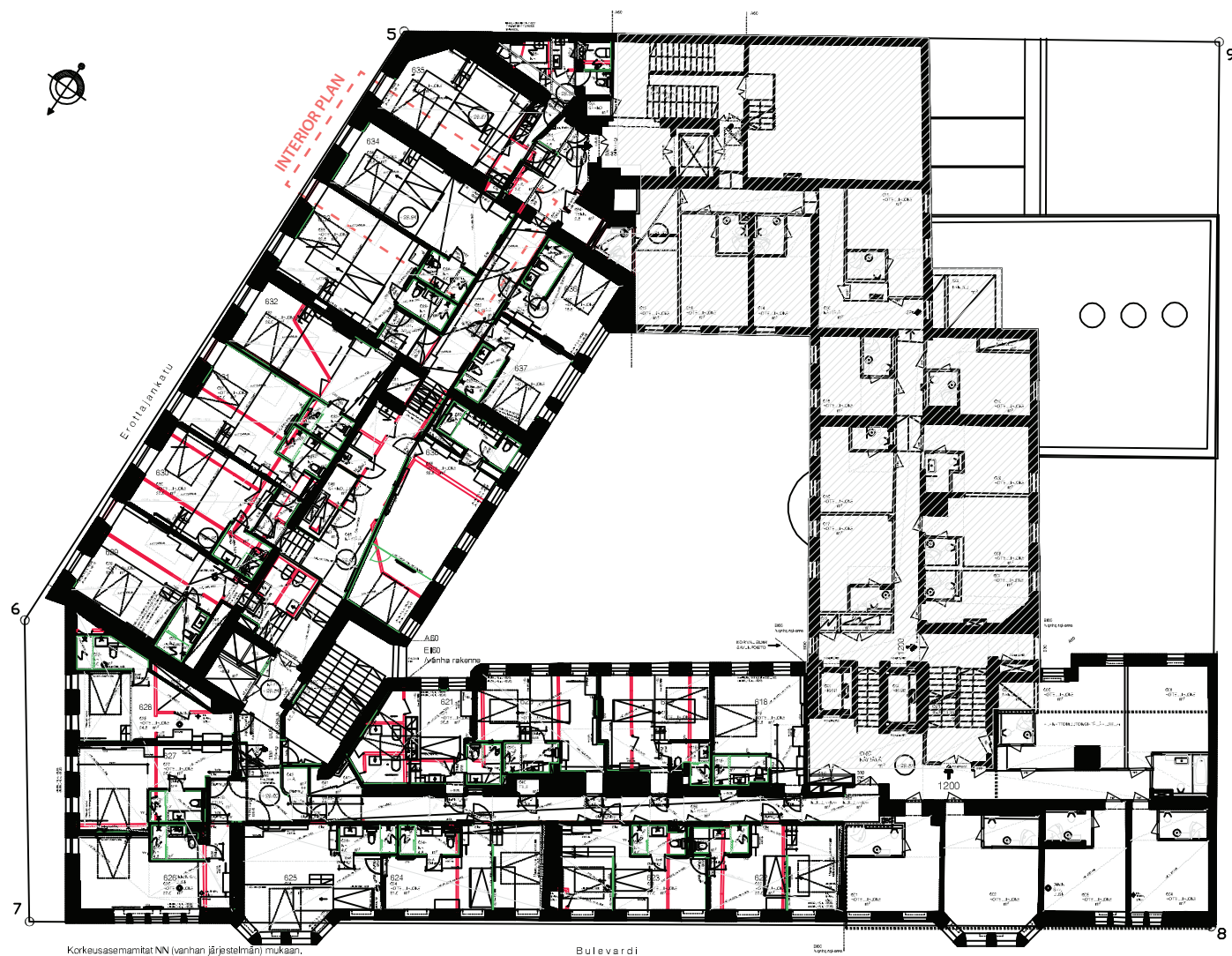
- Building protection by the Helsinki City Museum. The building protection descriptions in Helsinki are mostly written in the detail plans, with different markings, e.g. sr-1, sr-2 etc. The detailed plan of the RAKE building is very outdated and has no protection description although the building surely has great architectural history and townscape value. Therefore all the protection descriptions are defined individually, concerning the different projects that are planned in the building. In such a case, the Helsinki City Museum conducts evaluations together with the building control department.

- Protected area: by The National Board of Antiquities
The Esplanadi Park and Bulevardi Street is a protected area, with cultural historical value according to the National Board of Antiquities. Therefore, any plan for changes on the façade, roof, and any visible area should be checked in the planning phase.

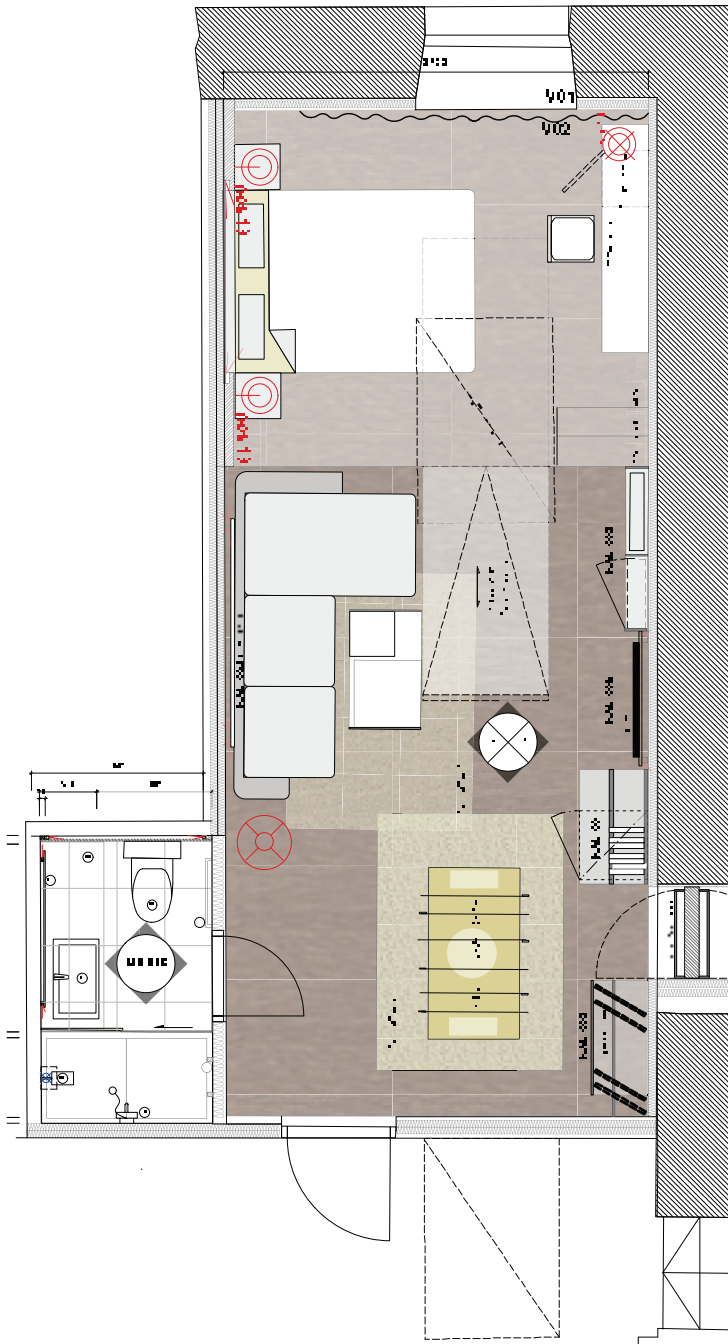


Drawing. 3.3-3. General plan. 6F.
Sarlotta Narjus. 2013. SARC Oy.

Existing walls for demolition
New construction



Drawing. 3.3-4. Interior plan.
General plan by dSign Vertti Kivi & Co.



PROJECT SUMMARY

based on permit documents. SARC Oy.

A. Conversion of space use on the 6th and 7th floors: From office rooms to 30 hotel rooms (21 rooms on the 6th floor and 9 rooms on the 7th floor).

- Structural change: Re-division of the space including demolition of non-load bearing wall (see left page).
- Technical retrofit: Fitting of new cooling devices and ventilation devices.
- Up gradation of existing radiators and electronic and acoustic capacity.
- Fitting of sprinklers in the entire premises.
- Upgrading of toilets in all hotel rooms.
- Rearrangement of the drainage system
- Addition of technical and functional rooms in the corridor

B. Refurbishment of the 6th and 7th floors (D.3.3.x)

- Suspended ceiling and floor renewal
- New wall finishing and furnishing

C. Glazing:

- Glazing of balcony on the 7th floor on the Bulevardi site with direct access from hotel rooms
- Glazing covered roof-top terrace on the corner of Erottajankatu and Bulevardi

*Did not get building permit regarding protected issue by writing time (01.2014)

D. Upgrading the old elevators on Staircase A

E. Restoration of the roof according to instructions of the structure engineer

CONVERSION OF BUILDING

The premises on the 6th and 7th floor were utilized as offices. The refurbishment project altered the premises from office use to new 30 hotel rooms. As the indoor requirement of hotel rooms are considerably different from office space, various alteration of technical and structural components were necessary including update of heating, ventilation and acoustic capacity. Also, additional 30 toilets were planned for hotel rooms which requires huge structural change.



IMAGE. 3.2-1 (LEFT)
Previous condition. office used space.
Author. 2013

INTERIOR DESIGN

As a characteristic of the hotel business, interior design plays significant roles in the refurbishment project. For the refurbishment project, separate interior design office, dSign Vertti Kivi & Co was designated. Accordingly, scope of work between architects and interior designers were clearly divided. As shown in the perspective below, immense amount of finishing material and various type of products are planned in each hotel room.



3.4. The project group

The Hotel Klaus K refurbishment project involves a variety of stakeholders: hotel operators and real estate owners, architects, and engineers. The project members are engaged in different phases of the project with various degrees of influence. The local municipality also has an effect on the project, as it is the authority that grants approval. Because each member has different interests in the project, each one's understanding of sustainability also varies. Accordingly, it is crucial to understand the diverse perspectives and define the role and responsibility of each project member clearly at the initial point of the project. This chapter will introduce and analyze the role of all the project members engaged in the Hotel Klaus K refurbishment project. Further, the excerpts from the interviews will shed light on the diverse views and opinions of the project members regarding sustainable building refurbishment.

What does sustainability mean to you??

Who initiates a sustainable project?

Who is responsible for the process of a project?

| | OWNER | LANDLORD | CONTRACTOR | ARCHITECT | ENGINEER | CONSTRUCTOR | MUNICIPALITY |
|------------------------|--|---|--|---|--|--|--|
| AGENT | STAKEHOLDERS | | PROJECT GROUP | | | | Helsinki city planning office Helsinki City Museum National Board of Antiquities (Museovirasto) |
| | Klaus K | RAKE oy | INDEPRO | Architect : SARC Architects Interior : dSign Vertti & Kivi | HVAC& Electric : Granlund Structure : Konstru Acoustic : Helmaki Fire regulation : L2 | In pendency (December.2013) | |
| ROLE | Project initiator Investor Decision maker | Real-estate owner of the building | Project coordinator | Project designer | Project engineer | Project constructor | Regulation Building permit |
| TIME FRAME | INCEPTION STAGE | | PRE-DESIGN STAGE | DESIGN STAGE | | CONSTRUCTION PHASE | BUILDING PERMIT PHASE |
| MAIN INTERESTS | Profitable Business Hotel Operating Facility maintenance Service life | Long-term service life & Maintenance | Coordination of process Cost management Schedule management Building regulation Permit | Social-cultural value Aesthetic quality of design Material selection Design life | Technical capacity Material performance Short-term Maintenance | Site, cost, Schedule & quality of construction | Cultural environment Building protection Urban landscape |
| COMMUNICATION PRIORITY | Contractor & Architects | Client & Contractor | Client all project members | Client Engineer & Constructor | Architects & Constructor | Architects & Engineer | Contractor & Architects |

D3-4. The project group of the Hotel Klaus K refurbishment project. Author.

3.4-1.General role of project members

A. STAKEHOLDERS

Two main groups of stakeholders are involved in the project: Hotel Klaus K and real-estate owner, Rake Oy. First, the initiator of the refurbishment project, the client, is the general manager of Hotel Klaus K who is also the main stakeholder of the project and a final decision maker. As a main investor in project, the client has a business-oriented perspective and aims to increase the value of the hotel to gain a profit from the refurbishment project. Second, the owner of the building, the landlord, is the real estate company Rake Oy that participates in the decision making as a stakeholder with limited influence as opposed to the influence of the client. In general, a real estate owner may have further perspective to the whole life cycle of building than other project members since they have to consider the property even after service life of one business.

As Huang mentioned in his thesis, a stakeholder needs to understand all aspects involved in a refurbishment project, i.e., environment, regulations, materials, and architecture design; for every design step, they need to have close and strong connections with all project members. The stakeholders have close relationships with contractors who are usually assigned at the beginning of project to control the total budget and timeframe of the entire process. They also interact directly with architects for finalising a design proposal. The opinion of the client has the most significant impact on other project members during the entire phase of project throughout various decision-making steps.

If a client aims to achieve sustainable refurbishment, a project should be initiated in a sustainable manner with adequate financial support and involvement of project members with experience in the field. The financial aspects of sustainability are strongly connected with building maintenance and serviceability, both of which, if efficient enough, are capable of reducing building operating costs in long run. The aspect of social responsibility is gaining attention in the hotel sector, where businesses are looking for possibilities to enhance value by using sustainability as a marketing point. However, the business-oriented view towards sustainability may not be shared by all project members, as some may tend to concentrate on environmental, social, or cultural aspects of technical or design-oriented solutions.

B. CONTRACTOR

A contractor undertakes a building project at the request of a client at the beginning of the project and is in charge of the budget and schedule of the entire project.

"The contractor assists stakeholders by acquiring the necessary permissions and licenses for the project and acting as the communication bridge in a project team, by interpreting clients' wishes to create project requirements. Most contractors also act as main project manager, because they usually have comprehensive information about building design and construction materials, fluently communicate with other parties, coordinate the working processes, and monitor the schedule." (Huang, 2010, p31).

Since, contractors help select project members from architecture studios, engineering design companies, and construction companies, they are key to the establishment of a proper team which has a sustainable approach. Furthermore, the contractor creates an open channel of communication among all project members and guides constructive discussions.

For the Hotel Klaus K refurbishment project, board meetings were held regularly to discuss crucial issues and check the schedule organized by the contractor of the project, Indepro Oy (See the table on following page). For efficient time management, besides board meetings, meetings in small groups were also organized on the request of project members. Although frequent meetings require considerable time, this practice is considered very useful in reducing miscommunication or confusion among the project members in the long term. For instance, the architects have direct meetings with the client on a monthly basis. Even though there are separated design offices that charge an architecture design part and an interior design part, there was no individual meeting between them but frequent share of material since the boundary of work was clearly divided. Meetings are also held often between the group of architects and group of engineers to check the feasibility of the plan.

C. ARCHITECT

Architects create a design based on the needs of the clients and end users (hotel guests in this project), considering the existing structure as well as the financial and technical feasibility. *"They need to understand the vision of the clients, practical needs of end users and synthesize this information into the architecture design"* (Huang, 2010, p31). Since various issues are involved in a design solution, architects collaborate with engineers to ensure the feasibility and implementation of the design and appropriate material selection. Since architects communicate closely with clients, engineers, material vendors, and constructors during the various design phases, they have a continuous and strong voice in the project group. As a person in charge of his/her own architectural plan, the architect takes the responsibility to produce appropriate drawings and documents to communicate with the project team and municipality. For the current project, the architect Sarlotta Narjus, from the previous refurbishment project in 2005, is appointed as the principle designer.

C-1. INTERIOR ARCHITECT

dSign Vertti Kivi & Co. took charge of the interior designing for the Hotel Klaus K refurbishment project. With a contract, the work scope is clearly divided between the architects and interior architects. The role of an interior architect is relatively larger in a refurbishment project than in new constructions. Since the hotel requires various types of interior finishing, furniture, fabrics, and decorations, material selection by the interior designers has a considerable effect on the total environmental impact of the refurbishment project.

D. ENGINEER

Engineers for a refurbishment project are necessary to involve into project earlier than new construction. For instance, a structure engineer examines the existing structure to check the degree of the possibility of changing the building structure before initiating the design phase. In addition, HVAC and mechanic engineers examine the existing system and check the technical capacity. During the design phase, all engineers and designers work interactively to draw plans corresponding with the views of other project members. As Huang points out, engineers have to actively interact with architects, material vendors, and constructors in order to provide feasible solutions.

Since environmental sustainability of a building is closely connected with energy efficiency, the engineers play a significant role in the project. With expertise in building systems, they can suggest options such as using renewable energy sources or applying new building components to the project. Engineers also check that service life of each building components is longer than design life of the building and secure vacancy to systems which requires maintenance access. In the Klaus K project, the acoustic engineering plans for sound comfort in each room are considered crucial aspects of the project.

Project engineers for Hotel Klaus K refurbishment :

- Structure engineer: Konstru Oy
- HVAC engineer: Granlund Oy
- Electrical engineer: Granlund Oy
- Acoustic engineer: Heikki Helimäki Oy

E. CONSTRUCTOR

Constructors deal with the actual construction work involving physical materials. In most sizeable projects, a constructor company is chosen by means of bidding after the generation of a basic plan by the architects.

"They have to be able to exchange the knowledge of materials with vendors, architects, and engineers to coordinate the construction work. They file material requests to material vendors on the basis of the architectural and engineering plans and implement the architect's and building engineer's designs" (Huang, 2010, p32).

For a sustainable refurbishment project, constructors are expected to offer enhanced documentation as well as connect with suppliers of sustainable material. Also, Constructors play a great role in pollution reduction in on-site work and logistic of building material and products during the construction period.

F. MUNICIPALITY

Governmental organisations exert a considerable influence on refurbishment projects through elements like building permits, historic building protection, fire regulations, and building codes. Since the RAKE building is considered one of the protected buildings, the Helsinki City Museum inspects the entire process and scope of the refurbishment project with respect to the permit-related processes. The main task of the City Museum is to manage the protection work for the culturally and historically valuable buildings and environments owned by the city and private individuals. The planning protection guidelines, based on the Land Use and Building Act (132/1999), are the primary means of building protection. The City Museum assesses the sites to be planned from architectural, historical, and urban landscape points of view. The City Museum issues statements when granting building permits for the repair of protected buildings or other cultural-historically valuable buildings. The building permit authority in this case is the Building Inspection Office (see an interview, p. 69).

3.4-2. Interviews

Interviews were conducted

- to understand the different roles and interests of each project member,
- to analyze the drivers of sustainable refurbishment, and
- to explore further sustainability possibilities for a refurbishment project.

Main interview questions:

- What is your role in the project?
- What is the most difficult aspect of refurbishment projects?
- What is your understanding of sustainable refurbishment?
- What could make the refurbishment case Hotel Klaus K more sustainable?

INTERVIEW #1

Name: Marc Skvorc

Position: General Manager of Hotel Klaus K

Role in the project: Client

Date of Interview: 24.09.2013

Name: Kenneth Cederberg

Position: CEO. Managing director of RAKE Real Estate Oy

Role in the project: Real estate owner/Landlord

Date of Interview: 07.11.2013

Q. What is your role in the Klaus K refurbishment project?

Marc: *"I'm the general manager at Hotel Klaus K and I take care of all the issues related to the Hotel and the refurbishment project".*

Kenneth: *"The hotel is a family business that is still learning, so there is a clear division of role and working boundaries between the hotel company as tenant and operator and RAKE Oy as real estate owner and landlord. Before conversion of part of the building premise from office to hotel rooms, cost value analysis was conducted to ensure that the property would bring sufficient amount of income. Also, the analysis results showed that the refurbishment would increase the value and revenue of property significantly."*

** The following interview excerpts are written by author based on face-to-face conversations and e-mails.

Q. How do you define sustainability in your business?

Kenneth: *"Sustainability is a very fundamental aspect of our business philosophy. Since, our company is a family business that has been handed down across four generations, the vision of our company is multi-generation oriented. Every decision that we make will affect next generation who will hand it over to the next generation. So, we are committed to the principles of sustainable development, prioritizing human and environmental welfare in all of our operations. For instance, for the refurbishment of the Bulevardi 6, we worked with a sustainable consultant from Gaia. We started with the environmental issues to the marketing point of sustainability; we set the criteria for sustainability and challenged all process and planners to reconsider options and think of ways to develop the building in more environment-friendly way."*

Q. Why couldn't the refurbishment project be undertaken in a sustainable way?

Marc: *"Each hotel has its own way of leaning business and appealing to customers. Some hotels give priority to sustainable value, such as the Conscious Hotels in Amsterdam. Hotel Klaus K advocates cultural value by promoting a high-end lifestyle as a member of the Design hotel group. We do have sustainable options in our service, but we do not push them to the front line; we introduce them as organic and local food for breakfast and towel change policy options."*

Kenneth: *"For the Klaus K refurbishment project, there was not that much capacity to improve with respect to sustainable aspects. The available options for decision making were very limited. Therefore, there was no additional marketing point or corresponding value to pursue it. For instance, we conducted a research with the engineering company Granlund to check the possibility to bring solar panels at the very beginning of the project. Yet, the expected production capacity was about 1% of the total consumption of building use. It was obvious that it was hard to achieve practical benefits or marketing value by installing solar panels."*

Q. What is the crucial point in a sustainable refurbishment in general?

Marc: *"As a characteristic of the hotel business, the point of view of customers should be considered. Guests pay money to relax and enjoy in our rooms. Therefore, it is important not to make guests feel burdensome or guilty in whatever we pursue."*

Kenneth: *"It requires multi-disciplinary approach to achieve a sustainable solution. Although, the social recognition of importance of sustainability is growing in general, there are many conflicting values and parties involved in practical projects. For instance municipality, human-right, technology, cultural, political, and environmental issues are all important points to consider, but they are not always heading in the same direction."*

INTERVIEW #2 ARCHITECT

Name: Sarlotta Narjus
Company and title: Sarc Oy, Architect
Role in the project: Principle Designer
Date of Interview: 12.11.2013

Q. What is your role in the Klaus K refurbishment project?

"As a project architect and principle designer for the refurbishment project, I manage and coordinate the work of the designing group to put the sketch and design together to make sense and meet the time schedule of each design group and the overall time schedule of the project manager, a contractor that is Indepro in this case. And the Klaus K extension project is a continuation of work from the massive refurbishment project in 2005. During the previous refurbishment project in 2005, we were already aware of the upcoming hotel extension project, so some parts of the work were done then, such as creating additional drainage and ventilation capacity."

Q. How complicated is a refurbishment project compared to a new construction?

"It's hard to know the existing situation of a building structure and system, so the beginning of a refurbishment project is based on assumption. But usually unexpected situations arise after starting the demolition making it difficult to meet the time schedule. Also, the time frame for the construction period is relatively short. Since, there are tenants inside the existing building, clients try to avoid huge losses of

rent during the construction period when the building should be empty.

Q. What is the most important aspect of a sustainable process?

"It depends on the case. It's a new thing and rules and regulations keep changing, so we have no experience or background. Compared to conventional buildings, for every sustainable construction, waste management is very important."

Q. What is the biggest obstacle in a sustainable refurbishment project in general?

"The most difficult thing is to secure enough funds for extra investment in sustainability. It is difficult to get back the initial investment in a short time in many cases. Clients are usually aware for need of extra investment, but it's hard to calculate precisely. Also, the process of a sustainable project is quite new and varies with each project so that it is hard to plan the exact amount of extra amount of work and time. For example, a project aiming to get LEED or BREEAM, needs much more extra work compared to a process of conventional construction. Moreover, some criteria of those frameworks are not suitable in the Finnish context. Unfortunately, extra work is required just to get a certificate, but we do understand this is necessary for increased value of the business and competitiveness in the international market. And the fluency of the process gets better with accumulating experience."

Q. How do you define sustainable construction?

“To achieve efficient use of the building itself. As an architect, I try to figure out how we improve the usability of space with minimum intervention by understanding the user’s behaviour. In architectural solutions, innovation may come even without high technical knowledge.”

Q. What could the Hotel Klaus K refurbishment project be undertaken in a more sustainable way?

“Energy saving wasn’t even an issue in 2005. It was introduced much later. However, the new HVAC system was quite a clever way. For the RAKE talo, it’s hard to bring energy efficiency if you are not undertaking a huge change, for instance change of wall, window, or roof structure. Also, there was no need to change the energy source which is district heating and cooling, as they are clever ways to utilize the existing infrastructure. For the on-going refurbishment project in 2012, the boundary of work is too small to bring in many options. Some sustainable options brought into discussion at the beginning phase of the project such as installing solar panels on the roof but it ended up not being applied.”

INTERVIEW #3 ENGINEER

Name: Kenneth Dooley

Company and title: Granlund. Sustainability Group Manager.

Role in the project: Not involved.

Date of Interview: 16.10.2013

Several engineers are engaged in the project from different fields, such as structural engineers, acoustic engineers, fire code experts, electric engineers, and HVAC engineers. Although the interviewee is not engaged in the project directly, he is the manager of the sustainable department at Granlund; therefore, the electric and HVAC engineers involved in the project report to him. The interviewee was asked about his general perspective on sustainable aspects of refurbishment projects.

Q. What is the general process of a sustainable project in your office?

"A sustainable project starts from the owners, tenants, or management that decide to go ahead with the refurbishment in a sustainable way, as one of the attractive aspects of their asset, and because energy efficiency is often a start point of sustainable renovation, we bring sustainable agents to the dedicated design team for a certain project. These agents work as advisors by engaging and proposing some sustainable solutions to the engineering team of the company. At the very beginning of project, we bring, for example, 50 target to achieve and discuss it with other working group including architects. After that, the number of target may reduce and distributed to other project members according to responsibility. Yet, responsibility distribution is not clear all the time. There could be several names on one category, leading to overlapping of the working boundary and responsibility. In this case, the project manager would be in charge of the process and communication in

between. At the end, each decision of the process should be reported to the clients or contractors for the final decision."

Q. How complicated is a refurbishment project compared to a new construction?

"It's difficult to give modern standards of comfort to old buildings. Building regulations keep changing and it is hard to fulfill these requirements with old and, especially, historic buildings. For instance, contemporary building regulations require buildings to be super insulated, but it is hard to change the U-value of old structures. Also, in Finland, many old buildings are 80-m deep, making it hard to bring daylight and natural ventilation into the building, as extra systems and materials would be required to achieve a contemporary level of comfort and performance. At the beginning of a sustainable project, we try to measure the use of energy and water to understand actual use. Old engineering systems are more complicated than modern systems, so it requires extra cost and efforts to examine and replace them."

Q. What is the crucial point in a sustainable refurbishment project?

"People don't understand sustainability. The concept has grown from energy sufficiency and then level 2, i.e., measuring water consumption not reduction to level 3, i.e., measuring total carbon footprint and recycling. There are so many things to say about further categories but that would be boring. The concept is not interesting when viewed as small aspects but is interesting when viewed as a nice package of all the aspects. It is important to communicate with people. Since sustainable buildings are able to achieve a sum of many small aspects, we should aim to tell a story from a sustainable framework."

INTERVIEW #4 MUNICIPALITY

Name: Sari Saresto, Mikko Lindqvist
Position: Curator, Helsinki City Museum
Role in the project: Not involved
Date of interview: 19.10.2013–25.10.2013 (via e-mail)

Q. Could you explain the protection status of the RAKE building?

Sari: *"The building does not have a protection status in the plan, but it has been listed in the city-district inventory. The detailed plan is from the 19th century, so it is very old and outdated. In terms of building projects and restorations, it should be considered as a protected building. The area from Esplanadi Park to Bulevardi including buildings along the street is also listed in the national register of culturally significant buildings and sites (National Board of Antiquities, 2009)."*

Q. How does the Helsinki City Museum manage the protection work for the RAKE building?

Mikko: *"There are over 4000 buildings and sites that are protected in Helsinki. The building protection descriptions in Helsinki are mostly written in detail plans, with different makings, e.g. sr-1, sr-2 etc. The detailed plan of Rake-building is very outdated and has no protection description although the building surely has a great architectural history and townscape value. Therefore, all the protection descriptions need to be defined individually, concerning the different projects that are planned in the building. In such cases, the Helsinki City Museum conducts an evaluation together with building control department. Unfortunately, no general outline is available for this question. The building permit issues are prepared in the building control department not in our department."*

DISCUSSION

As an interior architect of the Hotel Klaus K refurbishment project, I evaluated the case as a non-sustainable project because it did not achieve the desired value at the beginning. Through this thesis, I realized that I had a narrow insight about the project and did not see the bigger picture. I was not aware of most of the information in PART C when I was in the project group. It is partially due to my limited role as an interior architect but still I could contribute more actively.

Through the interviews and research, I realized that the project case had a good start point for a sustainable refurbishment. First of all, active use of the old building should get high credit as sustainable built environment by saving CO₂ and green house gases emissions due to existing building stock and preserve its cultural and historical value of it. Moreover, as a family-run business, the management at Hotel Klaus K has a mindset that gives importance to sustainability and cares about next generation. For instance, during the renovation in 2005, extra capacity for ventilation and electricity was planned in advance for future changes; furthermore, at the project, several sustainable options were checked, such as solar panels on the roof top, even though these options were rejected owing to lack of capacity.

After all, the boundary between a sustainable project and conventional one is not set clearly. The criteria for sustainable building differ for each project and depend on the degree of target point, which again varies for different project. From a holistic point of view, there is always a scope for change and pursuing sustainable value by any member of the project in any phase of the process, if one were to look at a project in a broad context.

PART C. IMPLEMENTATION

4.1. The process of sustainable refurbishment

4.2. Target setting

4.3. Scenarios

4.4. Role of architects in sustainable refurbishment

4.1. The process of sustainable refurbishment

The process of refurbishment can be divided into five stages: pre-project, pre-design, design, construction and operation stage. Although most of the time and budget is allocated during the design and construction phase, the majority of the crucial decisions for sustainable refurbishment are made during the pre-project and pre-design stages.

First of all, to pursue sustainability in a refurbishment project, it is crucial that the project initiator, usually the client, commits to starting the project in a sustainable way in the pre-project stage to secure enough time and budget for the extra processes. To draw a sustainable solution, considerable time and effort are required for its conviction, decision and realisation. If an architect or engineer tries to propose it without a requirement of client, the extra effort is hard to be compensated later. Having said this, not every project has the option of sustainable refurbishment.

Secondly, as there are various members in a project group with different interests and understandings of sustainability, it is crucial to work on a common set of sustainable refurbishment goals. This

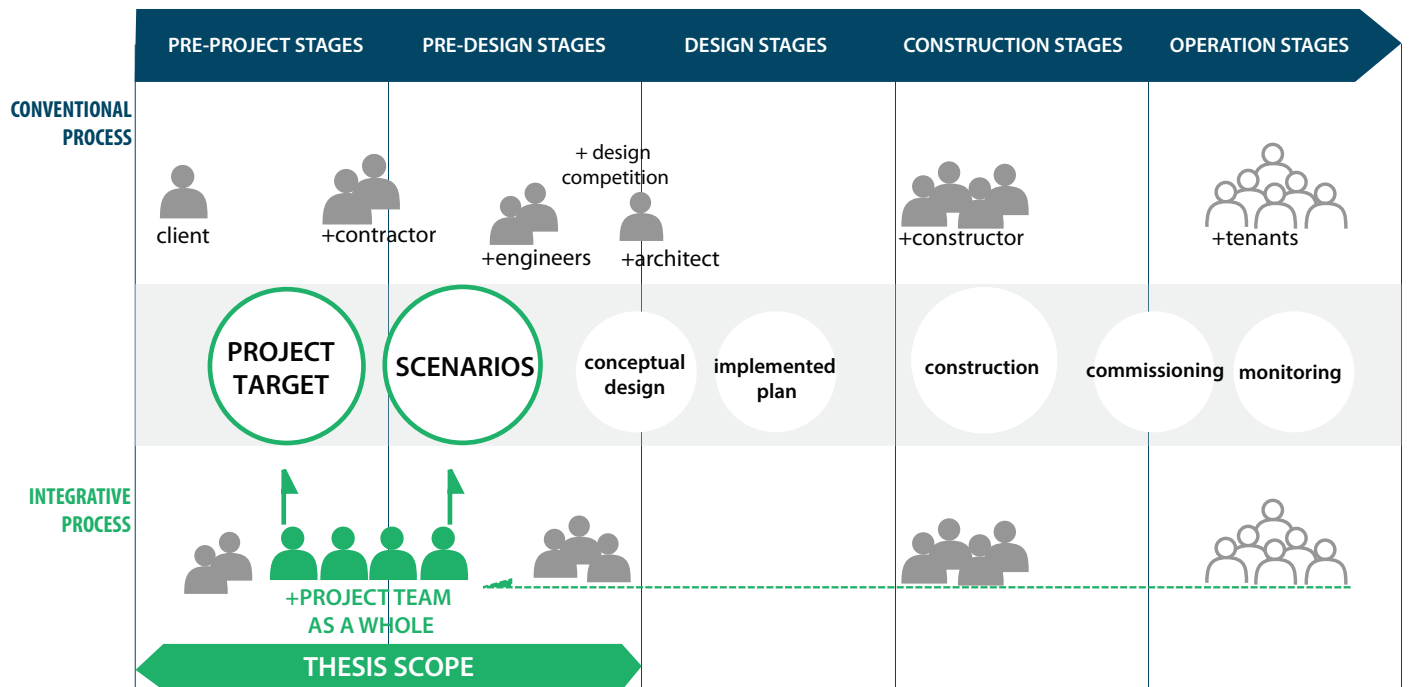
means that the project engineer, architects and designers should bring their ideas together early enough in the pre-design stage such to be able to clarify their interests and requirements while adhering to sustainability. The group thus shares a common vision and responsibility, setting a strong foundation, from the pre-design stage.

Unfortunately, in conventional processes (based on ARK12)¹ of planning stages, architects, engineers and constructors involve themselves in projects one after the other and therefore have limited options for mutual decision making. To achieve an efficient process, it is necessary to change from conventional linear design and delivery processes to 'the integrative process'. The integrative process makes the project team an unified organism that does not solve problems in isolation. According to the Integrative Process Standard², all relationships should be designed to interact in such a way as to achieve optimal results; purposeful studies and meetings are held to explore system interrelationships and exchange ideas for possible new solutions.

1. The Finnish Association of Architects (SAFA) and The Building Information Foundation(RTS).2012. Scope of work in architectural design (ARK 12). RT 10-111109.

2. Market Transformation to Sustainability & American National Standards Institute. 2011. Integrative Process Standard

D. 4.1. The process of sustainable refurbishment.
 Author, based on Le Roux. 2012b.
 Lecture slide, P43.



4.2. Target setting

What to pursue?

AIMS

- For diverse stakeholders to share a clear vision.
- To create positive discussion in the pre-design phase of the project.
- To bring all project related members together and clarify responsibility.
- To verify related issues together and secure reasonable time for this process.

The common goal of setting targets together can be a shared vision and objective throughout the process and enable distribution of responsibility among project members. The target can play a role as a clear platform for further process and as a guide for decision making.



D. 4.2. The core area of protection. Author.

T. 4.2-1. Framework for sustainable construction (see right page) :
International Organization for Standardization (ISO- 21929) defines aspects of sustainable building as follow.
Core areas of protection, aspects of building that impact on these areas of protection and indicators that represent these aspects. The number of X.s indicates the primary areas to which the aspects have a potential impact – XX indicates primary (or direct) influence and X secondary (or indirect) influence.
(Häkkinen, 2012)

INTERNATIONAL STANDARD FOR SUSTAINABLE CONSTRUCTION

Sustainable development of buildings and other construction works brings about the required performance and functionality with minimum adverse environmental impact, while encouraging improvements in economic and social (and cultural) aspects at local, regional and global levels (ISO 15392, 2008).

Sustainable building process is defined as the overall quality of the process that enables the delivery of sustainable buildings. The three main prerequisites for sustainable building are (Häkkinen, 2012):

- 1) Availability of sustainable building technologies.
- 2) Availability of methods and knowledge for sustainable target setting, design, procurement, monitoring and management of buildings.
- 3) Development of sustainable building processes and adoption the new sustainable building technologies, methods and working models.

| ASPECT | | CORE INDICATORS | CORE AREAS OF PROTECTION | | | | | | |
|--------|-----------------------------------|--|--------------------------|------------------|---------------------|-----------------|-------------------|---------------------|------------------|
| | | | Ecosystem | Natural resource | Health & well-being | Social equality | Cultural heritage | Economic prosperity | Economic capital |
| 1 | Emissions to air | Global warming potential | XX | | X | X | | X | |
| | | Ozone depletion potential | XX | | XX | | | X | |
| 2 | Use of non-renewable resources | Amount of non-renewable resources consumption by type | | XX | | | | X | |
| 3 | Fresh water consumption | Amount of fresh water consumption | XX | XX | | X | | X | |
| 4 | Waste generation | Amount of waste generation by type | X | XX | X | | | | |
| 5 | Change of land use | Indicator measures the changes in land use caused by the development of the built environment with help of a list of criteria | XX | XX | | | X | | |
| 6 | Access to services | Indicator measures the access to services by type with help of criteria | XX | | X | XX | | | XX |
| 7 | Accessibility | Indicator measures the accessibility of building and its curtilage with help of a list of criteria | | | | XX | | | |
| 8 | Indoor conditions and air quality | A set of indicators that measure the air quality and sub-aspects of indoor conditions with help of a list of measurable parameters | | | XX | | | X | |
| 9 | Adaptability | Indicator measures the flexibility, convertibility and adaptability to climate change with help of a list of criteria | | XX | X | | | | XX |
| 10 | Costs | Life cycle costs | | | | | | X | XX |
| 11 | Maintainability | Indicator measures the maintainability against the results of service life assessment and with help of a list of criteria or with help of expert judgement | | X | | | X | | XX |
| 12 | Safety | Indicator measures the sub-aspects of safety against the results of simulations or fulfilment of the safety related building regulations | | | XX | | | | X |
| 13 | Serviceability | Indicator measures serviceability with help of a list of criteria or with help of post-occupancy evaluation | | | | | | XX | |
| 14 | Aesthetic quality | Indicator measures the aesthetic quality against the fulfilment of local requirements or with help of a stakeholder judgement | | | | | XX | | |

SETTING CRITERIA FOR SUSTAINABLE REFURBISHMENT

As the introduced framework for sustainable construction mainly deals with new construction, the objectives should be revised for refurbishment cases according to local context and condition of the structure. To be specific, as a refurbishment case starts from an existing structure on an assigned plot, project criteria, especially for land use and energy source, should differ from new construction. Kimmo Lylykangas (2012) noted that 'ISO defines area of protection, aspects of sustainability and core set of indicators with top-down approach. But the standards do not define weighing of aspects and benchmarks'. Accordingly, applicable objectives for implementation should support the core aspects.

On the following page, diagram 4.2-2 – Aspects and criteria for sustainable refurbishment – starts from the aspects of sustainable building set out by the International Organization of Standard to bring objective value to criteria. More specific objectives are suggested by the author based on BREEAM International (2013) and DGNB (2012) to give more applicable criteria. Although the assessment tools are not utilised as certified projects, the criteria can be used as a starting point to set objectives in the pre-design phase of a project. The criteria are adapted for the refurbishment project 'Hotel Klaus K' by the author. In the actual process, all project members should check the suggested list together and revise it according to project conditions. After setting the criteria, responsibility for each objective can be distributed according to the type and character of the objective and the professional field to which it is related.

Refurbishment criteria and responsibility

(See the right page T.4.2-2)

Here is explanation how to read the mark *, **, *** in the table.

* In the table, Core indicators of ISO 21929-1, 2011 : Sustainable construction. But, a category 'Change of land use' is revised to 'Impact on site' considering characteristic of a refurbishment project. And the 'Process' is added to reflect the criteria of BREEAM and DGNB.

The criteria are mainly based on BREEAM International 2013. Some objectives are revised by the author to reflect conditions of the refurbishment case 'Hotel Klaus K'. Part of the original criteria of BREEAM such as 'impact of refrigerants' and 'NOx emissions' are excluded considering the Finnish context. Other criteria such as 'drying space', 'site selection', 'mitigating ecological impact', 'long-term impact on biodiversity', 'protection of site ecological value', 'natural Hazards', 'private space' are excluded considering the limitation of refurbishment case. 'public transport accessibility and maximum car parking capacity' is also excluded due to sufficiency in the present condition.

The criteria marked with ** follow DGNB since BREEAM has no corresponding category.

***Responsibility of each criterion is assigned by the author reflecting on role in the refurbishment project 'Hotel Klaus K'

T.4.2-2. Refurbishment criteria and responsibility

| CORE INDICATORS ISO 21929-1 (2011) | CRITERIA FOR REFURBISHMENT based on BREEAM 2013 & DGNB 2012** | RESPONSIBILITY *** |
|---|--|---|
| EMISSIONS TO AIR | Life cycle impacts of materials (LCA) | HVAC Engineer / Architect Architect / Interior designer |
| USE OF NON - RENEWABLE RESOURCES | Energy efficiency improvement, Energy monitoring External lighting, Low and zero carbon technologies, Energy efficient cold storage, transport systems, equipment Responsible sourcing of materials, Insulation | Mechanical, HVAC, Electric Engineers Architect / Client |
| WATER CONSUMPTION | Water consumption & monitoring, Leak detection and prevention, Water efficient equipment | Mechanical engineers / Client Interior designer |
| WASTE GENERATION | Construction waste management Recycled aggregates, Speculative indoor finishes Operational waste | Constructor / Contractor Architect / Interior designer Client |
| IMPACT ON SITE* (Change of land use) | Construction site impacts Building foot print, Enhancing site ecology, Surface water run-off, Reduction of light pollution | Constructor / Contractor Architect |
| ACCESS TO SERVICES | Travel plan, Alternative modes of transport Proximity to amenities, Inclusive design | Architect / Client |
| ACCESSIBILITY | Safe access (Inclusive design) | Architect / Interior designer |
| INDOOR CONDITIONS AND AIR QUALITY | Visual comfort(day lighting), Indoor air quality(ventilation), Thermal comfort Acoustic performance (sound insulation), Noise attenuation | Architect /Structure engineer HVAC engineer Acoustic engineer |
| ADAPTABILITY | Flexibility and conversion capability Adaptability of Technical Systems** | Architect / Interior designer All engineers |
| COSTS | LCC assessment Service life planning | Client / Contractor |
| MAINTAINABILITY | Designing for robustness | Architect / Interior designer |
| SAFETY | Security, Fire safety | Architect / Fire regulation expert |
| SERVICEABILITY | Stakeholder participation | Client / Architect |
| AESTHETIC QUALITY | Design and Urban quality, Integrated Public art** | Architect / Interior designer |
| PROCESS * | Integrated planning, Comprehensive building design Sustainability aspects in tender phase, Documentation for facility management Construction quality assurance** | Client / Contractor Architect / All engineers Constructor |

TARGET SETTING FOR THE HOTEL KLAUS K REFURBISHMENT CASE

This chapter applies the criteria of sustainable refurbishment introduced on previous page to the Hotel Klaus K refurbishment case. The set of core indicators of sustainable refurbishment is directly applied to the project on the first column. According to the each indicator, sub-categorised aspects of the previous refurbishment case is listed in the second column. The detailed lists are based on the case analysis in the PARTC and interviews with principle designers of the previous project, Antti-Matti Siikala for the 2005 refurbishment and Sarlotta Narjus for the 2012 refurbishment. Although the projects did not begin with the target of sustainability, some aspects adhered to sustainability that are in the table. Other categories are done with conversional process based on standard process according to Finnish building code.

The further issues on the right column of the table suggest sustainable aspects which could be considered and implemented in the Hotel Klaus K refurbishment project in 2012. The sustainable aspects of the project are suggested by author as an ideal set of targets for the project. Based on the ideal project target, four scenarios will be presented to suggest holistic ideas for the Hotel Klaus K refurbishment on the following pages.

THE HOTEL KLAUS K REFURBISHMENT CASE

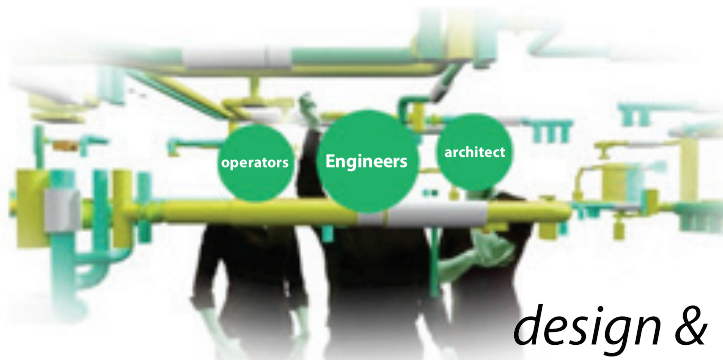
| CORE INDICATORS | COMPLETED IN 2005 & 2013 | FURTHER ISSUES |
|-----------------------------------|--|---|
| EMISSIONS TO AIR | New ventilation system which reduces heat loss by catching warm air installed in the 2005 refurbishment with capacity of further refurbishment. | Energy monitoring of the building could be planned in the pre-design phases. Possibility for building envelope improvement by window change and energy monitoring system could be checked (See the Scenario #1.p80). |
| USE OF NON-RENEWABLE RESOURCES | Possibility of installing solar panels on the roof top was checked. Not realised due to minimum capacity of production. | Since the building located in existing grid of district heating and cooling by the Helsingin Energia, alternative energy options do not bring huge advantages for the project. |
| WATER CONSUMPTION | According to regulation of the City of Helsinki and internal hotel policy. | Selection of water saving sanitary wares such as showers, faucets and toilet seats could be checked for the new 20 toilets. Possibility of obtaining an operational certificate. |
| WASTE GENERATION | According to regulation of the City of Helsinki and internal hotel policy. | Construction side waste management should be planned carefully in pre-construction phase with constructor. |
| IMPACT ON SITE | As a member of the Design District Helsinki, the Kluas K hotel has tried to improve outdoor environment of the building by attribute. | |
| ACCESS TO SERVICES | The Klaus K hotel is located in the city centre with proximity to public transportation and amenities. | |
| ACCESSIBILITY | Inclusive design is applied in the existing hotel rooms. Yet, due to existing steps which limit changes to the new 20 rooms planned without considering the issue of access for disabled people. | |
| INDOOR CONDITIONS AND AIR QUALITY | Additional radiators and change to ventilation system are planned for thermal comfort and indoor air condition. Acoustic engineered checked sound insulation capacity for new hotel rooms. Day lighting comes through existing sky lights and windows in some rooms. | The great view toward the city centre could be improved with access to terrace on the 7th floor. Permit issue is engaged in the terrace regarding additional grazing part. |
| ADAPTABILITY | Extra capacity of HVAC, electricity planed in 2005 for the further refurbishment. | For the fixed design elements in the rooms, recyclable and easy disassemble and re-assemble design detail could be checked. |
| COSTS | Standard process. | Life Cycle Cost assessment could be utilized to calculate long term payback compensating initial investment. Marketing value of sustainability could be checked. |
| MAINTAINABILITY | Detachable ceiling module is planned for easy maintenance. Durable floor material selected in consideration of frequency of cleaning. | Human resource management can attribute better operating of the building especially in the Hospitality sector (See the Business oriented approaches. Maintenance. p33). |
| SAFETY | Fire safety issues are checked according to regulations with local experts. A safe is placed in every room regarding security issues. | |
| SERVICEABILITY | Participation of stakeholders was planned through the board meetings. Some sustainable options checked in advance. | Pre- survey for hotel customer could be planned for better end-user participation. |
| AESTHETIC QUALITY | Co-creation event planned for participatory design (Integrated public art). | See the following Scenario #4.(p.86) |
| PROCESS * | Standard process. | See the Process design. p 90. |

4.3. SCENARIOS

How to achieve the project goals??

In this phase, diverse scenarios can be brought to the table for open discussion on how to reach the project goals. Holistic ideas enrich the project by generating new possibilities and bringing forward innovative solutions. In addition, creating tangible design options in the early stages of the project enables a clear vision to be shared and fosters constructive communication between stakeholders and all project members, allowing a sustainable strategy to be built. The scenarios presented should be evaluated financially, based on the actual value of the property, its value after construction and the estimated cost required for its refurbishment. Development of economically and technically attractive refurbishment packages increases the energy efficiency of existing buildings (Le Roux, 2012b).

Scenarios vary by focusing aspects of sustainability and methods to reach shared project targets. For instance, solutions to reduce carbon footprints may differ depending on utilised technology, from passive to active solutions, or choice of building life cycle stage such as changing the energy source to a renewable source, reducing embodied building CO_2 or reducing building operating energy consumption. Indeed, each scenario should consider project-specific issues such as available technology, economic capacity and engaged legal aspects and be evaluated based on those local issues and criteria set by the project team at a previous stage.



design &

#1. An energy efficient hotel

VENTILATION SYSTEM
LIGHTING DEVICES
SANITARY WARES
MONITORING SYSTEM



#2. The certified building

#3. Increasing social & cultural value

#4. Co-creation



SCENARIO #1. An energy efficient hotel

Reducing energy, electricity and water consumption

This scenario aims to reduce energy consumption of building operations with available technologies and practices. As a result of characteristics of the hotel business, there is more capacity for reducing energy and water consumption in the building (Part B. Business-oriented approach p.32). Active design solutions such as altering the HVAC system are required rather than passive design solutions such as natural ventilation and use of daylight because of lack of possibility in the property. In addition, as the refurbishment project aims to convert offices to hotel rooms, huge alteration of the HVAC system and new sanitary wares and a piping system for 30 new toilets are necessary, offering huge possibilities for improvement. The pre-monitoring and survey phase should be added as a key process as it is crucial for understanding the actual use of the building system, current amount of energy consumption and condition of the building structure and system during the pre-design phase. Monitoring the building during the building operation phase is also crucial to compare energy consumption before and after the refurbishment and for evaluation of the project.

Improvement of a building envelope plays a significant role in the energy efficiency of the building. To be specific, in the Hotel Klaus K project, there are huge surfaces of windows on the 7th floor in every room and corridor installed in 1984, which have huge capacity for U-value improvement. The option of window alteration should be checked with the monitoring phase by comparing the current condition of windows and the capacity for reducing heat loss with new windows. As the RAKE building is protected by the Helsinki City Museum, there are certain limitations to improvement of the building envelope or massive change of building structure for the refurbishment. Accordingly, the legal issue should be checked during the pre-design phase and the construction phase should be carefully

designed to reduce time involved and the impact to the site. The 3encult projects introduced in Part B, Case studies of Historic Buildings (see p.30), are good references for the process of the scenario.

Methods to develop operating systems through massive architecture intervention and using human resources can be suggested as actual management of building operation is executed by service workers (see Part B. Business oriented approaches). In this context, designers should consider access to maintenance and circulation of service flow.

According to the Carbon Trust (2005), it is recommended that specifiers go further than the building regulations by setting a design target as a percentage of improvement which is greater than that required by the regulations. Targets should be challenging enough to require designers/bidders to submit calculations and/or methodologies in their proposals. The demonstration of specification compliance can be made a requirement, to show that the building complies with the brief. This should take place at some point before handover.

In addition, the Life Cycle Cost (LCC) approach is recommendable for use, so that clients, investors and tenants are able to consider long-term payback through saving operating cost by reducing energy and water consumption. In many cases, the energy saving options are neglected as a result of high cost of installation. The LCC assessment enables decisions to be made from a long-term perspective by comparing the initial cost of energy saving options and payback of investments. The solutions do not have to be adjusted for building all together at the same time but a step by step process is optimal for the conditions of the project. Together with service life planning (see Part B, p. 26), access for maintenance and capacity for further changes such as use of a modular system of building components can be planned for gradual changes in building.

Graphic source (top to bottom):

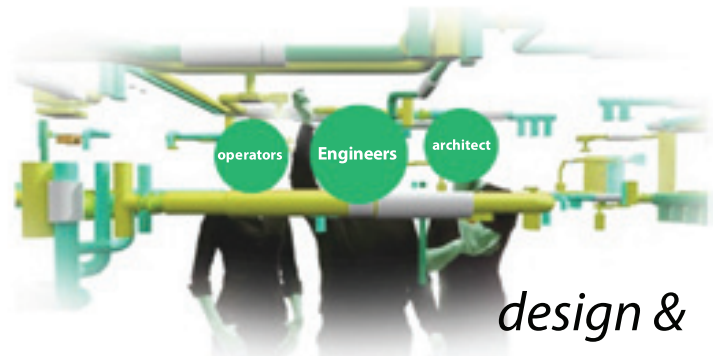
1. Heinonen. 2011. p.1181. Figure 4.
2. Granlund. webpage. <<http://www.granlund.fi/granlund/ihtisia/kari-hyykky/>>.accessed 07.02.2014.
3. Carbon Trust. 2009. Hospitality sector walk around checklist.

pre-design phase
How investment returns in long-term payback?

**SOLUTION COMPARISONS
TECHNICAL AVAILABILITY
TOTAL INVESTMENT**

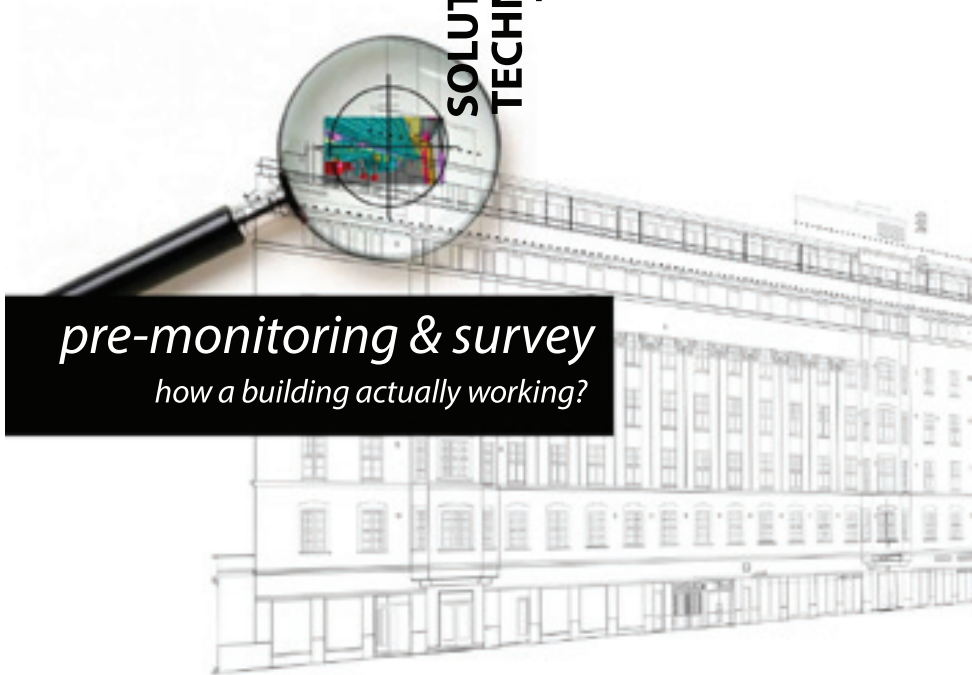
LCC

**POSITIVE PR
DECISION MAKING**



design & construction phase

HEATING AND COOLING SYSTEM
VENTILATION SYSTEM
LIGHTING DEVICES
SANITARY WARES
MONITORING SYSTEM



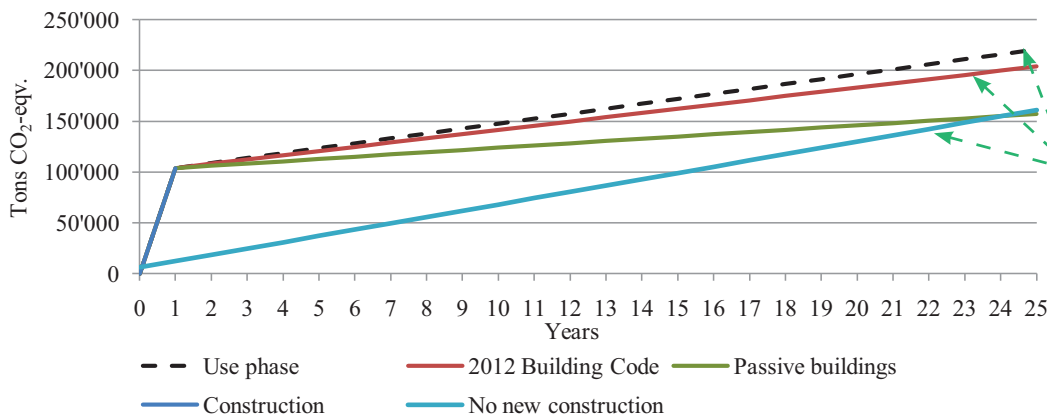
pre-monitoring & survey
how a building actually working?

Hospitality sector walk around checklist

| Checklist item | Yes/No | Comments |
|--|--------|----------|
| 1. Are there any visible signs of water damage or leaks? | | |
| 2. Are there any visible signs of mold or mildew? | | |
| 3. Are there any visible signs of pest infestation? | | |
| 4. Are there any visible signs of structural damage? | | |
| 5. Are there any visible signs of electrical damage? | | |
| 6. Are there any visible signs of fire damage? | | |
| 7. Are there any visible signs of vandalism or graffiti? | | |
| 8. Are there any visible signs of poor maintenance? | | |
| 9. Are there any visible signs of poor hygiene? | | |
| 10. Are there any visible signs of poor safety? | | |

operating phase

We are the one who make the real action!
CSR & HRM



Finding an acceptable point
Sustainable options
&
Financial / Technological
availability

SCENARIO #2. The certified building

An environmental assessment tool and the integrated process

This scenario suggests utilising market-available criteria and framework for the refurbishment process. The ready-made package of objectives plays the role of a target to pursue and a guideline for decision making. Diverse life cycle assessment (LCA)-based environmental assessment tools are available and are introduced in Part B (p. 22). To find a suitable tool for the refurbishment case 'Hotel Klaus K', a number of issues should be carefully examined. First, it should be explored whether the scheme of the tool specifies criteria for refurbishment projects which differ from new construction. Second, the tool should have flexible boundaries within the project scope able to be utilised for a refurbishment project of part of the building. As the Hotel Klaus K refurbishment project does not cover the entire building, an assessment tool that only considers the entire building as a project boundary is not suitable for the project. In addition, the tool should enable gradual changes of the building using a step by step process as the Klaus K hotel did for the refurbishment projects in 2005 and 2013. Finally, one must consider the local context. As mentioned in Part B, some objectives may not be suitable in the Finnish context as most of the tools were invented in other countries.

For the sustainable refurbishment process, it is important to commission the selected assessment tool in the pre-design phase to enable utilisation of the assessment tool not only as evaluation criteria but also as design objectives. In addition, a tool auditor and assessor should participate together

as part of the project team and suggest options from the pre-design stage. As mentioned in the integrated process (p. 73), it is crucial to bring all project members together in the pre-design phase to discuss all relevant issues and verify the type and amount of required work, include them in the scope of work and plan the time schedule. It is also important to prioritise the criteria according to the most cost- and time-effective options dependent on the project conditions in the early stages. If the decision is made to use an assessment tool at a later stage, it causes extra amount of work for all the designers involved to provide the required additional documents and thereby creates a negative attitude within the project team members, eventually causing less project improvement and fewer better options.

From an economic point of view, as the hotel can be certified by an authorised organisation after the refurbishment project, it must be able to bring extra marketing points with sustainable value. The labelled building results in increased competitiveness in the international market, appealing to more hotel guests. Eventually, the increase value of the hotel is able to compensate for the initial investment made in commissioning the assessment tool.

PRE-PROJECT PHASE

decision making & commissioning

Certified building as a marketing point.

Increased value to tenants and customers.

Enhanced competitiveness of building in international real estate market.

A good reference project of 'Environmental building' to portfolio

The ready-made criteria as design objectives.

The agent as a project team member

Integrative process

an assessor into the project team in pre-design stage

| ENVIRONMENTAL ASPECTS | KEY FACTORS | RESPONSIBLE | FURTHER NOTES |
|-----------------------|--|------------------------------------|---|
| ENERGY | Construction site impacts * | Contractor / Constructor | Site management, resource use, emission and pollution |
| | Energy Efficiency | Architect / HVAC engineer | Limitation of energy change (e.g. buildings) New systems should be checked. |
| | Sub-metering of substantial energy uses | Mechanical, Electric engineer | - |
| | Sub-metering of high load areas / tenancy | Architect (sist)/Electric engineer | Possibility to install smart indicators in rooms |
| | External Lighting | Electric engineer/Architects | Regulation should be checked when lighting |
| WATER | Low or zero carbon technologies | - | Solar panel choices already been checked. Not production |
| | Lifts | Architects / Client | Possibility to install smart indicators in rooms |
| | Water Consumption | Architects / Interior designer | Possibility to install smart indicators in rooms |
| | Water meter | Mechanical engineer | Main water meter connection to building automatic system |
| | Major leak detection | Mechanical engineer | - |
| MATERIAL | Sanitary supply shut off | Mechanical engineer | Solenoid valves are installed on the water supply to each toilet area in the building and the flow of water through that supply is controlled by a link |
| | Sustainable on-site water treatment | Mechanical engineer | Possible solution checking for wastewater treatment |
| | Materials Sourcing | Architects / Interior designer | Check possibility to utilize Life Cycle assessment from material list. |
| | Responsible sourcing of materials | Architects / Interior designer | Utilization of products with eco - certified specification. |
| | Design for robustness | Structural engineer | Check Green Guide rating for thermal insulation, responsible sourcing. |
| WASTE | Design for robustness | Structural engineer | Minimizing the frequency of use of cement materials. Protection of high exposure area. |
| | Implementation of Site Waste Management Plan | Designer / Constructor | Implementation of Site Waste Management Plan. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Centralized waste management | Designer / Constructor | Centralized waste management. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| POLLUTION | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |
| | Recycling operation in room | Designer / Constructor | Recycling operation in room. Identification of the key - relevant waste/demolition materials and recycling of the materials. |

+point of marketing
+competitiveness to tenants
+ international value to portfolio

SCENARIO #3. Increasing social and cultural value of design

Partnership with local design shops

This scenario is a business-oriented, top-down approach. In this scenario, the client has a strong business concept and framework for refurbishment. In the Scandic hotel group, introduced in Part B, A case study of a business oriented approach (page.32), the role of an architect is relatively limited as architectural solutions support the business. However, this scenario proposes a design concept combined with a business model from the point of view of an architect as a project member of multi disciplinary team for the refurbishment project. Innovative architectural solutions with a novel business model could be more welcome, as the Hotel Klaus K is part of the Design hotel group in which the concept of design forms a crucial part of the hotel strategy, allowing more capacity for architects to bring creative design ideas.

The Hotel Klaus K is located in the centre of the Helsinki Design District (see p. 51), which introduces and represents Finnish design. As part of the Helsinki Design District, the Hotel Klaus K has contributed to improving and promoting the neighbourhood. As a member of the Design hotel groups and the Helsinki Design District, the hotel appeals to design-sensitive customers. Indeed, such customers are willing to pay extra for a hotel room to enjoy the value of the hotel in the historic building located in the centre of the Design districts. This scenario starts from those embedded values of the hotel, utilising and maximising the benefit of socio-cultural aspects. As a consequence of the characteristics of the hotel refurbishment project, which is a hospitality business requiring more

attention to interior design, a substantial part of material use comes from interior finishing, furniture and decorations. As these components have short design life spans because of material capacity and also flow of fashion, it is important to know how to extend the life cycle of the design elements to reduce carbon emissions from embedded material and to cut down maintenance fees. It is also important to plan to re-cycle or re-use material and consider after disposal of the products. As an innovative way of extending the design life of interior elements, the scenario proposes creating a partnership between design shops in the Helsinki Design Districts and Hotel Klaus K. By using material from local design brands such as furniture, fabric, lamps and decorative objects, the hotel rooms are able to act as extended showrooms of the Helsinki Design District, allowing local design brands to promote their products in use. Furthermore, the hotel is able to fulfil customers' expectations of high quality design with the extra value of local design. Customers may select and order products directly from their rooms or easily drop by shops located near the hotel. This scenario could stimulate new consumer cultures, bringing extra financial benefit to the hotel and local design shops, although specific business models and possibilities should be developed further with experts in the field. Ultimately, this scenario expects the proposed partnership to bring mutual benefit to the hotel and partners and contribute to the design district.

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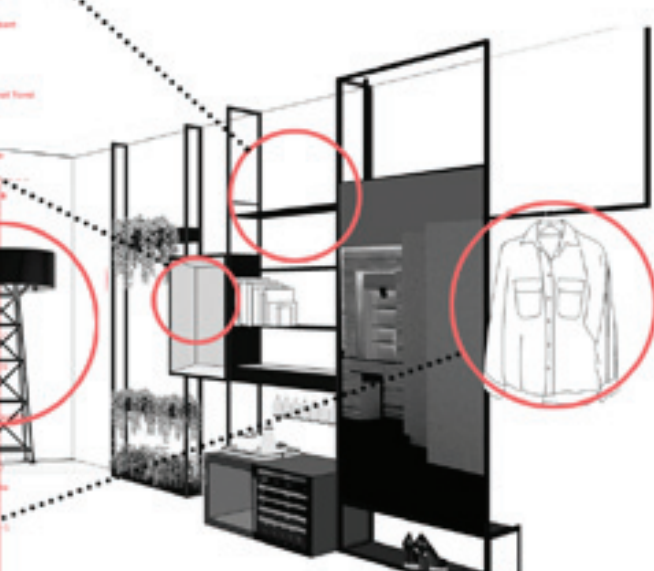
- 1998, 2000**

- © 2011 Blackwell Publishing Ltd

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- DOI: 10.1002/anie.201100001

- extend design life*

KLAUS K
HOTEL A MEMBER OF
DESIGN HOTELS™

SCENARIO #4. Co-creation

Passive and active methods of participatory design

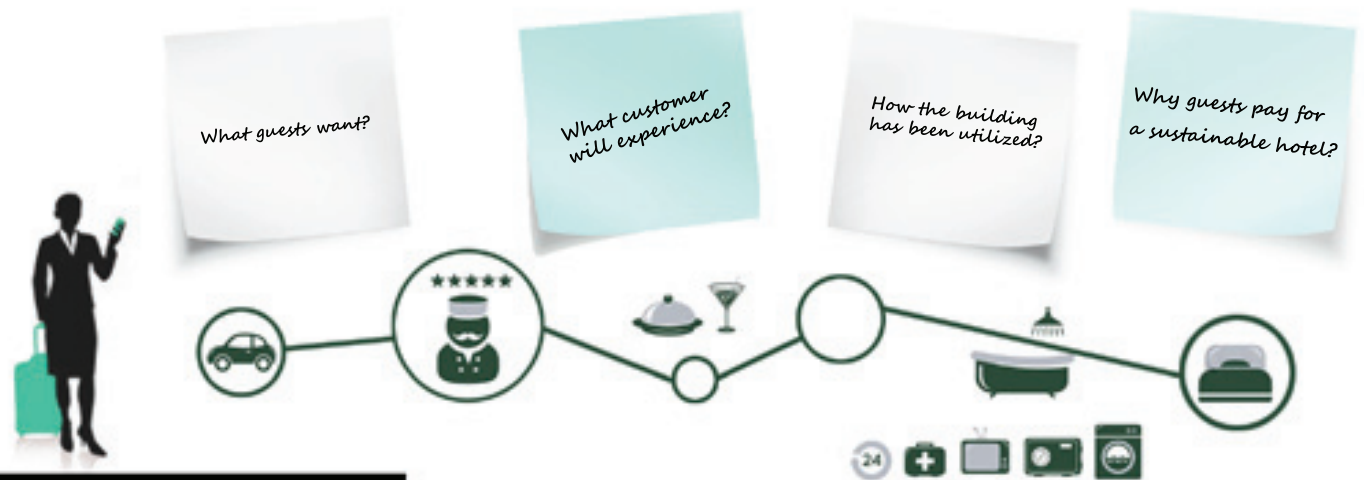
This scenario aims to understand the views of customers; what they expect when they visit the hotel and what they will experience in that space. Contrary to the business-oriented scenario, this user-centric method is a bottom-up approach. The co-creation scenario encourages fostering of passive and active approaches to participatory design.

First, passive participatory design processes such as early research and surveys of users can be conducted during the pre-design process. The process enables analysis of hotel guest expectations and the actual use of the building. For the Hotel Klaus K project, customer journeys and their expectations of sustainable hotels can be studied. Although the end users of the hotel are not a specific group, general patterns of behaviour and tendencies can be examined. The agent of the process could be a specialist of service design, as in the Engine service design for the Virginia Hotel group case study introduced in Part B (p. 37). Various emerging studios in the service design sectors in Finland have also worked for diverse projects to define the needs of end users. The results of the pre-research phase could be applied in diverse channels in the form of, for example, web based interface or architectural intervention. The role of architects is to interpret those requirements from pre-research to design solutions, verifying necessary improvements

to space and making changes.

Secondly, active methods of participatory design can be planned as a part of the design phase. The co-creation process already planned for the ongoing refurbishment of Hotel Klaus K has tried to bring local graffiti artists into corridor design. Local graffiti designers can be considered part of the larger segment of society able to bring public art into the design elements of the hotel. This also draws public interest to the hotel and refurbishment case through diverse communication channels such as workshops and open events. For instance, the Hotel Klaus K actually hosted an open event to promote the co-creation process on the night of arts in 2013 (see image on the following page). The event received positive feedback, allowing better communication with the public by providing information about what goes on in the hotel. The sustainable aspect of the process adds social value to the aesthetic quality beyond the flow of fashion and enables extension of the life of design components. In consideration of the sustainable aspect, the co-creation process can extend to corridors and into the rooms and lobby area.

As the Hotel Klaus K is part of the Design hotel group and the Helsinki Design District, it is expected that co-creation methods would have a stronger effect than in any other type of building.



PRE-SURVEY & RESEARCH

> patternizing behavior > customer journey design



5.4. ROLE OF ARCHITECTS

in sustainable refurbishment.

LIMITED ROLE OF ARCHITECTS

The role of architects in refurbishment projects is limited compared to their role in new constructions. As refurbishment starts from an existing building structure, there are physical limitations to changing existing structures or systems. To understand the actual building use, engineers should involve themselves in the pre-design phase to examine the current condition of the building structure and system. For feasible solutions, architects should communicate continuously with engineers. During this process, many of the suggested ideas filter down to design application. Moreover, as there are existing residents or tenants in the building, refurbishment starts from the specific requirements of end users. Accordingly, architects should understand the actual uses of the building at the outset, identify residents' needs and reflect these in architectural solutions. In this context, there are various agents involved in the refurbishment project from the pre-design phase, not only clients but also residents and building engineers. Eventually, because of limitations in existing structures and diverse stakeholders, architects have less free design.



D. 5.4. Project Influences.
Loughborough University, 2013.

EXTENDED ROLE OF ARCHITECTS

Architects play the significant role of mediator throughout the process of architectural projects and beyond architectural design. Various types of work delivered by architects shown to authorities, planners and policymakers affect diverse levels of decision making. A sketch or perspective which represents the vision of a project may be able to draw financial support and official works regarding legal process can enable prevention and neutralisation of threats and development of local competitive advantages. Accordingly, architects should understand legislation criteria and design strategies to stress the importance of socio-economic aspects amongst different stakeholders. A question is therefore raised: 'what is the difference between the role of architects in conventional building design and in a sustainable refurbishment project?' The process of sustainable construction entails extra issues in the process such as target setting and energy auditing. Refurbishment projects require additional effort and time to understand the condition of property and building systems. Such efforts can include, for instance, pre-refurbishment surveys. Accordingly, there are additional processes for sustainable refurbishment projects which require architects to play different roles.

This thesis defines the extended role of architects in sustainable refurbishment in two categories:

- Communicator (principal designer)
- Process (scope of work) design.

ARCHITECT AS PRINCIPLE DESIGNER

"Being the principal designer (PD), the architect is responsible for achieving the design result of the object according to the client's objectives. The PD also manages and coordinates the work of the designing group to avoid conflicts and meet the time schedule and carry out other design management tasks according to the agreed scope of the design contract" (SAFA, 1995)¹.

The principal designer, usually a main architect of a project, should comprehend not only architectural design but also all ranges of the project from building codes to technical components to enable adjustment of the building system. The PD is also responsible for building permit issues and delivering all necessary documents and drawings. In addition, architects should facilitate mutual understanding among project members to enable a corresponding conclusion to be drawn. In particular, as a sustainable refurbishment project has an especially high degree of embedded uncertainty and additional tasks involved in pursuit of sustainability but not a sufficient archive of reference projects, the PD should have a broad perspective and understand the overall process of the field. Eventually, the architect in a sustainable refurbishment project plays an extended role as a communicator.

1. The Finnish Association of Architects (SAFA) and The Building Information Foundation(RTS).1995. Scope of work in architectural design: ARK95. RT 10-10576 en.

PROCESS DESIGN

Scope of work in architecture design in sustainable refurbishment

As the concept of sustainable refurbishment is still young in the field of construction, there are many difficulties for architects in defining scope of work and delivering necessary material on schedule. Unexpected work resulting from uncertainty in refurbishment projects and extra processes involved in sustainability issues as a consequence of accumulated experiences cost extra efforts and time to architects and cause the entire process to be delayed. Accordingly, it is crucial to define extra tasks for sustainability of a refurbishment project at the beginning of the project. Joaquim Ferreira (2013) defines the key phases of refurbishment projects and the extra work involved, and these are set out in diagram.5.4 (below).

Table 5-4(right) shows that the scope of architects' work in sustainable refurbishment projects is based on the standard RT 10-111092 and the scope of work in architectural design is developed by the Finnish building information foundation (RTS) and approved by the Finnish Association of Architects (SAFA). The newly released standard (ARK12)¹, contains more detailed lists with sub-specialist project stages when compared to the previous version (ARK 95)², realised in 1995. Nonetheless, as the scope of work is written for general construction, it requires additional processes for sustainable refurbishment projects so that the extra work scope of the sustainable refurbishment, focused on the pre-design phase, is added to the table by the author. As the additional scope of work includes a range of sustainable options, it may not be necessary to apply the whole set of works to every refurbishment project. Application of the additional processes can differ according to project context.



| Project setup and pre-refurbishment survey | Energy auditing and performance assessment | Identification of refurbishment options |
|---|---|---|
| <ul style="list-style-type: none">- Define scope of work- Set project targets- Determine available resources- Pre-refurbishment survey | <ul style="list-style-type: none">- Energy auditing- Select key performance indicators- Building performance assessment and diagnostics | <ul style="list-style-type: none">- Energy saving estimation- Economic analysis- Risk assessment- Prioritize refurbishment options |

- 1. The Finnish Association of Architects (SAFA) and The Building Information Foundation(RTS).2012. ARKKITEHTISUUNNITTELUUN TEHTÄVÄLUETTELO (Scope of work in architectural design): ARK 12. RT 10-111109.
- The Finnish Association of Architects (SAFA) and The Building Information Foundation(RTS).1995. ARKKITEHTISUUNNITTELUUN TEHTÄVÄLUETTELO (Scope of work in architectural design): ARK 95. RT 10-10576.

D. 5.4. Key phase of refurbishment decision making process Ferreira.2013.

| PROJECT STAGE | | DECISION MAKING | EXTRA WORK SCOPE FOR SUSTAINABLE REFURBISHMENT (focusing on pre-design phase) |
|--------------------|---|--|--|
| PRE-DESIGN PHASE | INCEPTION STAGE The necessities, requirements and possibilities to start the project are evaluated and considered during the inception stage. Use the results to compile an urgent evaluation that defines the basic nature of the project. | >Project decision | SUSTAINABLE PROJECT SET-UP <ul style="list-style-type: none"> - Project target setting - Define scope of work |
| | PROJECT PLANNING STAGE Specific project implementation requirements, implementation possibilities and alternative implementation procedures are evaluated during the project planning stage. Use the results for compiling a project plan where the extent of the quality objectives of the implementation procedure and the final product determine the cost level and the time schedule of the project. | > Investment decision | PRE-REFURBISHMENT ANALYSIS <ul style="list-style-type: none"> - Select key building performance indicators - Building performance assessment and diagnostics - Energy auditing - Pre-refurbishment survey |
| | DESIGN PREPARATION STAGE Project designers are selected and design contracts are made throughout organizational planning, design competition and necessary negotiations. | > Planning decision (Design start-ups) | SCENARIO PROPOSALS <ul style="list-style-type: none"> - Prioritise refurbishment options - Energy saving estimations - Economic analysis - Risk assessment |
| DESIGN PHASE | DESIGN PROPOSAL STAGE Alternative design solutions are suggested to meet the project objectives. | > The final proposal plan decision | |
| | GENERAL PLAN STAGE Development of the selected proposal design into viable plan. The general plan may include various options for spatial solutions. | > The general plan and permit documents decision | |
| | BUILDING PERMIT PROCESS Designer ensures deliver of valid and necessary permit documents for application to municipal authority. | > Building permit decision | |
| CONSTRUCTION PHASE | IMPLEMENTED PLANNING STAGE The required plans and documents are prepared, to allow the amounts, procedures and quality level to be defined with an accuracy required by the calculation procedure for implementation costs. | > Implementation plans approval | |
| | CONSTRUCTION PREPARATION STAGE Constructors are selected and contracts are made. | > Building decision | |
| | CONSTRUCTION STAGE The final result of construction should meet the project target according to design. Inspection is conducted to ensure that. | >Acceptance decision | |
| OPERATION PHASE | COMMISSIONING STAGE The tasks ensure that the operation and maintenance of the project can proceed according to objectives and plans. | > Building operation | |
| | WARRANTY PERIOD Monitoring activities are started to ensure the operation properties of the building are in order. | | |

Table 5-4. Extra scope of work in architectural design for sustainable refurbishment focusing on role of architectural design in pre-design phase. Author based on ARK 12¹.

DISCUSSION

Despite the increasing movement of sustainable architecture towards a low carbon society, market interests have tended to focus on new construction rather than building refurbishment. As a result of the burden of initial investment and the time-consuming process, especially in the pre-design phase, it is more difficult to bring sustainable criteria to existing buildings with relatively small size, less budget and short project timeframes. Moreover, most building refurbishment and energy retrofit projects are focused on residential buildings as these are responsible for most building energy consumption. However, this does not mean that a non-residential building is not worthy of investigation.

All the questions in this thesis came from the thesis case, the Hotel Klaus K refurbishment project, and this thesis is the journey towards the answers to these questions. Local context, historical and cultural background, specific building conditions and project member involved in the thesis case play a significant role in tangible results. Nonetheless, the Hotel Klaus K may not be the best case to explore the process of sustainable refurbishment. As the research started after the actual design phase of the project, the proposal for this thesis ends up as an academic work without possibility of being applied on a real project. In addition, the hotel/ hospitality business is more sensitive area to draw sustainable issues than other types of buildings. Even, few hotels utilize sustainable value as a key marketing point such as the Scandic hotel group introduced in

the Part B; most of other hotels hesitate to highlight the sustainable issues in the front not to bring any pressure to hotel guests. So that communication way of sustainable parts to end users should be carefully designed as more available options not responsibility neither duty.

Despite of all the limitations of the thesis case, it enriches the thesis by allowing implementation of studied approaches to a practical case with project specific conditions. The perspective of the thesis continuously zooms in and out from the particular project to general frameworks. The various degree of perspective helps to understand the difference from new construction to refurbishment and approaches from conventional architecture to a sustainable one.

The thesis suggests ideal process of sustainable refurbishment focusing on the pre-design phase through applying and adjusting studied approaches to a practical case. Even, the proposal based on a certain case, frameworks for target setting and extra scope of work in architectural design are applicable to other projects. The frameworks can be developed further according to different conditions of each refurbishment project. It is hoped that this thesis will have a further chance to develop by applying and adjusting the frameworks to other cases.

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