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CREDIT Case Study Guideline

CREDIT Case NN00

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Preface

Summary

Guideline:
The summary of the case study (maximal 1-2 pages) will be included in CREDIT Report 4 (WP5) and part of it could be incorporated in CREDIT Report 2 (WP4) and CREDIT Report 3 (WP6). What kind of building/project, enterprise and benchmarking system is described in the case, and when and where is it working.

Buildings (WP4) summary
Guideline:
What assessment tools and methods are employed? When in the buildings lifecycle are the assessments made (relate this to the CREDIT Carpenter model)? How is the usability of the tools and methods? What party makes the assessments and how does it work? What indicators are registered or assessed (relate this to the CREDIT Indicator classification level 1 or 2)?

Enterprises (WP5) summary
Guideline:
What are the assessments used for in the enterprise? What indicators are registered and assessed? How is the usefulness and relevance of the evaluation of the assessed indicators (relate these to CREDIT indicator classification and the Value chain model) and the phase in the process (relate this to the CREDIT carpenter model and the Don Ward Bubble model) for the enterprise? Furthermore what are the experiences with the documentation and reporting (this includes the procedure, the player/party making it)?

National benchmarking (WP6) summary
Guideline:
What type of organisation is the benchmarking system (Relate this to the benchmarking typology model seen in WP6)? How big a part of the sector does it cover? How is it developed and anchored in the sector? What values and indicators are included in the benchmark (relate this to the CREDIT indicator classification level 1 and 2 and the Value chain model)? What is the relation between input data and output data - is input and output the same, or does the output different from the input data? What part of the building lifecycle process does the benchmarking relate to (relate this to the CREDIT carpenter model and the Don Ward Bubble model)? How is the usability of the system experienced in relation to data collection, data handling, assessment, evaluation and archiving of properties, economy and other values of the building? How is the effect of the system in the sector?

1. Introduction and objectives

Guideline:
Use the following text as background for describing a short introduction to the chapter.

This chapter describes the objectives of the CREDIT project, the background, scope and purpose of the case study of search engines for private homes, and the research design of the study.

1.1 The objectives and the project programme of CREDIT

Guideline:
Use the following text.

Sir Winston Churchill once said, "We shape our buildings, afterwards our buildings shape us" (28 October 1943). This quotation underlines how strongly a building can influence its occupier or user. It is not without complications to provide complex public facilities for example for hospitals, schools, universities and libraries able to meet both the internal and external stakeholders' needs and experience. The aims and demands of different stakeholders within a project may sometimes conflict with other stakeholders' interest. Understanding the needs and experience of the stakeholders is essential to stay competitive in today's market. A client who pays attention to the needs of the end-users will be rewarded with a high-performance property. Concurrently, this shift seeks to solve many ills associated with inadequate building conditions that result in poor building function.

The amount of both public and private money that are invested in delivering public and private facilities calls for decisive measures to be adopted. Collaboration with the relevant stakeholders helps building owners to identify performance indicators required for creating high-performance facilities. The project aims to define a model for the implementation of performance requirements that ensures fulfilment of various types of users' and stakeholders' needs and demands. The model should also allow for the continuous measurement of the effectiveness of the applied requirements and the model as such, so that it can be improved as more knowledge and experience of it is gained.

Adhering closely to the themes laid down in Erabuild, the aim of CREDIT is to improve transparency of value creation in construction and real estate. Thus, the objectives of CREDIT are:
– To capture end-user needs and experience in order to identify and quantify – where possible – value creation in the constructions and real estate sectors,
– To develop compliance assessment and verification methods,
– To define and develop benchmarking methods and building performance indicators for the construction and real estate,
– To propose recommendations for international benchmarking of key performance indicators of buildings.

Consequently, the deliverables of CREDIT are:

1. The establishment of a network of Nordic and Baltic researchers of benchmarking and performance indicators by frequent interaction in workshops across the Nordic and Baltic countries.
2. A State-of-the-Art report to identify and critically examine a number of existing tools, databases, mandatory reports, approaches and benchmarking schemes to capture and measure end-user needs, client demands and public requirements to performance and value creation.
3. A strategic management and decision-making tool to guide the definition and development of benchmarking methods and building performance indicators in different business cases.
4. A comprehensive performance assessment and management tool with associated key performance indicators to capture end-user needs and experience and to continuously measure and verify the compliance of performance throughout the life cycle of an actual building project linked to building information models.
5. Recommendations of how sector and national indices of performance indicators can be designed in order to promote international benchmarking of construction and real estate.
6. Dissemination of the lessons learned and tools developed through news articles, press releases and workshops with actors from the construction and real estate sector.

The expected impact of CREDIT on the construction and real estate sector at national and European levels are as follows:
– Improved understanding of end-user needs and client's demands to performance requirements and level of satisfaction.
– New and improved tools to make the costs/value ratio of products and services more transparent throughout their life cycles.
– A more solid and evidence-based background for launching new public policies to improve the competitiveness of construction and real estate business.
– Improved opportunities for more accurate comparisons with neighbouring countries via improved methods.

More information about the background is given in the CREDIT project programme (CREDIT, 2007).

1.2 Background, purpose and focus of the case study

Guideline:
Why was this particular case study chosen, and what specific indicators, assessment tools and benchmarking system are investigated. The purpose of the case study could for example be described using the following bullet points:
– Mapping how cost and value are assessed and made transparent in this type of xxx (performance management and cost/value assessment).
– Exploring how xxx are continuously adapted to accommodate users' needs (innovation process).
– Analysing the implications of implementing benchmarking by using xxx (implementation – state/market, public policies and, intention vs. result).

1.3 Research design and methods applied in the case study

Guideline:

The case study is explained in relation to the three levels in the CREDIT information model: Building level (WP4), Enterprise level (WP5) and National benchmarking level (WP6).
Describe who wrote the case study or took part in the case study e.g. were interviewed, and what kind of analysis and evaluation they have performed.

Theoretical framework
Guideline:
Give a short description of the theoretical framework being applied in the analysis of the case study.

Research design: Case study
This case study has been conducted as an action research by researchers and members of a firm or organisation seeking to improve their situation (Greenwood and Levin, 1998). A number of reasons justify the selection of XXX as a case for CREDIT:
– Argument 1.
– Argument 2.
– Argument n.

Data and methods
We have gathered data in this case study from multiple sources to enhance reliability and trustworthiness of the results (Robson, 2002). This case study primarily uses the following types of data and methods:
– xxx
– xxx

1.4 Reading instruction

Guideline:
Use the following text.

This report summarises the case study of search engines as input to work package 4-6 of the CREDIT project. Chapter 2 in this report addresses issues relevant to WP4 on assessments at project level. Chapter 3 addresses issues relevant to WP5 on the application of assessments in firms. Chapter 4 addresses issues relevant to WP6 on sectoral, national or international benchmarking systems. Chapter 5 discusses and concludes on the lessons learned with respect to the three levels of projects, firms and systems.

The work of each work package (WP) is documented in various other reports, articles etc. Below, a graphical illustration of the hierarchy and linkages between the individual reports is given.

Figure 1. Graphical illustration of the hierarchy of CREDIT reports.
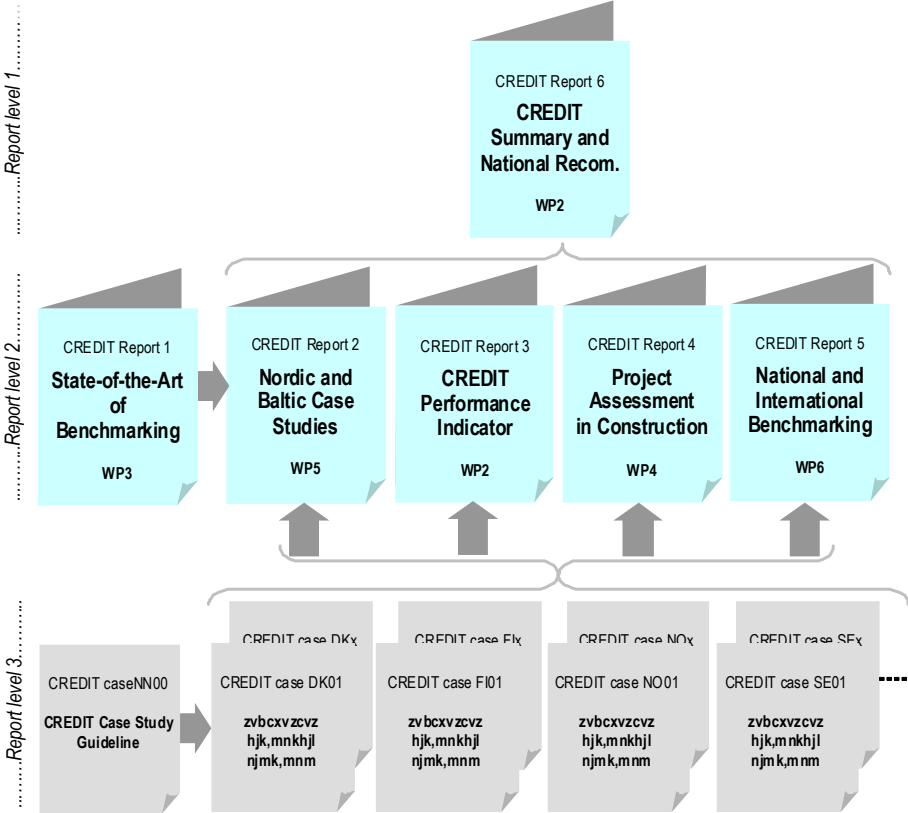
2. Buildings – assessments in construction or real estate processes

Guideline:
Chapter 2 is particularly relevant for WP4 and CREDIT Report 2 and focuses on the construction and facility management process of a specific building. How are data and information about the process and the building collected, managed, evaluated and used? What assessments and what indicators are applied in the different phases from the pre-project to hand over and the FM and use of the building? Please write a 3-5 line introduction to Chapter 2 before Section 2.1.

2.1 The actual building, building parts and processes

Guideline:
Describe the time and location of the building or real estate. When and where was the building and constructed? Describe the type of building, building part and construction which are in focus in the case study. What is the building used for (office building, non-profit housing, shopping mall, hospital, university, school and so on)? What is the construction type (new buildings, renovation and conversion)?

2.2 The applied assessment methods and tools in the processes

Guideline:
This section characterises the assessment methods and tools in the actual design, construction and real estate processes and describes the frame and management of the assessment of the building or facility management.

Which assessment methods and tools were applied? What were the methods and tools used for (collection of information, handling of data, assessment, evaluating or filling the cost and performance indicators of the building)? Are they often used? Is there a routine in using them? How much time does it take to employ them?

The assessment tools must be described in relation to the specific use in the individual phases related to the Carpenter model (strategically pre analysis, functional briefing, design, construction, facility management and post analysis of user needs and satisfaction).

The assessment tools must also be described in relation to who made the assessment and for whom (end-user, client, investor, architect/engineer, contractor, manufacturer, seller, buyer, researcher or impartial third party). Describe also the role that the individual party plays in the in the assessment, and whom the assessments were prepared for and reflecting whose needs?

2.3 Cost and performance indicators applied in the assessments

Guideline:
Describe how the indicators are used in the assessment. Which indicators were used in each of the assessment methods and tools? How are they ap-

plied in the different phases? Do they differ between different types of buildings and between different building parts and processes?

Describe also the documentation and results of assessment. How is the assessed indicators documented and reported in the different phases? How is the documentation and reporting of the assessed indicators used in later phases of the construction and real estate processes?

2.4 Relation to different enterprises and national benchmarking

Guideline:
Describe the relation in the CREDIT information model between building and construction and real estate processes (this Chapter 2) and enterprises (Chapter 3) and national benchmarking (Chapter 4). It is also possible to refer to other case studies and chapters in them. What kind of information is used from other projects? Is information from benchmarking systems or from assessments of other projects used in the work with this case? If so - in what phase and in what the process? What kind of information is used from other cases and projects? In what degree are the assessments and indication figures in the case study used by the different enterprises involved project or in related benchmarking systems?

2.5 Visions and innovation for future improvements

Guideline:
Are there plans or ideas for improvement of the assessment methods and tools (this includes all step in an assessment process such as collecting and processing data or reporting information and using data and information)? If so, are the improvements or goals related to specific assessment tools, indicators or the building type? What innovation strategies and visions have motivated the evaluation and the choice of methods and tools? Are there new ideas or specific comments to the different proposals from CREDIT especially on cost and performance indicators in construction and real estate processes?

3. Enterprises – assessments and indicators internally applied

Guideline:
This chapter focuses on how one or more of the enterprises participating in the building case (Chapter 2) uses the assessments and indicators internally in the firma, company or organisation to control and improve their business. Please write a 3-5 line introduction to Chapter 3 before Section 3.1.

3.1 The actual enterprise, company and firm

Guidelines:
What are the name, size and type of the actual enterprise described in Chapter 3? Type could for example be: Investor, consultant/contractor, client and organisation (not authorities, researchers and data systems)? What are the assessments used for in the enterprise (monitoring, management of process and product, development of buildings, facility management or the services of the enterprise)?

3.2 Assessment methods and tools applied in the enterprise

Guideline:
Which assessment methods and tools are applied in the enterprise (registration of data, questionnaires, data from accounts analysis, meter reading)? How are the results documented, analysed, filed and reported?

3.3 Costs and performance indicators applied in the enterprise

Guideline:
Which cost and performance indicators for either product or process are included in the assessment central for the management of processes, products and facilities internally in the enterprise? The process performance indicators could for example be such as amounts, time and defects or product performance indicators such as quality and properties such as energy, indoor climate, accessibility, usability, architecture or more social values. Which parts of the building (constructions, installation, rooms, functions and equipment) are included in the evaluation and have been assessed by means of the performance parameters described above?

3.4 Relation to building cases and benchmarking organisations

Guideline:
Does the enterprise use information gathered in benchmarking systems (sector, national or international benchmarking systems) or assessments from other building projects in their work? How does the enterprise communicate with the building project or the activities provided in the real estate? It is possible to refer to other cases and chapters in them.

3.5 Visions and innovation for future improvements

Guideline:
What visions do they have in the enterprise for developing the management of assessments and applying indications in improving their business and for the employment of them in the short and the long run? Are there new ideas or specific comments to the different proposals from CREDIT especially on assessments and indicators in construction and real estate processes?

4. National benchmarking – indicators, assessment and organisation

Guideline:
This chapter focuses on sector, national and international benchmarking in related to the assessment and application of indicators in building in Chapter 2 and in enterprises in Chapter 3 and how benchmarking is organised, managed and rooted in the sector and what indicators are assessed in the system. Please write a 3-5 line introduction to Chapter 4 before Section 4.1.

4.1 The actual benchmarking organisation and its purpose

Guideline:
What was the background for establishing the organisation and business for the sector, national or international benchmarking system? What is the purpose of the system (monitor, management, communication, education or innovation)? How long has it been working? How is the business financed? What part of the market does the system cover (building projects, facility management, enterprises, authorities, research and education, selling and buying)? How is its market share of the part it covers? What effect does the benchmarking have on construction, real estate and the business of related enterprises? Is it required legally to deliver data to the system, is it a demand of the market or is it voluntary? Who are the data operator and administrator of the benchmarking system? How is the system's relation to the different players in the sector, the authorities or others?

4.2 Assessment applied in the benchmarking organisation

Guideline:
Who collects the data to the system: The operator and administrator themselves, their own specialists, or is the information gathered from the enterprises involved or the facility management of the building in question? How is data collected? Which assessment methods and tools do data operator and administrator of the system use to handle and compile the collected data?

4.3 Cost and performance indicators applied in benchmarking

Guideline:
Which indicators are applied? The indicators applied; do they differ between different types of buildings and between different building parts? How is the assessed indicators documented, assessed, reported and used in the different phases?

4.4 Relation to enterprises, building project and real estate

Guideline:
How is the documentation and reporting of the assessed indicators used in different phases of the construction and real estate process? How is the in-

formation gathered and processed in the system communicated back to the enterprises? Is the gathered information communicated back to the sector as more general information? It is possible to refer to other cases and chapters in them.

4.5 Visions and innovation for future improvements

Guidelines:
How does the benchmarking organisation work strategically with innovation and dissemination of e.g. assessment methods, data collection, how to improve the dissemination of new experiences and guidelines and how to implement new and better indicators? What visions or specific plans are there for future improvements and what changes are their in the organisation or what methods will soon be reality? Are there new ideas or specific comments to the different proposals from CREDIT especially on assessments and indicators in construction and real estate processes?

5. Discussions and conclusions

Guideline:
Start with a 3-5 lines introduction to Chapter 5 before Section 5.1. Chapter 5 is one maximum two pages that give a picture of what experience there is gained from this case, and what knowledge CREDIT can extract from this case.

Guideline:
In this chapter the authors discuss the collected information in Chapters 2, 3 and 4 in related to the different models in CREDIT included the CREDIT information model (Figure 2), and the authors add their independent comments and knowledge from research and international standards. The discussions and conclusions are given separately for CREDIT Report 2 (WP4), CREDIT Report 3 (WP5) and CREDIT Report 4 (WP6) in Section 5.1, 5.2 and 5.3 respectively. Table 1 (proposed by Ole Jørgen Karud, SINTEF, NO) can be used in the discussion to show the relation between the CREDIT cost and performance indicators and the indicators evaluated in the case study. Other variations of the questionnaire in Table 1 can be made for example by using the following questions:
– How are the information and data treated in the benchmarking system?
  – Collected information or measured data
  – Processed, calculated and analysed data
  – Applied information and presented data
– In what part and function are the information and data applied in building (construction or real estate) and enterprises?
  – Monitoring the process and product
  – Controlling and adjusting the process to fulfil the product specification
  – Improving and developing products and processes
– How widely are the indicators disseminated in the sector?
  – Building: Few, 1 %, 2 %, 5 %, 10 %, 20 %, 50 % or the majority
  – Enterprises: Few, 1 %, 2 %, 5 %, 10 %, 20 %, 50 % or the majority
– What are the effects, goals and cause not reaching the goals?
  – Direct goals
  – Long term goals
  – Cause for not reaching the goals.

Figure 2. CREDIT information model in relation to decisions in the planning, design, construction and facility management processes.
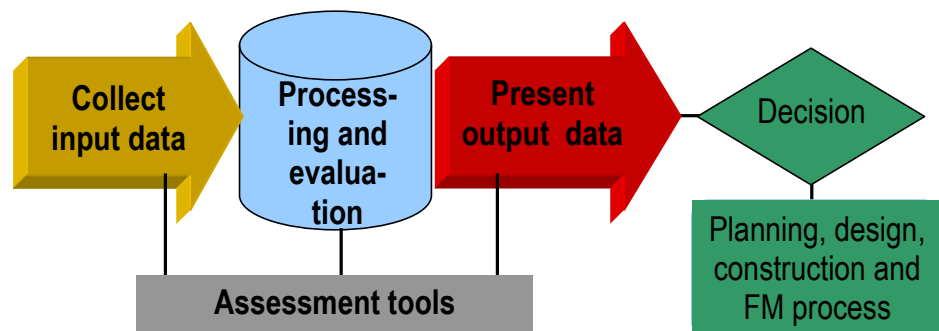
5.1 Buildings – lessons learned and recommendations

Guideline:
Describe the experiences with the usability of the employed assessment methods and tool (for collection of information, data handling, assessments, evaluations and filing of the properties, economy and other values of the process/building). How did they apply to the various phases of the building process (relate this to the CREDIT carpenter model) and to the indicators included in the assessment (relate this to CREDIT indicator classification)? Describe the experiences with the documentation and reporting, and how it worked out that this was done by that party who did it.

5.2 Enterprises – lessons learned and recommendations

Guideline:
What are the experiences with the usefulness and relevance of the evaluation: Both of the assessed indicators (relate these to CREDIT indicator classification) and the phase in the process (relate this to the CREDIT carpenter model and the Don Ward Bubble model)? Furthermore what are the experiences with the documentation and reporting (this includes the procedure, the player/party making it)?

5.3 National benchmarking – lessons learned and recommendations

Guidelines:
How is the usability of the system experienced in relation to data collection, data handling, assessment, evaluation and archiving of properties, economy and other values of the building? What indicators are assessed (relate this to the CREDIT indicator classification)? What is the relation between input data and output data - is input and output the same, or does the output differ from the input? What part of the lifecycle of a building does the benchmarking relate to (relate this to the CREDIT carpenter model and the Don Ward Bubble model)? What type of benchmarking system is the system? (Relate this to the benchmarking typology model see WP6). Furthermore how is the effect of the system? If there is an evaluation of the system, the result is shortly described.

Table 1. Questionnaire to evaluate CREDIT Indicator Classification.

CREDIT Indicator Classification	*To which degree are the following indicators preferred?*
Company:	Please use the following scale when answering:
Role:	2 Always - strategic and very important
Project: Country:	1 Sometimes, depends upon the project
Date: Sign:	0 Not at all, unimportant

Cost and performance indicators	Public demands	Internal project demands	Measures during building process	Measures when finished project	During facility management	Comments and other indicators recommended
1. Cost, price and life cycle economy (LCE)						
11 Capital, investment, construction, commissioning cost						
12 Building services related to operation and maintenance						
13 Business services related the activities in the building						
2. Location, site, plot, region and country						
21 Location and address						
22 Plot opportunities						
23 Spatial solution and property aesthetics						
24 Surrounding services						
25 Social values						
3. Building performance and indoor environment						
31 Category of building, quantity, size and area						
32 Safety and security of burglary						
33 Usability and adjustability						
34 Thermal comfort						
35 Air quality and health						
36 Visual climate						
37 Acoustic climate						
38 Aesthetics of building and indoor spaces						
39 Feelings and sensations						
4. Building part and product performance						
41 Category of building parts, quantity, size and area						
42 Safety						
43 Durability						
44 Thermal quality						
45 Impact on air quality						
46 Lighting quality						
47 Acoustic quality						
48 Aesthetic quality as form, surface, colour and details						
49 Feelings and sensations						
5. Facility performance in operation and use						
51 Category of tenancy and operation and area of space						
52 Applicability of the facility						
53 Operation						
54 Services						
55 Social performance						
6. Process performance in design and construction						
61 Category of process, supplier and organisation						
62 Resource control and project management						
63 Health and safety and work environment						
64 Quality management						
65 User involvement and cooperation						
7. Environmental impact						
71 Resource use						
72 Emissions						
73 Biodiversity						

References

Greenwood, D.J. and Levin, M. (1998). *Introduction to action research: social research for social change.* Thousand Oaks, CA: Sage Publications.

Robson, C. (2002). *Real world research.* Oxford: Blackwell. 2 Edition.

Appendix A: Title

Guideline:
Add if relevant, otherwise delete
Remember to start on a right-hand side.

CREDIT©

Construction and Real Estate -
Developing Indicators for Transparency

★ ★ ★ ★ ☆

This report describes the guideline for reporting results
of the 28 case studies in CREDIT. The guideline was un-
dertaken as part of the Nordic and Baltic project CREDIT:
Construction and Real Estate – Developing Indicators for
Transparency.

    The guideline is aiming at three levels: the project or
building, the firm and the national benchmarking system.

Guideline:
    In max 10-15 lines describe the content of the report
based on the text above.

SINTEF   VTT   LUND UNIVERSITY   Danish Building Research Institute AALBORG UNIVERSITY