ARCHITECT

DOCUMENT YOUR VALUE CREATION

How to get started!

DANISH
ASSOCIATION OF
ARCHITECTURAL FIRMS

dreyersfond

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> A great building must begin with the unmeasurable,
> must go through measurable means when it is being designed
> and in the end must be unmeasurable.

Louis I. Kahn

Yes! – And while your work echoes in eternity, you can now both evaluate and measure what effects the architecture has on people and the environment. And you can demonstrate that architecture that successfully conjoins functionality and beauty is durable and is genuinely a positive model for business – for the Clients, for the Users and for the Community.

PREFACE
HOW DOES ARCHITECTURE CREATE VALUE?

What kinds of value? How much and for whom? For how long and at what cost? These are fundamental questions that all too often are being left unanswered, with loss of value and resources as a result.

This book is an introduction to how architecture creates value for clients, users and societies and a guide to how you can create and document value as an architect. It is aimed mainly at architects, but we hope that a general audience will also enjoy reading it, and particularly that it will also be of use to the many partners architects are working with in the value chain of the construction industry. Architecture is something that concerns us all, and value is created by many stakeholders and disciplines working in partnership.

The book is based on the experience from our 'Architecture Creates Value' project, wherein we presented more than 75 well-documented cases of built projects creating value. New cases are being added continuously. The project made evident that the design of places and buildings is making a profound impact. Architecture can provide solutions that enable social, environmental and economic benefits and improve the management of resources and environmental impacts.

However, we also found that the value created by architectural design is rarely documented and is accordingly being poorly understood by decision-makers as well as by the general public. This is a fundamental problem. Architecture is too often seen as a nice to have add-on to real estate and construction, while value is primarily being considered in financial terms. This lack of understanding erodes architects' position as strategic advisers.

The methods we are introducing here mostly originate from fields outside architecture but can easily be integrated in architects' services and business models, as the cases presented here show. There is a major business potential in working out how these values can be assessed, measured and communicated in a way that resonates beyond the architectural profession. Doing so may even strengthen the aesthetic dimension of architectural design. After all, value is based on whether people experience something attractive and are willing to use resources to pursue those experiences. Caring for aesthetics, functionality and durability is caring for value.

We see that trust is reinforced and businesses are promoted when architects are able to clarify the value that they generate. Now we want to share those insights with a wider audience and empower architects to become more precise and factual about the value they contribute to clients, users and community.

We are living in an age where it seems as though everything has to be measured and weighed. Of course, this is not possible. But we can certainly become more precise about what actually works when it comes to improving cities, buildings and landscapes. The pressures on resources and environment must be addressed urgently to ensure the social and cultural progress of societies worldwide. Does your project contribute locally to the 17 sustainable development goals of the United Nations? You can use the methods in this book to assess how you are doing. We need art, facts and knowledge to improve solutions for the generations to come.

We hope that this book will provide you with inspiration!

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Project EXPERIMENTARIUM
Architects CEBRA
Photo ADAM MØRK

> The results from 'Architecture creates value' bear out that architecture and the quality of the physical surroundings have a major impact on human well-being and behaviour, and can have significant positive financial effects.

INTRODUCTION
CREATE TANGIBLE VALUE!

Architects have a natural interest in documenting how their work and their designs generate value. If these values are clear and easy to communicate, architects' advice to Clients and Users, as well as their partnerships with them, are reinforced.

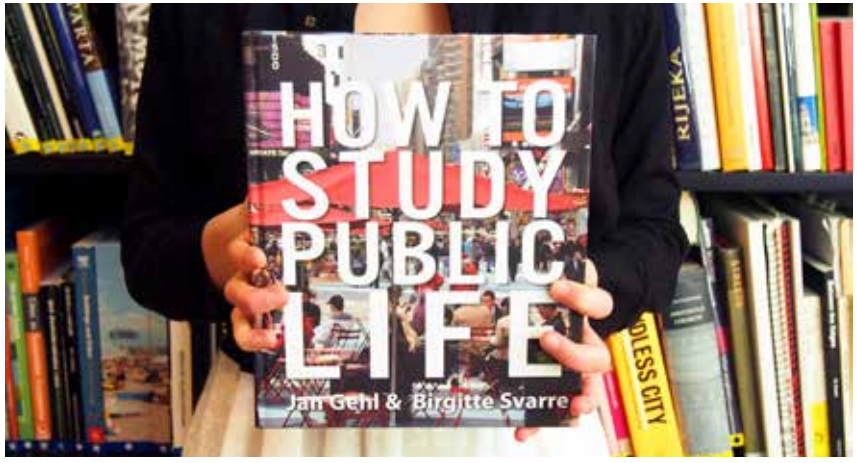
Does architecture create value? The answer to this question is entirely dependent on whether anyone feels that the quality of the surroundings makes a difference to him or her. Whether it supports these people in the activities that they find important. And whether it reinforces their communities, their sense of well-being, and their health. Both the research results and the experiences from the collection of examples from the Danish Association of Architectural Firms, entitled 'Architecture creates value' bear out that architecture can give rise to significant social, environmental and economic effects. But architects could become a lot better at communicating and documenting exactly how to make this happen.

The major invisible force in the built environment is the way in which architecture tacitly underpins people's sense of well-being and health. City planning and building design define frameworks for how we organise our social lives, our working lives and our private lives. The challenge lies in the fact that we are so surrounded by architecture, on all levels – from planning and urban spaces to furnishings and industrial design – that it stands in the background of the lives we are leading, literally and figuratively speaking. We all experience architecture. We are all surrounded by architecture every single day. But even so, understanding architecture is not something that appears on school curricula, and it is not an articulated part of our overall education. We take our surroundings for granted. This presents architects with a creative challenge: how can we highlight and communicate the value created by architecture in ways that make sense to Clients and Users and that are relevant in terms of economy and social policy?

Traditionally, the value of architecture is documented by the work itself. If the building is functional, durable and a pleasant place to be, it is left to stand for a long time – and inspires generation after generation to take good care of the re-sources invested in the building. But when it comes to developers for whom time and money are the overriding priorities, and - to boot - in a world where resources are becoming increasingly scarce, the architect's design methods and visualisations are, in fact, not always enough to convince political and economic decision-makers. The economic models that are being used to finance architecture are often markedly short-sighted. This poses a problem, given the fact that whatever we build is supposed to stand for many generations to come, and should continue to create value in the long-term. All too often, it is clear that suboptimal construction economy takes precedence over quality, thus reducing the long-term value of what is being built.

This is why there is a need to challenge the economic approach on its own terms: can we demonstrate that the quality of the built environment will bring about significant social effects that can be turned into economic benefits for individuals and communities alike? Can we show that the long-term value of the built environment is worth far more than the funds invested? Not only will this give architects a business model that can motivate individual developers to invest more wisely; we also stand to gain as a society. We would like to help you and your partners to get working on this!

Around 5% of the gross national product of Denmark and similar countries is being spent on buildings and construction, and these investments are being spent on initiatives like new construction and renovation of our building stock, which is being renewed at a rate of around 1-2% every year. This is a significant percentage of the societal economy, but nevertheless a much smaller percentage than the consumption of resources by the building industry. The built environment is responsible for 40% of energy consumption, 35% of resource consumption and about 30% of the waste that we are producing in Denmark. The potential for savings is enormous, as has been shown in 'Architecture Creates Value' and other documents. But even these figures are miniscule in relation to the percentage of national wealth that the built environment represents: more than two thirds of Denmark's economic capital is bound up in the value of the building stock.
Therefore, there should be no doubt whatsoever that the built environment is an absolutely key societal concern that deserves a great deal of attention. Nevertheless, there is insufficient emphasis being placed on the role of architecture in the economy. The value of the built environment decays, if it is not continuously maintained and improved. That's why we need architects in many positions in society.



Photos: Gehl

Jan Gehl was probably unaware that he was on a path to achieving world success as an advisor on urban life improvements when he began making registrations of urban life, movements and presence in Italian urban squares and piazzas in 1965, as a young architectural student. Through and extensive series of research publications, Jan **Gehl** managed to formulate the design and planning principles that he is now using in towns and cities all over the world, generating well-documented social, environmental and economic effects.

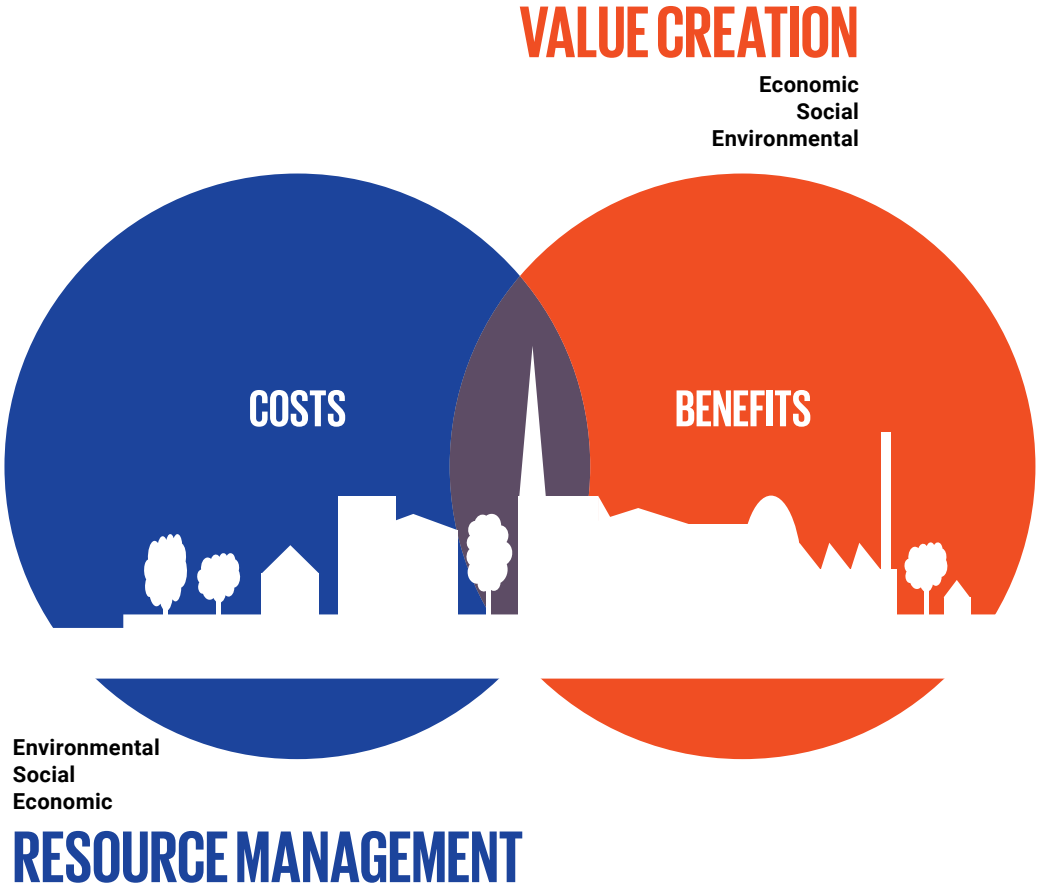
WHAT VALUES?

Any architectural project has a number of in-depth objectives and tasks that need to be solved and implemented. There are benefits to be created and costs that need to be reduced.

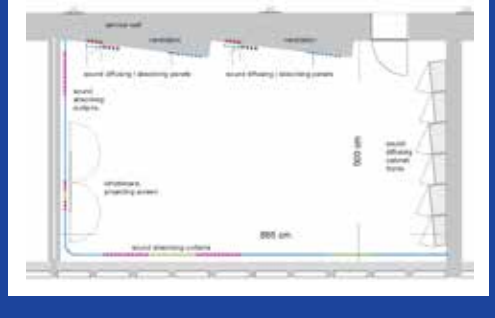
You could say that any project involves a more or less explicit 'business model', even though this does not necessarily need to be commercial. The business model for a hospital, for example, involves promoting health and alleviating suffering among patients and providing a good place to work. A school, on the other hand, is supposed to support its students' academic and social development and provide a good study environment. A school often serves as a hub for activities and communities in the local urban environment, too.

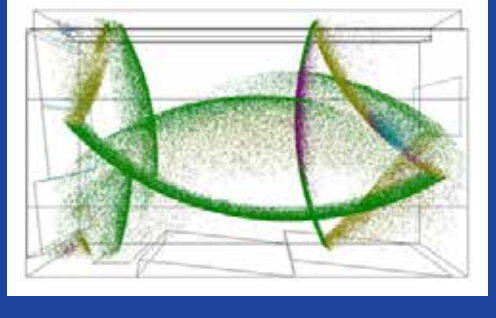
Working with cost-effectiveness and optimising solutions is a basic prerequisite in architectural design when it comes to ensuring that as much value as possible is being created. And a great deal of energy is being invested in doing precisely this in architectural firms everywhere, every day. The challenge is seated in this: if we do not invest just as much energy in highlighting and documenting value creation on the social, environmental and economic levels, we run the risk of downgrading values that constitute the whole point of building and of turning them into 'soft values' and according compromising them.

The Brundtland Commission's definition of sustainability as a development that complies with current needs without jeopardising future generations' opportunities for fulfilling their own needs – socially, environmentally and economically – is of particular relevance to the built environment. The architectural and environmental qualities of buildings and cities are what help to create social values and effects that can be of economic value. And the social, environmental and economic costs can be assessed and accounted for in a life cycle perspective, which includes several generations of users.



Photos: Vilhelm Lauritzen Arkitekter & Alectia



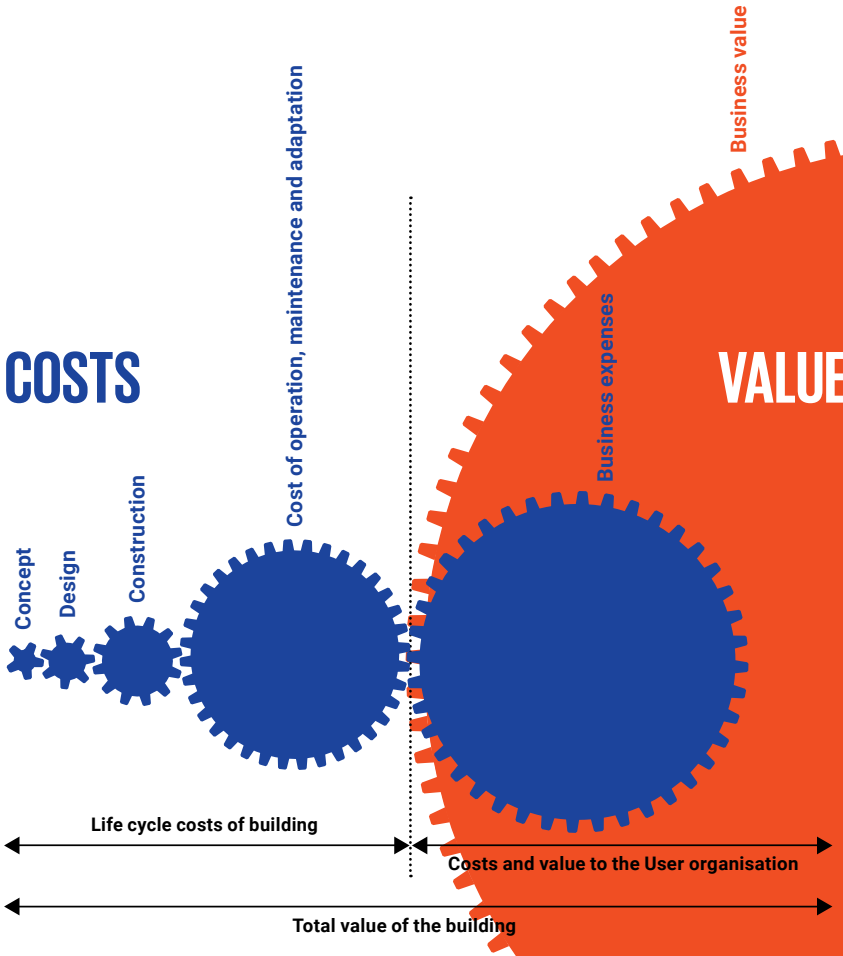


Compare the economic benefits of social effects and environmental qualities to the costs of producing them.

Sustainability is a relatively new concept, addressing the pressures of resource use globally, but value creation and resource-effectiveness have always been basic pre- requisites for architects, even in the architecture of bygone ages. With **Radiohuset**, built during WW2, **Vilhelm Lauritzen** demonstrated how all of the different scales of architectural design, ranging from site plan to details, could underpin sublime musical experiences in an age when resources were in short supply. When his successors at Vilhelm Lauritzen Arkitekter were assigned the task of adapting Radiohuset for use by the Royal Danish Academy of Music 60 years later, they were able to use Vilhelm Lauritzen's original design principles to create ideal acoustic conditions for teaching classical music with a limited construction budget.

Photo and plan by Vilhelm Lauritzen Arkitekter.
Acoustic simulation by Alectia.

VALUE IS CREATED OVER TIME FOR VARIOUS STAKEHOLDERS



The initial planning and design processes have the greatest influence to bear on the values created by a building for users and the surrounding community over its lifetime. The distribution of costs and values varies according to the function and the quality of the building.
The graphic set-up here has been inspired by Bang 2016, Saxon 2005, Evans & al. 1998

How are the values of a given building brought forth by its architecture? It is the initial planning and design processes that create most of the value, by far. This is where the strategic decisions are made – the decisions that can enhance user experiences, well-being and health. This is where resource consumption can be reduced significantly. Investing more time in planning and designing can potentially serve to increase the value creation of a project.

It costs almost nothing to identify and describe the needs that a project should fulfil. The expenses of designing are but a fraction of what it costs to actually construct the building. In turn, construction costs are slightly less than the costs required to operate, maintain, adapt and renovate the building over its lifetime. However, if we also take into account the economy that is related to the use of the building and the activities that take place within it – as a workplace, for example – the figures that we come up with are frequently of a completely different order of magnitude: personnel expenses and the value of the activities around which the architecture establishes as frame are far, far greater than the expense of actually constructing the building.

Perhaps the most extreme case of this phenomenon is a hospital. Even though hospitals are very expensive to build, the costs of staffing and running a hospital are so high that the entire construction budget only covers two to three years of operation. Imagine what a slight increase in productivity or in the healing of patients, due to better design, would be worth to society! 'Healing Architecture' is a field of research that is quite well-documented and applicable as a design principle. The interesting thing is that the decisions made at the very earliest stage of the planning and design phases are what cost the least.

If we look at the big picture, these are the decisions that are of the greatest significance when it comes to whether the Users like the building and feel that the physical framework supports their activities. If the building is perceived as a good place to work, this helps to motivate Users, and even miniscule improvements in productivity may result in significant gains for businesses and organisations. The same pattern is applicable to environmental impact: 75% of the environmental impact can be related to the very first strategic target formulations and design decisions. If just a bit more time is invested in pursuing long-term goals through design-related effects, initially, then ambitious Clients and Users can reap significant gains, with more efficient use of resources – and the same can be said for us as a society.

The value created by architecture is not documented all that frequently, neither in Denmark nor elsewhere. Most projects are terminated when users or residents move in, and then the Client, the architects, the engineers and the contractors all go their separate ways, and only come back to make sure that the technical durability is living up to the guarantees. Very few architects, Clients and Users take any systematic look at how the new surroundings affect the people who use them. And with this, they are missing out on knowledge that would be valuable to all of them: how do we create the most value by making the best possible use of the resources invested in the built environment? How can we go on adapting our surroundings so that they will support the needs of people and businesses – needs that are constantly changing? What solutions create the most value? How can we reduce our consumption of resources? How can we build sustainably – socially, environmentally, economically and, especially, aesthetically?

We would be in a better position to answer these questions if we were more capable of highlighting how architecture and planning create value for individuals and communities.

This is why we are introducing a methodology here that can be used when you aspire to create value in the planning and design process, and when you want to evaluate and measure values after your project has been put into use. You do not need to start working with them all at once – the important thing is to start working with them.

Photos: Vadehavscentret, Dorte Mandrup Arkitekter

The Wadden Sea Center by **Dorte Mandrup Arkitekter** reinterprets the local construction style in the regions lying along the coastline of the Wadden Sea, thereby emphasising the relationship between nature and mankind and the unique local landscape. The spectacular thatched roofs are inviting and serve to show how people have been using the local resources for their building work since the dawn of time. The significant increases in tourism and visitor numbers that we are seeing in connection with cultural buildings all over the country are promoting our awareness of our common cultural foundation and creating financial value for local communities.

What are enhanced well-being and fewer sick-leave days worth in socio-economic terms?
How can we measure well-being, motivation, productivity and learning?
What design decisions have the greatest impact on the results?
Will architecture that promotes health pay off, over time, on account of its effects?
Document your value creation. Enhance your knowledge.

HOW DO I GET STARTED?

Starting to document value doesn't have to be a complicated task. Start off with the methods that are of immediate relevance to you, and try them out on a project that you're working on at the moment. The knowledge that you and your partners will gain is valuable and can be used straightaway.

In 'Architecture creates value', we have collected a number of examples of how architecture can make significant impacts. You'll find some of these examples on the following pages, where we provide a brief description of some of the methods used to document how architects have developed, underpinned and created value, together with their partners and stakeholders. The results from 'Architecture creates value' serve to show that design and the quality of the physical surroundings have a major impact on human well-being and behaviour, and can elicit significant positive economic effects. But we are still at the beginning stages of understanding how. We still need to make more research in practice.

The architect's most important tools when it comes to creating and documenting value have always been the drawings and models that they use to examine possibilities and organise the best possible physical framework around people's lives – and, of course, their experiences of constructing and their perception of the constructed work in itself. Drawings and models are used to define the best strategy for the management of the many initiatives and resources employed in construction. Sketches, drawings and models have always provided a point of rotation for exploratory discussions with Clients, Users and local stakeholders in order to come up with a solution that – ideally – creates value for all parties. Architects are constantly analysing how buildings and environments influence people, and the empathetic, artistic and practically oriented, experience-based design methodology will always be the foundation of architects' work. However, we could easily extend the pallet to include methods used in other professional approaches.

Many of the methods that we are presenting here are already being used by architects and have been used for many years. The people that started using them early on have often achieved great success with them. The fundamental issue is to consistently map value creation for the many groups of stakeholders affected by the building: Clients, Users, and Community. This is not rocket science: no, it's all about taking some of the research-based methods from social sciences, natural sciences and economics and applying them to architecture, using them to shed light on architectural issues. As you will see from some of the interviews that we have included here, the architects using these methods feel that it helps them to create better architecture while also reinforcing their own businesses and, even more especially, the businesses of their Clients.

It is important to be consistent and transparent about the knowledge we have - and also about the things that we don't know. It is also very important to address both the pros and cons of a project without over-claiming the benefits in order to communicate with credibility. Value can both be created and destroyed, and can both increase and diminish over time. No projects come without costs. Actually, the detrimental effects of construction on the natural environment are, perhaps, the most important hidden costs today, costs that definitely need to be included in future standards for construction. Let's put these costs on the table and try to reduce them. As you will see in some of the following cases, once you begin to account for social, environmental and economic costs and benefits, radical improvements can be effectuated through design.

The great deal of positive attention that 'Architecture creates value' has received indicates that we have managed to identify a key issue. The close links between functionality, aesthetics, resources and economics in our examples tell a tale about the power of architecture underpinned by facts and statistics. We believe that improving our evaluation of the quality of our surroundings will stimulate better architectural design and urban development.

Happy reading!

Project AKERSHUS UNIVERSITY HOSPITAL
Architects C. F. MØLLER
Photo TORBEN ESKEROD

Value has everything to do with advantages and disadvantages, with costs and benefits. What qualities does the project have, and how do they create value for Clients, Users and Community? There are a number of methods you can use to document how your project creates value through its planning, its design and its use.

OVERVIEW OF METHODOLOGY

CREATE VALUE IN 3 STAGES
STAKEHOLDER ANALYSIS
VALUE CREATION

CREATE VALUE IN 3 STAGES

Value has many dimensions and fundamentally depends on what people perceive and appreciate. This is why you've got to work on documenting social, environmental and economic values in dialogue with the project's stakeholders when developing projects in your capacity as an architect.

Plan, Design and Use

All projects are implemented over a period of time and undergo a range of development stages. Construction projects traditionally operate with several identified stages such as programming, project design, tendering, construction and use. There may be more or less of these stages and the terminology tends to differ from one country to another, but the processes are fundamentally comparable. Here, for ease of understanding, and for purposes of highlighting that most value is created in the planning and design stages and that the value should be documented at the use stage, we are using a simpler subdivision:

Plan – where the project's foundation, values and task are defined.

Design – where the project's resources and solutions are decided upon and executed.

Use – where the project's actual value creation for Clients, Users and Community can be documented.

Project stakeholders

Most architectural projects aim at creating value for three main groups of stakeholders: Clients – who invest in the project and make decisions during the design process. Users – whose activities the buildings' architecture is designed to support. And also, the Community for which the architecture helps to create a framework, and whose resources are being managed in the building(s).

Architecture always creates value – just look around you!

Yes! – Architects have been planning and designing towns, buildings and landscapes with lasting value since the dawn of time. The three virtues of architecture inherited from antiquity – functionality, durability and beauty – are still the set of values for architects of today. However, quality is often challenged by the very short time given to planning and design processes in most projects, which is problematic since these are the processes where most value is added to a project.

Architecture gives rise to experiences. Experiences add value. Architecture is a way of expressing social values and political and economic interests. The challenge that we are facing nowadays is to build bridges between the experience-based, artistic creation of perceived qualities and the rational resource management requirements – not least in economic terms – that are demanded of us these days. Extending the pallet of tools for documenting value in multiple dimensions and over longer periods gives architects better opportunities to communicate and highlight the value of their work.

PLAN

Initially, spend time clarifying the stakeholders' needs and values.

Define a range of success criteria and indicators that can be used to assess the project's value creation.

Establish a vision and a programme for the project.

Set goals for the qualities that can be measured, and put into words the qualities that cannot.

Use the indicators to create an aggregate narrative relating to the advantages and gains that the project is supposed to create and the disadvantages and costs to be avoided or minimised for all of the project's stakeholders.

Establish a Baseline for the project: Record the starting point and use this as a basis for making a comparison of the effects that the project will create later on.

Where appropriate, use one or more sustainability goals, a certification system or a reference project to define baselines for project performance.

DESIGN

Involve the stakeholder groups in the design process. It brings about a sense of co-ownership when the stakeholders feel that they have some influence over the results. It is important to guide the dialogue process so that it will be meaningful to the stakeholders at the time they are being asked to be involved.

Use visualisations, prototypes and mock-ups to harvest early experiences of what stakeholders think of the project's solutions.

Feedback from stakeholders provides valuable data when there is a wish to ensure that the project is creating value as intended.

Use digital models to simulate the consequences of the solutions and to keep track of the project's environmental and financial performance.

USE

The project's actual value creation only becomes apparent, over time, after the building is put to use.

How do Users perceive the project? How is it perceived in the local Community? How does it perform according to Clients' expectations?

How does it create opportunities and encourage activities and behaviour that Users consider valuable?

Document and follow up on the project's value creation.

Register what differences the project has brought about for its Users.

Describe and measure the project's environmental qualities and assess the economy that surrounds the social effects and activities that are being stimulated by theproject. Compare the benefits to thecosts, - preferably in a life cycle perspective.

STAKEHOLDER ANALYSIS

Value for whom? – Project stakeholders. Most architectural projects aim to create value for three maingroups of stakeholders: **Clients**, who are investing in the building and expect to see results by virtue of the social attractiveness and environmental qualities of the architecture as these translate into revenue. **Users**, whose activities are supposed to be supported by the functional and aesthetic solutions of the building. **Communities**, which have an interest in enhancing citizens' well-being by means of attractive urban development and building construction with an effective use of resources.

We also need to consider the people involved in the building design – architects, engineers, contractors, etc. – that are committed to delivering value into the project in question. However, the future values of the building are typically created for **Clients**, **Users** and **Community** are defined by virtue of how the architecture creates value for all three stakeholder groups simultaneously. That being said, the stakeholder groups are not homogeneous either. There is often a desire to differentiate between several stakeholders in the same group; between project developers and investors, for example, or between several different user types. It is also possible to differentiate between neighbours, local communities or even global communities when documenting social value. Any piece of architecture ideally makes a contribution to social and cultural development while claiming a share of the earth's resources. For example, you can use this methodology if you want to demonstrate and discuss your project's contribution to some of the 17 UN Sustainable Development Goals.

Value for several generations – socially, environmentally and financially

One of the most significant challenges of architecture is that buildings typically remain standing for a very long time and accordingly have to create value for several generations of building owners and Users, and for a Community that is constantly developing new needs, new technologies and new ways of organising itself on a social level. The lifetime of the building is significantly longer than the investment horizon of the developer, longer than the needs of the first generation of Users, and will outlast the various players in the construction value chain. Building design is resource management, from an extremely long-term perspective. This gives rise to a number of challenges from a community perspective, at a time when architecture is increasingly being understood as a short-term investment object on the market that is very susceptible to financial peaks and troughs, and where emphasis on minimising construction costs and time for building design and implementation may entail that solutions sustainable in the long term are not given priority, with adverse consequences for operation and utility value in the long run. Because stakeholders are typically operating with different time horizons and values, discussions with stakeholders are an important means of creating and ensuring long-term value. The methods presented below therefore aim to document long-term social, environmental and economic value.

Stakeholders – who are they?

Stakeholders include everyone with an interest in the project, and everyone that is going to be influenced by it. For architectural projects, this group typically includes developers, users and the community of which the construction work will become part.
Architects are also stakeholders, together with other parties involved in the construction work. When mapping values for the various stakeholders, it is important to prioritise and communicate how the individual groups are going to be represented and influence the project.

METHOD

PLAN

Define stakeholders and chart their values, needs and preferences. Define **assignment**.

Define **criteria** by which the success of the project can be assessed. Some criteria have to be measurable.

Establish **Baseline**: Describe stakeholders' present conditions, activities and organisation, or use references for later comparisons.

DESIGN

Define which **design features** and process-related resources are to be used in the project in discussion with stakeholders.

Assess and simulate the design's **qualities**.

Assess what effects the solutions are expected to have, **adjust** the solutions if necessary.

USE

Evaluate the qualities of the design with stakeholders.

Measure **effects** in relation to success criteria. Include new criteria, where relevant.

Document value creation by **comparing** measured and observed effects with the baseline and relating to costs.

CLIENTS

USERS

COMMUNITY

Map the value creation for these three groups of stakeholders.

VALUE CREATION

What creates value? How and why? For whom, when and for how long? When you want to create documentable value, you have to define value concepts and ways of presenting the problems, in dialogue with project stakeholders and in partnership with them before getting started. Evaluate the design solutions with them while they are being designed and when they are put into use.

Map out how the project is going to create value

All projects begin with a desire to improve a situation and make a positive difference. But the success of the solution is largely dependent on how the challenges to be resolved have been defined.

If you want to work methodically with creating and documenting value, it is important to structure the process: You've got to map out the development of the project and how, and for whom, the project creates value – from the project's infancy in the planning phase, where the task is defined, through the design phase, where the project's resources and solutions are being decided upon, up until the project is implemented and put into use.
Since the project's actual value creation only becomes apparent when the project is put into use, it is crucial to systematically follow up and monitor the social, environmental and financial performance of the building over time. If you want to document your value creation, start registering the differences that your project makes – **socially**, **environmentally** and **economically** – before, during and after the design process.

Social value creation

The social sciences have developed a broad range of methods suited to documenting social values. Three of the most fundamental are: Interviews – where you ask people what they think and what makes sense to them, and what experiences they value; **Observation studies** where you register links between behaviour and spatial conditions; and **Questionnaires** – which can be used to posit numerical values for experiences and behaviour. There are many variants of these methods, and they can be combined in several ways.

Environmental value creation

To a great extent, it is the quality of the environment created by architecture that creates value for the Users and the Community. Use evidence-based design principles so that the architecture underpins **well-being and health** as effectively as possible. Measure, simulate and optimise **environmental qualities** and reduce resource consumption and environmental impact by making use of **life cycle assessments** when you are designing for flexibility, re-use and re-cycling.

Economic value creation

Use digital models to keep track of the **construction costs** in order to be out in front of schedules and pricing during the construction phase. You can assess whether your solutions are economically sustainable in the long term by means of **life cycle costing**, and doing this may also serve to demonstrate the potential in working with circular economy and recycling. You can also assess the project's overall financial value creation by means of a **total value** assessment that turns social and environmental factors into economic values.

METHOD	PLAN	DESIGN	USE	CLIENTS USERS COMMUNITY
	Define stakeholders and map out their values, needs and preferences. Define **assignment**. Define **criteria** by which the success of the project can be assessed. Some criteria need to be measurable Establish **Baseline**: Describe the stakeholders' present conditions, activities and organisation, or use references for making subsequent comparisons.	Define what **design features** and process-related resources are going to be used in the project in dialogue with stakeholders. Assess and simulate the design's **qualities**. Assess what effects the solutions are expected to elicit, **adjusting** the solutions if necessary.	**Evaluate** the qualities of the design with the stakeholders. Measure **effects** in relation to success criteria. Include new criteria, where relevant. Document value creation by **comparing** measured and observed effects with the baseline and by relating these to costs.	Map out the value creation for these three groups of stakeholders.
SOCIAL	DEFINE SOCIAL OBJECTIVES	DESIGN FOR SOCIAL EFFECTS	DOCUMENT SOCIAL EFFECTS	INTERVIEWS OBSERVATION STUDIES QUESTIONNAIRES Document the social value creation.
ENVIRONMENTAL	DEFINE ENVIRONMENTAL OBJECTIVES	DESIGN FOR ENVIRONMENTAL EFFECTS	DOCUMENT ENVIRONMENTAL EFFECTS	WELL-BEING AND HEALTH ENVIRONMENTAL QUALITIES LIFE CYCLE ASSESSMENT Document the environmental value creation.
ECONOMIC	DEFINE ECONOMIC OBJECTIVES	DESIGN FOR ECONOMIC EFFECTS	DOCUMENT ECONOMIC EFFECTS	CONSTRUCTION COSTS LIFE CYCLE COSTING TOTAL VALUE Document the economic value creation

Project THE SILO
Architects COBE
Photo RASMUS HJORTSHØJ - COAST

Getting started with documenting one's value creation might seem
to be an overwhelming task. But the first step is easy: Give your Client a call.
Ask how the project is going. What your Client says will provide data for your investigation.
Then get out there and have a look for yourself.
Ask the Users what they think of the qualities you have designed.
Observe and ask questions. Register and measure. Now you're up and running.

SOCIAL VALUE CREATION

INTERVIEWS
OBSERVATION STUDIES
QUESTIONNAIRES

SOCIAL VALUE CREATION

When it comes down to it, all value is based on experiences. Does it feel good or terrible? Is it attractive? Does it make a difference? Value sets can both be described and measured in various ways. Use social science's methods to uncover and identify stakeholders' value sets with Observation studies, Interviews and Questionnaires, and involve them in the development of the project's goals and resources.

Information and knowledge flow both ways: asking questions of stakeholders and involving them in the process will allow you to harvest important knowledge about their needs, experiences and perceptions of the project. Actually, if you provide several stakeholders with the opportunity to leave their mark on the project through dialogue, you will also increase the chances of it being well received.

Plan – Uncover and identify the core values

Prepare the project by asking about the stakeholders' value concepts and about what activities create value for them: What are their practical needs? What are their expectations? What values do they prioritise? Map out the starting point by defining the tasks to be tackled by the project and accordingly solved for the various stakeholders. Define what success criteria they prioritise, and establish a basic scenario for subsequent impact assessment by mapping out the stakeholders' current conditions, activities, behaviour and organisation and focusing on what impact goals would be relevant to them. Put environmental and financial valuation and indicators into perspective

Design – Design for social effects

After the core values for the project have been described, the project's resources need to be developed and defined. The resources of the architecture are the design-related approaches that the architect will be using in order to ensure functionality, durability and beauty in solutions on all levels of scale, ranging from context to detail. There are process-related resources as well: if you involve stakeholders in efforts to develop the design, there is a better chance that the solutions will be based on a broader set of values, thus ensuring that the project is going to be perceived as creating value when it is put into use. Therefore, regularly assess the quality of the project in dialogue with the stakeholders, and assess whether the resources support the effects that are being sought.

Use – Measure social effects

Evaluate the project with the stakeholders: What qualities do they perceive when it comes to the project, and how do they create value for these in relation to the success criteria defined? Have new values been brought forth that were not anticipated? Are there values that have been lost? Examine impact goals, and compare with the earlier situation: What changes have been brought forth from the project? Can the effects be explained by the evaluation with the stakeholders? Or are there more factors involved? Assess whether the impact goals can be linked with environmental and financial effects.

> **Visit the 'scene of the crime'. Examine how your project creates value when it is put into use. Learn from the dialogue.**

METHOD	PLAN	DESIGN	USE	
	Define stakeholders and map out their values, needs and preferences. Define **assignment**. Define **criteria** by which the success of the project can be assessed. Some criteria need to be measurable Establish **Baseline**: Describe the stakeholders' present conditions, activities and organisation, or use references for making subsequent comparisons.	Define what **design features** and process-related resources are going to be used in the project in dialogue with stakeholders. Assess and simulate the design's **qualities**. Assess what effects the solutions are expected to elicit, **adjusting** the solutions if necessary.	**Evaluate** the qualities of the design with the stakeholders. Measure **effects** in relation to success criteria. Include new criteria, where relevant. Document value creation by **comparing** measured and observed effects with the baseline and by relating these to costs.	 CLIENTS  USERS  COMMUNITY Map out the value creation for these three groups of stakeholders.
SOCIAL	DEFINE SOCIAL OBJECTIVES	DESIGN FOR SOCIAL EFFECTS	DOCUMENT SOCIAL EFFECTS	 INTERVIEWS  OBSERVATION STUDIES  QUESTIONNAIRES Document the social value creation.

METHOD: INTERVIEWS

Who experiences what, and why?

Make use of interviews to define value concepts for your project's stakeholders. Interviews provide insight into social and cultural phenomena by probing into the world-view of interviewees and finding out what they are thinking, feeling and doing in various contexts. Interviews provide an opportunity to uncover tacit intelligence, to obtain expert knowledge and to qualify the interpretation of the spatial and social patterns that are being discussed or observed.

Combine interviews with observations, questionnaires and dialogue in workshops or focus groups in order to harvest insight into the stakeholders' values and into the impact that the design solutions make on their behaviour. Plan your interviews in such a way that your interviewees are representative of the issues and interests to be addressed by your project, and justify any omissions. Create a question framework. Define a series of questions that are the same for all the stakeholders, and supplement these with questions that address the issues facing individual stakeholders, or their interests. Give the stakeholders the chance to define questions themselves and address issues that you have not foreseen. Gather your interviews into a collective interpretation framework. What topics emerge in the various interviews? Can these be synthesised to form more general statements?

Be aware that the way and the sequence in which you ask your questions may affect the results, and avoid asking "leading questions". The results you get will reflect people's conscious perceptions, and not necessarily their actual behaviour. Therefore, it is often useful to supplement your interviews with other ways of analysing behaviour and cultural phenomena – use observation studies, for example.

PLAN	DESIGN	USE
Define assignment Define success criteria Establish baseline	Define features Assess effects Document qualities	Evaluate quality Measure effect Document value
Interviews are essential when it comes to establishing a stakeholder analysis with a broad base at the start of a project. Define what stakeholders are important to interview, and ask which values are key to their involvement in the project and how this can be expressed in terms of needs and impact goals in the project.	While the project's resources and solutions are being defined, supplementary interviews and discussions with stakeholders may help to qualify decisions so as to ensure that the solutions create as much value as possible for the stakeholders.	After the project is evaluated, use interviews to examine and document how people perceive the design solutions and how they are assigning value to them. Interviews are therefore essential when interpreting and explaining the project's effects.

CASE: AART ARCHITECTS, KULTURVÆRFTET

Location	ELSINORE
Completed in	2010
Developer	MUNICIPALITY OF ELSINORE
Architects	AART ARCHITECTS
Engineers	SØREN JENSEN RÅDGIVENDE INGENIØRFIRMA
Contractors	E. PIHL & SØN

Photo: Nicolai Perjesi

PLAN

Define assignment
Define success criteria
Establish baseline

The planning of Kulturværftet was developed by the municipality of Elsinore in dialogue with citizens.

The programmatic objective of Kulturværftet was to highlight the transformation of Elsinore from an industrial city into a knowledge hub and culture destination.

DESIGN

Define features
Assess effects
Document qualities

AART architects presented the winning design in an architectural design competition.

The design principles from the competition proposal were qualified further in dialogue with the project's stakeholders.

USE

Evaluate quality
Measure effect
Document value

An interview-based survey carried out by the Alexandra Institute documented value from a user perspective and provided both developers and the AART architects with important data on how the building would come to be an asset to its users.

The visitors were generally very pleased and felt that the place provided an inspiring framework for cooperation, knowledge sharing and social diversity.

Kulturværftet welcomes more than 750,000 visitors each year, and the library is one of the most well visited libraries in all of Denmark.

METHOD:
OBSERVATION STUDIES

Observe, count, measure and analyse.

Observation studies are highly suitable for mapping out and explaining usage patterns and causal links between spatial conditions, objects, activities and behaviour throughout all of the project's phases, and they can be essential for carrying on a dialogue with the project's stakeholders.

Observation studies are combined with photographic registrations, interviews and user evaluations, in order to obtain a broader view of the complexities of a given subject. Examine who uses a place, how frequently and in what way, for example. Map out the intensity of use and variations over time. If it proves possible to do so, involve the users in the interpretation of the observations and in the evaluation of the physical framework's significance and its influence on their behaviour.

Plan your observation study and carry out a test.

Decide on what data you need and how you are going to collect it. Consider how you will ensure consistency in your material. Be open to the things that you observe, and make sure you jot down your observations and impressions as soon as possible, while they are still clear in your memory. Render your observations visible with diagrams, photos, graphs, etc. Discuss your results with the project's stakeholders.

Remember that people may behave differently when they know they are being observed. Also, ethical guidelines and considerations, e.g. observations of minors, should always be taken into account and should always be taken seriously.

PLAN	DESIGN	USE
Define assignment Define success criteria Establish baseline	Define features Assess effects Document qualities	Evaluate quality Measure effect Document value
Ideally, observation studies should be used at the start of the design process in order to understand what the design is supposed to achieve and the potential for – and barriers to – the behaviour that you yearn and aspire to encourage with the design.	While the project is being designed, observation studies can be used to assess design principles and resources, for example, by means of prototypes and mock-ups, so that the design principles can be adjusted before production is initialised.	After the project is evaluated, observation studies can be used to examine and document how people actually use the design solutions and ascribe value to them, thus providing valuable information for future projects.

CASE: GEHL, TIMES SQUARE

Photo: NYC - DOT

Location	NEW YORK
Completed in	2008
Developer	NEW YORK CITY DEPARTMENT OF TRANSPORTATION (DOT)
Architects	GEHL

PLAN

Define assignment
Define success criteria
Establish baseline

The New York City Department of Traffic wanted to improve traffic safety at various urban squares lying along Broadway, including the famous Times Square.

Gehl observed and analysed traffic and urban life at these locations. At Times Square, Gehl found that vehicles took up 89% of the area, compared with 11% for pedestrians. There were almost no places for people to pause or linger.

DESIGN

Define features
Assess effects
Document qualities

Gehl used evidence-based design principles having to do with urban quality of life – including traffic safety – based on Gehl's research into this field, gathered over several decades.

Using these design principles as a tool, Gehl was able to design in a way that would improve traffic safety while also improving urban quality of life at these spots.

Gehl tested out the design principles in situ. The Department of Traffic diverted the traffic and set up open spaces for a time in 2008.

USE

Evaluate quality
Measure effect
Document value

This demonstration attracted a lot of attention and was a huge hit with city residents. Traffic safety was dramatically improved, and the incidence of people stopping up and enjoying open spaces increased, and significantly so. A decision was subsequently made to rearrange Times Square permanently. Gehl's test formed the basis for the final urban space project that was designed by Snøhetta. Eventually, this project was realized and it was inaugurated in 2017.

The permanent solution has reduced the number of pedestrian injuries by 40% and the number of road traffic accidents by 15%. Crime in the area has fallen by 20%.

METHOD: QUESTIONNAIRES

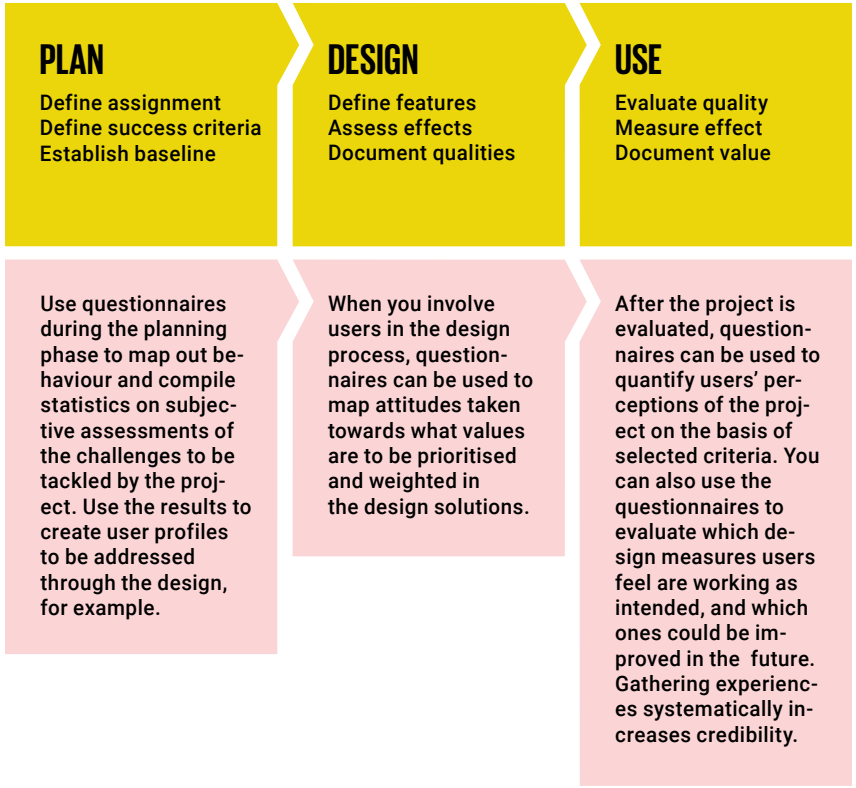
Measure behaviour, experiences and subjective values.

Use questionnaires to turn values, experiences and behaviour into numbers. By asking questions and asking people to give 'grades' based on the qualities they perceive and/or assess how frequently they are actually involved in activities or use the facilities, you will be able to compile statistics relating to the results, and thereby gain an opportunity to come up with more general conclusions for the issues at hand.

Combine questionnaires with interviews, observations and discussions in workshops or focus groups in order to harvest insights into the stakeholders' values and into how they perceive their spatial surroundings, in a more specific sense.

Plan out the objective of your survey and assess what statistical material you want it to produce. Define a series of questions that are the same for all stakeholders, and supplement these with questions that address the issues facing individual stakeholders, or their interests. Give stakeholders the chance to 'give grades' or to use numerical values to describe their experiences or assessments.

The questionnaires should be short and concise, so as to make it possible to have more respondents. A high number and wide variety of respondents are usually considered necessary to ensure the quality of a survey conducted by making questionnaires. Be aware that questionnaires are usually not suited when looking for nuance to social perceptions and patterns, e.g. values and personal experiences. Therefore, supplement your questionnaires with more in-depth qualitative data – from interviews, for example.



CASE: SIGNAL ARKITEKTER, KLOGE KVADRATMETER

Photo: SIGNAL Arkitekter

PLAN

Define assignment
Define success criteria
Establish baseline

SIGNAL Arkitekter uses questionnaires, interviews and observation studies to map out users' behaviour and needs.

Data collection provides SIGNAL Arkitekter with plenty of impetus when the social and business objectives of a new project are discussed with the Client.

DESIGN

Define features
Assess effects
Document qualities

Data is visualised in terms of user profiles, along with a mapping of the 'Fitness for purpose' of spaces in relation to user activities and strategic goals.

SIGNAL Arkitekter analyses how the users' current use of space can be optimised and comes up with suggestions as to how changes could serve to enhance well-being and improve the economy of operation.

USE

Evaluate quality
Measure effect
Document value

SIGNAL Arkitekter evaluates the project and gathers user data indicating how the use of space has altered before and after the change.

Data can be used to visualise social impact for the client and can be used to offer further advice on making adjustments and adaptations.

Project BYENS BRO BRIDGE
Architects GOTTLIEB PALUDAN ARCHITECTS
Photo LARS R. MORTENSEN

If you look towards the bottom of Maslow's hierarchy of needs,
we are building in order to keep people fit and healthy.
If you look towards the top, we are building to make sure that they are thriving,
are happy and are able to realise their dreams of living the good life.
Both of these elements are interlinked with the quality of the environment
that we are building and the resources that we invest in this.

ENVIRONMENTAL VALUE CREATION

HEALTH AND WELL-BEING
ENVIRONMENTAL DESIGN
LIFE CYCLE ASSESSMENT

ENVIRONMENTAL VALUE CREATION

When we build, we make use of nature's resources in order to create a new environment that underpins human well-being and health. When it comes to the degree of success of projects and the resources used for them, architects' design work and choice of materials are of major significance.

The positive effects can be optimised by using evidence-based design principles and working with environmental measurements and simulations. You can keep track of the negative environmental impact – climate impact and resource consumption, for example – and minimise this by means of life cycle assessments.

Plan – define environmental objectives

Expose what environmental conditions are relevant to the project's stakeholders and which design principles will best support them. Formulate both qualitative and quantitative environmental goals to be met by the project. Register the present environmental conditions on site or use predefined standards as a Baseline reference for the development of the project.

Design – simulate and assess environmental effects

Use research results and evidence-based design principles for design decision-making and for the selection of materials. Create models and prototypes for purposes of developing your design, and use simulations and measurements to qualify and put figures and scores on the environmental qualities that have been perceived. Keep track of the project's use of resources by working with recycling and energy optimisation.

> **Build models. All digital models can simulate countless environmental qualities. Give scores. Scores are values.**

Use – document environmental effects

Evaluate and measure the project's environmental qualities and obtain more information on how behaviour and technology will interact inside the building you are creating. Help Clients and Users to make best use of the project's facilities, and assist them in understanding the building as an asset, and to understand the building as an asset for their activities. Obtain and analyse usage data through post-occupancy evaluations or sensoring systems. This will provide important knowledge for you, your Clients and the Users.

METHOD	PLAN	DESIGN	USE	CLIENTS USERS COMMUNITY Map out the value creation for these three groups of stakeholders.
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ENVIRONMENTAL	DEFINE ENVIRONMENTAL OBJECTIVES	DESIGN FOR ENVIRONMENTAL EFFECTS	DOCUMENT ENVIRONMENTAL EFFECTS	WELL-BEING AND HEALTH ENVIRONMENTAL QUALITIES LIFE CYCLE ASSESSMENT Document the environmental value creation.

METHOD: WELL-BEING AND HEALTH

Use evidence-based design principles to design buildings that support social behaviour, well-being and health for everybody.

Increasing amounts of research are being carried out into how design can underpin well-being and health, and literature, guidelines and instructions are available that can be of use to qualify design and process solutions. Keeping abreast of the latest information in the field provides the best possible starting point for ensuring that the solutions will have the intended effect.

Well-being and health are largely related to how spatial conditions facilitate behaviour and activities, and they offer widened possibilities to the users. Make sure that these opportunities are available to all by using universal design. Arrangements that promote health and well-being are frequently very interdependent on behaviour, and solutions have to be elaborated in such a way that they fit in with the social and cultural context in order to elicit the best possible effect. Therefore, use discussions with stakeholders in your efforts to adapt evidence-based design principles to the specific challenges of the assignment.

Also be aware that material attributes and production processes can be linked with effects on health and well-being. Use instructions, certifications, checklists and environmental product declarations to avoid unwanted chemicals and production processes that may subject tradesmen working on the job to a poor work environment and may pose a risk to users.

Evaluate and measure the environmental qualities of the building and its effects on well-being and health when it is going to be put into use. Use the results to improve design principles and solutions for future projects.

PLAN	DESIGN	USE
Define assignment Define success criteria Establish baseline	Define features Assess effects Document qualities	Evaluate quality Measure effect Document value
Find research literature on health and well-being pertinent to the field for which you will be designing a solution. Examine whether design guidelines, checklists or other evidence-based recommendations have been published that can support the design process and be used to formulate objectives for well-being and health-related effects. Work with the stakeholders to figure out what specific requirements they have in terms of spatial organisation, material selection and processes that might serve to promote health and well-being in the finished building, as well as at the construction site. Plan in such a way that will safeguard the work environment during construction and operation, and, in time, the disassembly of the building's components for future re-use.	Use research, guidelines and checklists to support design solutions so that they are based on state-of-the-art knowledge in the field. Qualify design decisions in dialogue with user groups and other relevant stakeholders. Use universal design in order to guarantee equal opportunities and accessibility for everybody. Check that the solutions that are being implemented are of the same quality as the solutions prescribed. Implementation and deliveries of materials are of major significance to the environmental qualities of the building. Design a good work environment for the contractors that will be constructing the building. Make sure your builders are going to get home safely.	Use evaluations and measurements of the building's environmental qualities to create new evidence-based design principles or to improve the existing ones. Health and well-being effects focusing on behaviour can be documented by means of observation studies, usage data, work environment assessment statistics, etc. The health effects of materials can be documented by means of material data, environmental product declarations and certifications, for example.

CASE: 3XN ARCHITECTS, MIDDELFART SPAREKASSE

Location	MIDDELFART
Type	OFFICES AND PUBLIC AREA
Completed in	2010
Size	5000M2
Budget	DKK 60 MILLION
Architect	3XN ARCHITECTS
Landscape	SCHØNHERR
Developer	TREKANTENS EJENDOMSSELSKAB A/S
Contractors	KINGO KARLSEN A/S, JORTON A/S, GULDFELDT A/S
Engineers	COWI
Artistic decoration	OLAFUR ELIASSON

PLAN

Define assignment
Define success criteria
Establish baseline

One of the objectives of this project was to enhance employee motivation, job satisfaction and well-being by creating a rich work environment that would support cooperation and informal knowledge sharing. It was important that the building become an integral part of urban life, since the local community was made up of customers of the bank.

DESIGN

Define features
Assess effects
Document qualities

3XN was working with evidence-based principles related to the work environment and good indoor climate: views and access to nature, varying light conditions with lots of daylight and minimal glare, a building design that encouraged movement and informal meetings, clear orientation around the building and in the zoning, which promised both concentrated working and social interaction.

The building's transparent roof structure links the centre of the town with the Strait of Lillebælt and serves as a public space during daytime hours.

USE

Evaluate quality
Measure effect
Document value

3XN carried out an evaluation of the building in partnership with Roskilde University, which showed that 80% of staff were happier with the new building than with the previous premises, and 93% felt that they were working efficiently in the building.

Middelfart Sparekasse has been named the Best Workplace in Denmark on a number of occasions, most recently in 2016. The company is also on the list of the best places to work in Europe.

Photo: Adam Mørk

METHOD: ENVIRONMENTAL QUALITIES

Performance simulation and measurements – Optimise your design's environmental qualities. Use simulation tools and measurement of environmental qualities to qualify your project's environmental qualities as experience-based potential, and optimise its technical capacity from a sustainability perspective.

You can simulate the urban environment and climate qualities such as sunlight, sound, lighting, air and temperature – both indoors and out. The (indoor) climate has a well-documented effect on people's well-being, with cognate effects on productivity and learning, and is hence an important social and economic driver with respect to planning and architecture. Energy consumption for building operation is related largely to the regulation of the indoor climate and is closely linked with the design of buildings, the material selection, and the behaviour of users. Therefore, you can use simulations to enhance the sensory qualities of the design while also reducing the need for additional energy.

Environmental quality is one of the most important aims of architecture and is absolutely crucial to people's physiological needs, health and well-being. Therefore, expertise in assessing both technical and experience-related aspects is important in the design process. Use simulation tools and measurements to estimate the relative effect of the different design resources and how they interact. Examine design variations and combine the best solutions. Repeat and systematise your results in order to optimise your learning and knowledge.

PLAN	DESIGN	USE
Define assignment Define success criteria Establish baseline	Define features Assess effects Document qualities	Evaluate quality Measure effect Document value
Measurements and simulation tools can be used initially in order to map out the climatic and environmental qualities of a location (or the lack thereof) as a basis for a discussion about what qualities the project is supposed to promote and how these can be expressed in terms of the environmental objectives of the project.	While the project is being designed, simulations can be used to assess the environmental qualities of the design resources on a rolling basis, thereby using these qualities as creative input in the design process and also for purposes of qualifying decisions with stakeholders.	When the project is implemented, it ought to be followed up with environmental measurements on site and in dialogue with users. Are the environmental qualities and energy consumption commensurate with expectations? Or does the model, the technology or the behaviour need to be adjusted? How is the quality of the environment being perceived, and how does this make an influence on the users' well-being? The technical environmental performance of buildings is rarely commensurate with what was calculated beforehand when the buildings are eventually put into use. Post-occupancy evaluations studying the interaction between behaviour, technology and comfort can assist developers, operators and users in the improvement of the building's performance.

CASE: HENNING LARSEN ARCHITECTS, DESIGN WITH KNOWLEDGE

PLAN

Define assignment
Define success criteria
Establish baseline

The environmental qualities and challenges are being registered and being measured at the site.

Environmental goals are formulated in relation to the challenges and potentials at the site, and in relation to the programme and nature of the assignment.

DESIGN

Define features
Assess effects
Document qualities

The project's design adapts and works further with the environmental challenges and potentials from urban scale to detail.

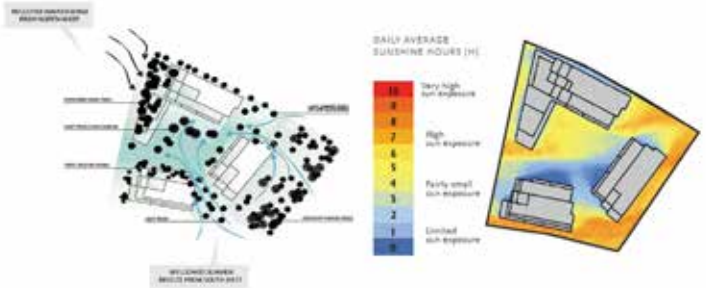
Simulations of local climatic conditions, indoor climate, comfort and energy consumption can ensure that design decisions on all levels of scale will help to create environmental qualities in the building while reducing resource consumption.

USE

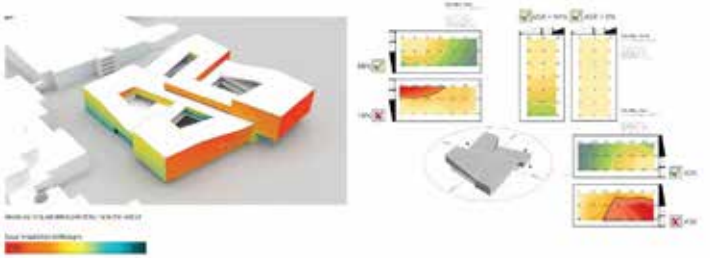
Evaluate quality
Measure effect
Document value

Simulations are followed up with environmental measurements in the constructed building and can advantageously be supplemented with evaluations of operating data.

Following up on the environmental and technical performance of projects can serve to document how aesthetics and functionality are interlinked and may reinforce the credibility of architects' design advice over time.



Urban micro climate studies - The Springs, Shanghai



Energy and daylight simulations - University of Cincinnati

Measuring daylight - Nordea Bank, Ørestad

Photo: Adam Mørk

METHOD: LIFE CYCLE ASSESSMENT

Keep track of the environmental impact of your project. You can for example use life cycle assessments to document whether your building design is climate-neutral or even climate-positive.

Life cycle assessment (LCA) is a method for quantifying and assessing the environmental impact of the production and use of buildings and structural elements throughout their entire lifetime. LCAs can be used, for example, to define goals for how to minimise your project's carbon footprint when you are working with material selection, reuse and recycling. When working with LCA, you have to figure in all of the materials in the structural elements that you are assessing and you need to use material data to calculate the environmental impact that production, transportation, use, maintenance, replacement and disposal are making. It is possible to carry out very fast LCA calculations if you use BIM models as a starting point, linking the material quantities directly to environmental impact databases. This will save you a lot of time, and will allow you to use the LCA to guide your design decision-making.

Take care to see that your solutions are not simply shifting the burden from one environmental impact to another. For instance, make sure to avoid a situation where your climate optimisation results in loss of biodiversity. Manual data entry is one of the typical sources of error. For this reason, a good idea is to develop a digital, BIM-based workflow that can automate the collection of material data and render visible the analyses with a minimum of effort.

CASE: 3XN, LENDAGER GROUP, VANDKUNSTEN, CIRCLE HOUSE

Location	LISBJERG, AARHUS
Completed in	2020
Developer	LEJERBO, MUNICIPALITY OF AARHUS
Architects	LENDAGER GROUP, 3XN, VANDKUNSTEN
Engineers	ORBICON
Contractors	MT HØJGAARD
Knowledge partners	DANISH ASSOCIATION FOR RESPONSIBLE CONSTRUCTION (FBSA), DANISH BUILDING RESEARCH INSTITUTE (SBI), GXN INNOVATION, CINARK, AARHUS UNIVERSITY SCHOOL OF ENGINEERING

Photo: 3XN

PLAN

Define assignment
Define success criteria
Establish baseline

Circle House is an affordable housing development project involving entreprises from the entire value chain of the building industry, focused on developing basic principles for circular construction.

The aim was to ensure that 90% of the materials could be re-cycled without losing significant value.

These solutions were to be implemented in a non-profit affordable housing project, built under market conditions.

DESIGN

Define features
Assess effects
Document qualities

During the development phase, all of the structural elements underwent a life cycle assessment by SBi (the Danish Research Building Institute). Environmental impact was quantified in relation to components' expected lifetime and the potentials for re-cycling and re-use.

The analyses suggested potential climate impact savings of 45-65% when compared with standard construction.

The potential savings was closely inter-connected with the architectural detailing of the building, which had previously been documented in models, drawings, prototypes and diagrams.

USE

Evaluate quality
Measure effect
Document value

The solutions were tested through the means of a full-scale demonstration pavilion.

The thorough testing of buildability and the well-documented environmental effects were used as a basis for tendering, and the contractor who was been entrusted with completing the finished building is obligated to comply with this.

Project HELGOLAND
Architects H+ARKITEKTER
Photo BRIAN BERG

Building design involves both “short-term money” and “long-term money”, and the temporal perspective for Clients’ investments is of major importance to the quality of what we build. But the best money spent is the money that both gives a return on investment to the Client, but also generates added value for Users and Community. We can invest more wisely and bring forth better solutions if we make value creation visible and transparent to all of the stakeholders, for example, with a total value assessment.

ECONOMIC VALUE CREATION

CONSTRUCTION ECONOMY
LIFE CYCLE COSTING
TOTAL VALUE

ECONOMIC VALUE CREATION

Regardless of whether you are working for private or public Clients, whether you are working with short-term or long-term investment horizons, whether or not the project is commercial, one of the top priorities for Clients and developers is economic predictability, particularly with regard to the implementation of the project. Being able to control costs can provide design freedom.

Time is one of the most important factors that you've got to keep track of when you want to ensure economic value creation with your project. When the temporal perspective is extended from the construction's economy so as to include the whole life cycle of the building, you can demonstrate the hidden potentials in working with re-use and circular economy. On top of controlling the costs, if you also evaluate the benefits for the project's stakeholders, you can document the economy of your project.

Plan – define economic objectives

Make transparent the economic conditions of the project, as well as the most significant factors for the Clients' project economy. Formulate a business model for the building which includes, as a minimum, the most significant expense items for the construction and operation of the building and the most significant advantages to be generated by the project for the three stakeholder groups: Clients, Users and Community. Can these be calculated in economic terms? What will they be worth to each group of stakeholders? What costs will be conjoined with the fulfilment of the environmental goals? What is the temporal perspective for the investment? And who is going to benefit from the value created? Discuss your assessments with the stakeholders, and find a way to substantiate and allocate gains and costs among the various stakeholders.

Design – simulate and assess economic costs and benefits in a life cycle perspective

Construction economy and time management will, under all circumstances, attract a great deal of attention from the Clients. You can increase the economic predictability by linking your building model to price databases and assessing, at regular intervals, the status of the project's economy. Have alternative solutions ready if the criteria for your project's economy should happen to change. Make use of life cycle costing to find out whether the immediately expensive albeit durable solution would actually be more cost-efficient than the cheaper solution. Calculate the net present value of future gains and costs.

Use – document economic impacts

Obtain usage data and find economic indicators that can serve to highlight the project's actual value creation in economic terms. Calculate the project's total value, defining the most significant social, environmental and economic impacts of the project for Clients, Users and Community in monetary terms. Work systematically to improve your gathering and processing of economic data in order to reinforce the credibility of your advice in future projects.

> **Compare the economic gains associated with environmental qualities and social impacts to the costs of producing them.**

METHOD	PLAN	DESIGN	USE	CLIENTS USERS COMMUNITY Map out the value creation for these three groups of stakeholders.
	Define stakeholders and map out their values, needs and preferences. Define **assignment**. Define **criteria** by which the success of the project can be assessed. Some criteria need to be measurable Establish **Baseline**: Describe the stakeholders' present conditions, activities and organisation, or use references for making subsequent comparisons.	Define what **design features** and process-related resources are going to be used in the project in dialogue with stakeholders. Assess and simulate the design's **qualities**. Assess what effects the solutions are expected to elicit, **adjusting** the solutions if necessary.	**Evaluate** the qualities of the design with the stakeholders. Measure **effects** in relation to success criteria. Include new criteria, where relevant. Document value creation by **comparing** measured and observed effects with the baseline and by relating these to costs.	
ECONOMIC	DEFINE ECONOMIC OBJECTIVES	DESIGN FOR ECONOMIC EFFECTS	DOCUMENT ECONOMIC EFFECTS	CONSTRUCTION COSTS LIFE CYCLE COSTING TOTAL VALUE Document the economic value creation

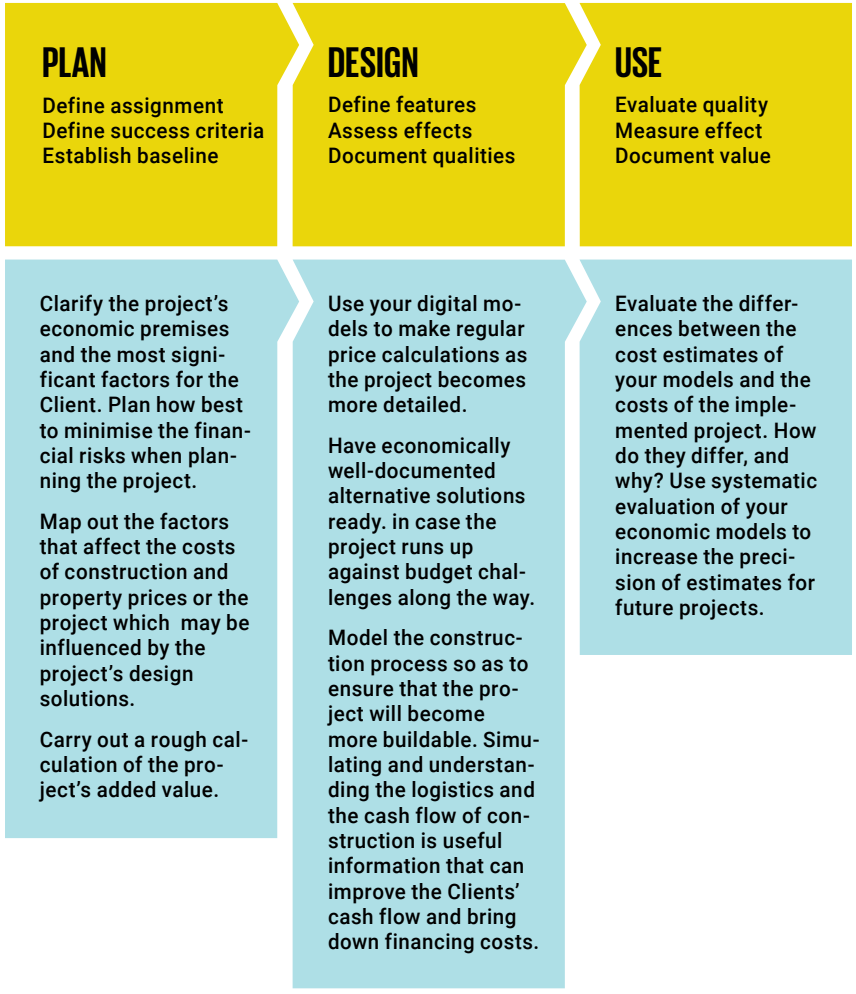
METHOD: CONSTRUCTION COSTS

Create better economic predictability: Economic predictability is a core value among the vast majority of Clients and investors. Use digital models to control the construction costs yourself.

The simplest definition of added value, in economic terms, is the difference between what it costs to produce an item and the price for which the item can be sold. This is more or less the same model that is used by commercial project developers in project sales, where the costs of financing, the purchase of land, design consultancies, construction and sale should all be recovered, with a profit, when the item is resold. Public projects are also generally run with locked budgets for construction costs, and come with the same requirements for cost management, although the goal here is not to achieve a return, but to implement the project on time and within the confines of the budget. Both cost-effectiveness and delivery of value are extremely dependent on time, and so scheduling and cost control is going to be crucial to the success of the project.

You can link your digital models to databases for construction prices and property values and create estimates for both costs and added value. In principle, you can simulate both construction prices and property prices, depending on your design choices. As you collect economic data for your projects, you will achieve a better foundation for your early stage design advice - which can prove to be of very high value to your client.

Access to economic data and knowing how to handle it are crucial to the credibility of your advice. Therefore, make sure that you have insight into the economy of your projects, all the way down to the details, so that you can establish and develop your company's economic advisory competencies.



CASE: ZESO ARCHITECTS, BIM AND CONSTRUCTION COST MODELLING

PLAN

Define assignment
Define success criteria
Establish baseline

ZESO ARCHITECTS is working with a group of collaborative partners in the construction value chain, supplementing one another's skills so that projects can be implemented with the greatest possible degree of economic predictability.

DESIGN

Define features
Assess effects
Document qualities

ZESO ARCHITECTS has developed a BIM-based workflow that aims to promote the straightforward exchange of digital information with collaborative partners, focusing on value growth within the project

This workflow links price databases to the BIM models and provides an opportunity to constantly monitor the project's construction costs. This gives both the Clients and the design team more opportunities to deliver quality on time and on budget.

USE

Evaluate quality
Measure effect
Document value

Methodical efforts to monitor construction costs are reinforcing ZESO ARCHITECTS' credibility as a collaborative partner and reinforcing a sense of confidence in the enterprise.

The knowledge and experience gained by ZESO ARCHITECTS by modelling construction costs digitally are being integrated into the early planning and the design phases of future projects.

Photo: ZESO ARCHITECTS

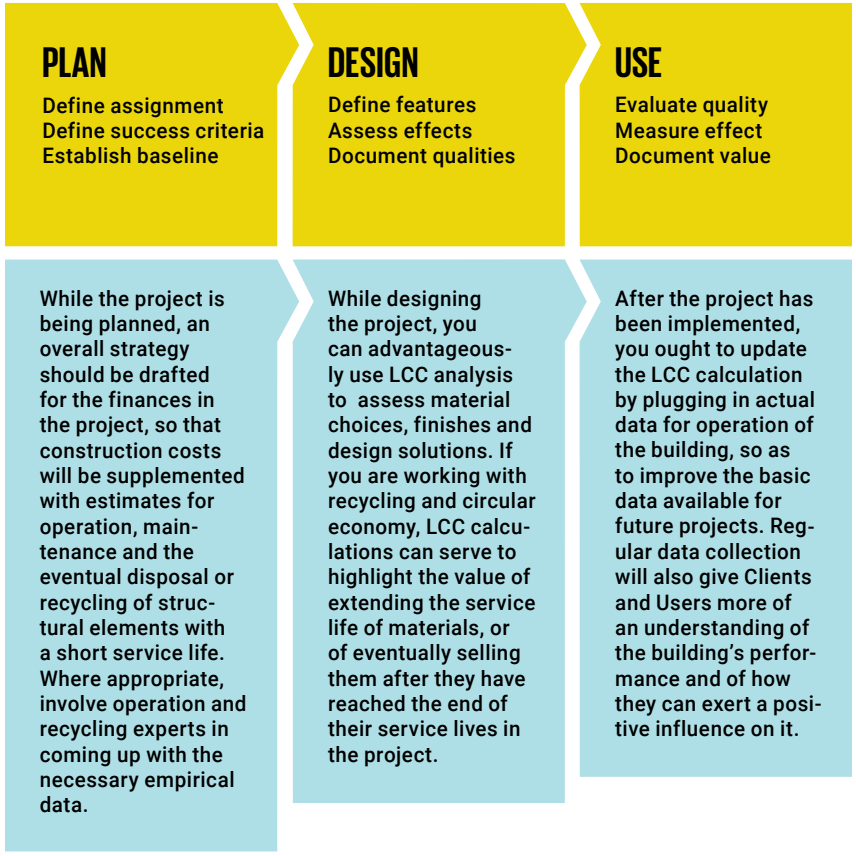
METHOD: LIFE CYCLE COSTING

LCC (Life Cycle Costing) – Assess your solutions in a long-term perspective. You can use life cycle costing to assess whether solutions with different procurement and operating costs are more beneficial in the long run.

What is the most beneficial option: a solution that is cheap to procure but ex-pensive to run, or vice versa? With life cycle costing, you can convert the overall expenses for procurement, maintenance, operation and disposal to net present value for one or more solution variants. Net present value is a simple way of describing that future gains are generally ascribed less value than the profits that are going to materialise in the short term. LCC calculations can be created for individual building components or for entire buildings.

The way in which we finance construction presents certain barriers for life cycle costing. In practice, it is often difficult to challenge the budget for construction costs, even if more expensive solutions here and now are demonstrably cheaper in the long run, due to short-term financial and sometimes political constraints.

Be aware that the functionality of the building component systems that you compare must be the same. If, for example, you compare a non-flammable material with a flammable material that triggers requirements for a sprinkler system, the sprinkler system must be included in the comparison. LCC is mandatory in some sustainability certification systems such as the DGNB and is increasingly being used in national and international procurement regulations.



CASE: VANDKUNSTEN, COBE, BRØNSHØJ SKOLE

Location	COPENHAGEN
Type	NEW BUILDING
Function	SCHOOL
Completed in	2017
Size	8000M2 INCLUDING THE EXISTING BUILDINGS
Total construction cost	80 MILLION DKK
Architects	VANDKUNSTEN, COBE
Landscape architect	MARIANNE LEVINSEN LANDSKAB
Developer	BYGGERI KØBENHAVN
Engineers	ORBICON

PLAN

Define assignment
Define success criteria
Establish baseline

When designing the Brønshøj Skole project, Byggeri København asked the architects to make use of LCC to assess material selections for floors and walls.

Public Clients in Denmark are obliged to use life-cycle costing at a building component level when they are making preparations for the construction of buildings.

DESIGN

Define features
Assess effects
Document qualities

The LCC analysis bore out that the advantages of cross laminated plywood and strip parquet, in terms of operation and maintenance, more than compensated for the cheaper construction costs for linoleum flooring and plasterboard walls over a relatively short period of use.

The LCC supported the architects' recommendation of materials, which also age beautifully and thus retain their value over a longer period of time.

USE

Evaluate quality
Measure effect
Document value

The LCC calculations formed a part of the formalised knowledge of Vandkunsten and COBE and can now be included as a well-documented design choice in future building projects without taking up a significant amount of time.

LCC analysis can then be used in earlier phases, in order to qualify more materials, possibly supplemented by an LCA analysis.

Photo: Helene Høyer Mikkelsen

METHOD: TOTAL VALUE

Turn social and environmental effects into economic values. Use total value assessments to describe the economic gains achieved by virtue of the construction and the activities supported by the architecture. View these in relation to the overall financial costs, and describe how gains and costs are being distributed among the stakeholders who will come to be affected by the project.

Often, the greatest expenses associated with a building are not the construction or operating costs, but the expenses of the activities around which the building forms a framework. For example, employees' payroll expenses are many times greater than the cost of renting an office property. That said, the activities are what create the gains. With total value, we take into account the most important social, environmental and financial advantages and disadvantages over which a building has an influence and turn these into costs. If the users are happier within a new framework, this may be of major financial value. It may result in better work performance, better learning or higher productivity, for example. It may also result in fewer days of sick-leave, thereby reducing costs. Even marginal gains in terms of productivity or health may be very valuable for a user organisation over time.

Architecture is often of major significance when it comes to the amount of interest generated by a building. A strong architectural identity can be used as branding, which can prove to be of major financial significance. For example, you could consider turning the value of an increased number of visitors into a financial value, or assessing the media value of what people are saying about the building in the press and through the various social media.

Use total value to highlight the overall 'business model' of the building for the various stakeholder groups: Clients, Users, and Community. In the net present value (NPV), turn as many social advantages and disadvantages as possible over the life-time of the building into financial values.

PLAN	DESIGN	USE
Define assignment Define success criteria Establish baseline	Define features Assess effects Document qualities	Evaluate quality Measure effect Document value
Use total value to evaluate and highlight gains for Users and the Community when the building is put into use. If the gains are sufficiently significant, they can be used as an argument in favour of investing in better quality in the construction of the building or investing in more facilities so as to reinforce activities involving Users or the local Community, if Clients can resell these gains by charging more rent or by accommodating more users in the building.	You can make your initial total value assessment more precise by including LCC assessments based on the material and component selection that you decide upon with the Client. You can also estimate the finances for the project's functional facilities and environmental amenity values.	After the project has been put into use, you can assess its overall financial value creation for Clients, Users and Community based on usage statistics, empirical data and financial indicators. Use qualitative descriptions of indicators that cannot be turned into financial figures.

CASE: SLA, SØNDER BOULEVARD

Location	COPENHAGEN
Type	NEW BUILDING
Function	URBAN OPEN SPACE AND PARK
Completed in	2006
Size	1.6HA
Total construction cost	18 MILLION DKK
Architects	SLA
Developer	MUNICIPALITY OF COPENHAGEN
Contractors	HOFFMANN A/S
Engineers	HANSEN & HENNEBERG
Knowledge partners	VEJ & PARK, PROJEKTKONTORET

PLAN

Define assignment
Define success criteria
Establish baseline

The municipality of Copenhagen decided to divert the traffic on Sønder Boulevard and invested DKK 18 million in the construction of a new urban park in order to give the residents in the densely populated district of Vesterbro better conditions for living their urban lives.

DESIGN

Define features
Assess effects
Document qualities

SLA was awarded the contract and designed the park with a number of facilities that stimulate the appetite for outdoor activities and urban life: a marketplace, ball-playing fields, benches, fragrant gardens, etc.

USE

Evaluate quality
Measure effect
Document value

Usage statistics indicated a significant increase in urban activity in the area.

A total value assessment prepared by Grontmij showed that the urban park is of major financial value to both homeowners and the municipality of Copenhagen.

Property prices in the area have increased, overall, by DKK 351 million in buildings that are located within a distance of 100 metres from Sønder Boulevard. As a result, the municipality of Copenhagen is receiving an extra DKK 12 million a year in tax revenues. Moreover, this urban space – with a total construction cost of DKK 18 million – has an estimated park value of DKK 125 million. Paradoxically, this attractive urban space might thereby come to trigger a process of gentrification in this particular area.

Photo: Mads Klitten

Project STUDIELANDSBYEN
Architects LENSCHOW & PIHLMANN
Photo HAMPUS BERNDTSON

Documenting value creation reinforces your business,
according to architects who are working systematically with doing this.
It amplifies what Clients have to say about the project,
and it helps Users to understand their surroundings
as being an asset to their activities.
These are services that you can sell.

PRACTICAL EXAMPLES

PRACTICAL EXAMPLE: AART ARCHITECTS

How is architecture perceived? And how is it being used in practice? AART architects evaluate their projects after they have been put into use. By collecting data on people's use, perception and opinions of the architecture, they are documenting their own social value creation.

Internal value

AART documents and examines architecture's social value creation by evaluating selected projects. They respond to the social impact of architecture and seek insight into the influence their work has on the people who are spending time in and around it. Processed data is a strong branding tool and helps to provide guidelines for new projects.

Data is being collected by means of observation studies, surveys and interviews. This method was developed in partnership between AART architects and the anthropological analysis institute, The Alexandra Institute, and is known as the "Social Survey Method". This partnership was launched with financial support from the Research and Innovation Board of Denmark, and the AART+ department is currently in charge of conducting all the evaluation processes.

External value

By documenting social value creation, AART architects is showing the Clients and the other stakeholders how architecture can actually be used and perceived by the people who use it every day. This makes it possible to return to the original intentions of the architecture and examine whether they were successfully implemented. And if so, then how? Important experiences are taken into consideration and preliminary/subsequent comparisons are employed as branding tools.

Why is it important to document value?
"It is precisely by examining and documenting the value we have created that we become wiser about what was successful in our projects, and what we should be doing better next time around. To be able to create value, you've got to understand initially what it is that actually creates value. This helps us to become more talented architects and to create better projects."

What external value is being added in relation to your Clients and your collaborative partners?
"Documentation largely involves a business and earnings perspective. By highlighting the value we create, we are documenting for the Clients what they are getting for their money, and of course we are also using this information to attract future clients."

What internal value does this give to the practice?
"All projects involve learning. To get the most out of your own work, you have to stop and ask yourself – and, even more especially, the users and purchasers of the building – what has gone well and what could be done better. Documentation of social value creation is an important element in our internal learning process, that says something about who we are."

Has doing this improved your business?
"We have managed to document what value our buildings create – for individual Users, and also for the Community, viewed in a wider perspective. This promotes our projects and the work of our studio. This is a strong selling point. It tells our clients what they are getting for their money at the time that they enter into a contract with us."

Nanna Flintholm
AART architects
Associate partner, Manager of AART+, Architect MAA

VUC SYD

> By rethinking the frameworks for learning, this educational centre has brought forth enhanced study motivation and an improved sense of well-being, while encouraging more active teaching with greater participation.
>
> **Alexandra Institute**
> Conclusion of the evaluation of VUC Syd

> In fact, the number of young people who are choosing to continue their studies at university, vocational college or the like is up by no less than 200%. Since the facility aims at students with high risk of unemployment this translates into an increase of more than 1000 young people each year who successfully takes another important step qualifying them for employment.
>
> **AART architects**

Photo: Adam Mørk

PRACTICAL EXAMPLE: AART ARCHITECTS

VUC Syd was the first project evaluated by AART architects in collaboration with the Client and the Alexandra Institute. The results showed that motivation was outstanding: the spaces provide conditions for active teaching with greater participation.

Rethinking spaces for learning

The VUC Syd education centre was designed with a focus on giving young people who have grown bored with attending school a new and more positive experience of attending school. This is helping to lift them out of the support-benefits system and into pursuing further education and, eventually, gainful employment. The evaluation bore out that VUC Syd attracted 53% more students than other VUC institutions. After their studies, 70% more students chose to take a vocational course, while 200% more chose higher education. This is equivalent to an increase of more than 1000 young people per year, in total, at VUC Syd as a whole. By rethinking the frameworks for learning, better study motivation and enhanced well-being were created, while encouraging more active teaching with greater participation.

It is already well established that the design of classrooms have significant impact on student's academic progress. When the qualitative data from the evaluation of VUC Syd is linked with quantitative data, this paves the way for positing an interesting hypothesis: the socio-economic gains from putting young jobseekers to work can be quantified as an average of DKK 208,000 per person, per year. Improving student motivation, academic progress and exam results has great economic impacts. Each successful student who in time gets a higher-skilled job contributes to the national economy quite significantly. A more precise survey of the influence of the various factors on learning and initiative requires further analysis. The socio-economic gains associated with improved motivation and drive – to move from education to being on the job – can eventually come to form part of a total value calculation.

PLAN	DESIGN	USE
The purpose of the VUC Syd building was to help young people to embark upon courses that could qualify them for jobs. Many of the course participants were unemployed and had completed only lower levels of education. It was necessary to create a good learning environment on the young people's terms. An open, flexible and digital learning environment was supposed to challenge the fixed classrooms. User involvement through dialogue and workshops held among Clients and future Users.	Different teaching zones serve to encourage varied activities and interdisciplinary encounters. Open and flexible frameworks underpin an innovative digital learning environment. Magnificent architecture with a central atrium help VUC to be perceived as a gathering point. Preparation for evaluation, once the building was put into use.	Evaluation by means of interviews, observations and surveys showed improved concentration along with the reinforcement of motivation for further studies. A greater sense of pride was identified among students and employees as a result of their links with VUC.
		VUC Syd's re-doubled success rate translates into an additional 1000 people choosing to continue with their education. The socio-economic gain from putting young jobseekers to work stands at an average of DKK 208,000 per person. Part of the improved success rate can arguably be attributed to students improved well-being and satisfaction with the environment at VUC Syd.

Project	VUC SYD
Location	HADERSLEV
Completed in	2013
Developer	VUC SYD
Advisors to developer	ARNE ELKJÆR
Architects	AART ARCHITECTS, ZENI ARKITEKER
Engineers	COWI
Contractors	MT HØJGAARD
Knowledge partners	ALEXANDRA INSTITUTE, CONTIGA TINGLEV, ROCKIDAN

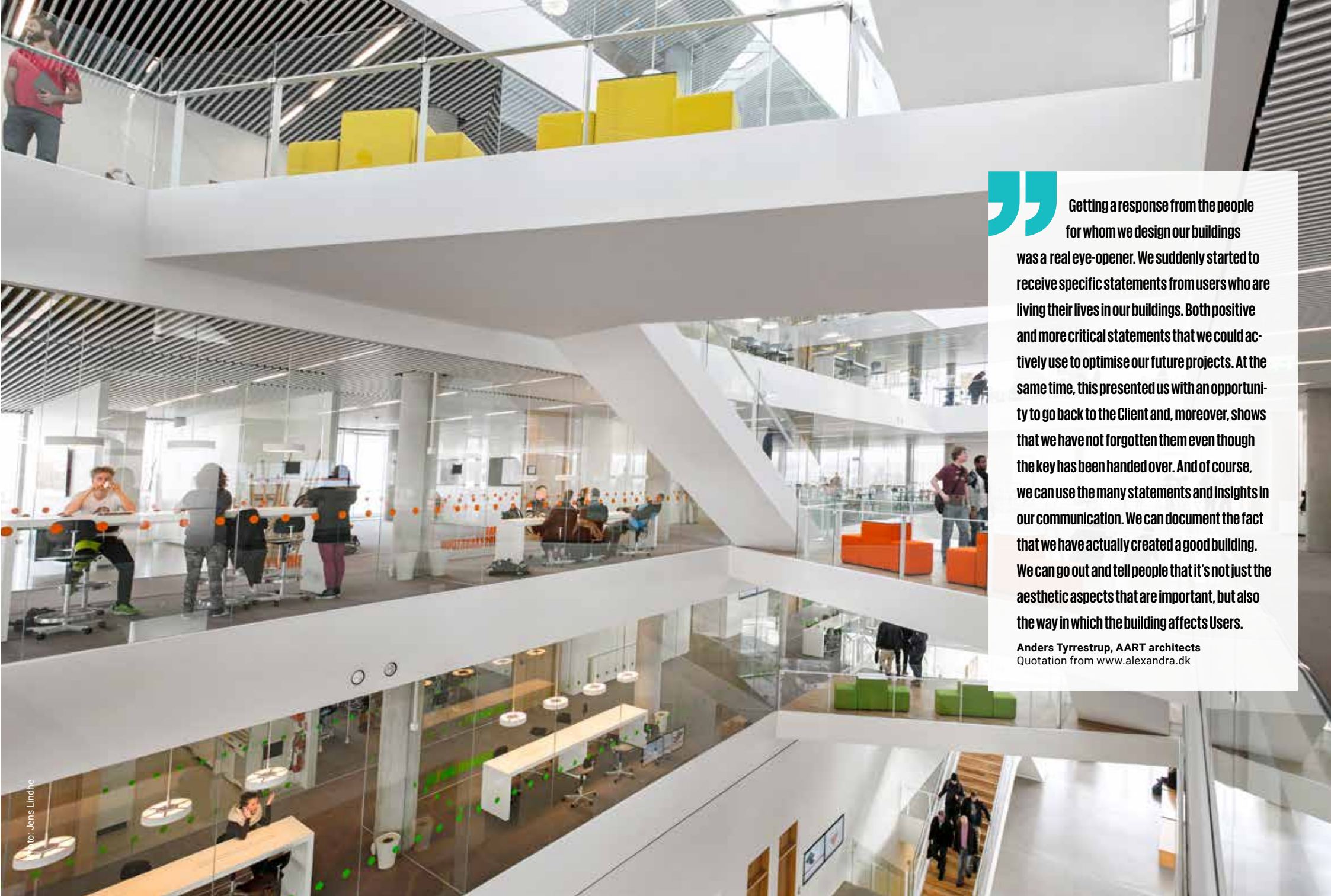


Photo: Jens Lindhe

> Getting a response from the people for whom we design our buildings was a real eye-opener. We suddenly started to receive specific statements from users who are living their lives in our buildings. Both positive and more critical statements that we could actively use to optimise our future projects. At the same time, this presented us with an opportunity to go back to the Client and, moreover, shows that we have not forgotten them even though the key has been handed over. And of course, we can use the many statements and insights in our communication. We can document the fact that we have actually created a good building. We can go out and tell people that it's not just the aesthetic aspects that are important, but also the way in which the building affects Users.
>
> **Anders Tyrrestrup, AART architects**
> Quotation from www.alexandra.dk

PRACTICAL EXAMPLE:
HENNING LARSEN ARCHITECTS

Henning Larsen Architects work with impact measurements in the urban environment, indoor climate and energy. Measurements and simulations give the business an insight into de- sign-related challenges and potentials that need to be addressed by the architecture.

Internal value

Henning Larsen Architects combines architectural professionalism with technical environmental expertise. The coupling between engineering skills and architectural skills helps to diversify the office, extending the company's brand and reinforcing its credibility as a strategic advisor.

Henning Larsen Architects uses measurements and simulation tools to document how their architecture brings about a good indoor climate and a better urban climate while using less energy. Simulations provide feedback on various architectural solutions and act as a collective interdisciplinary point of reference. These simulations are used to underpin the project's core visions, and the design is adapted and updated according to the interim results and calculations. When projects are put into use, measurements and behavioural analyses are used so that Clients, Users and architects can obtain vital intelligence on how use of the building can be optimised.

External value

Continuously updated technical documentation during the design phase helps the company and its Clients to make qualified decisions that reinforce functionality and environmental amenity values. The measurable environmental performance that Henning Larsen Architects is able to document constitutes a strong branding parameter for the clients of the firm.

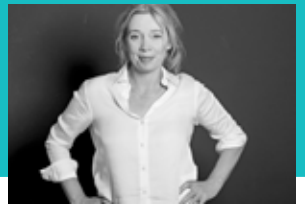
Why is it so important to document value?
Signe Kongebro: "We need to talk about how we can document the fact that we are attaining the goals that we have set for ourselves. Otherwise, everything turns into postulates – like 'I think' or 'I believe'. Documenting what you know is essential, especially when it can be converted into monetary terms."

What external value is being added in relation to your Clients and your collaborative partners?
Jakob Strømann-Andersen: "Being able to quantify things is an interdisciplinary door-opener. We create an agreement with the Client, very early on, and define a few impact goals that we can hold onto. These goals provide broader ownership throughout the process and establish a common language throughout."

What internal value does this add to the practice?
Signe Kongebro: "Being able to document the effects of architecture has a strong unifying effect, internally. Working with the measurement of impacts helps to transfer the emphasis on what is interesting about the building itself to what the building can do. We can see that being part of a wider narrative gives people a sense of pride."

Has this strengthened your business?
Signe Kongebro: "You have to create awareness of the value of your work before there is demand for your work. We know, for example, that daylight is a crucial factor for users of our architecture. This is why we have been working for a long time on communicating the importance of daylight by introducing new methods and new knowledge. This has allowed us to create a market for ourselves."

Jakob Strømann-Andersen
Henning Larsen Architects
Partner
Head of Sustainability Engineering
PhD, MSc. Arch. Eng.
LEED AP BD+C, DGNB Auditor



Signe Kongebro
Henning Larsen Architects
Partner, Professor (Adj.)
Head of Sustainability Research
DGNB International Consultant
Architect MAA

FREDERIKSBJERG SKOLE

CONCENTRATION AMONG PUPILS↑
NOISE LEVEL↓
VARIED DAYLIGHT↑
FOCUSED ARTIFICIAL LIGHT↑

> I think it gives us happier children, and also children who are more clever. Pupils who become engaged with skilful professionalism are happy pupils.
>
> **Jette Bjørn Hansen**
> Headteacher

Photo: Peter Nørby

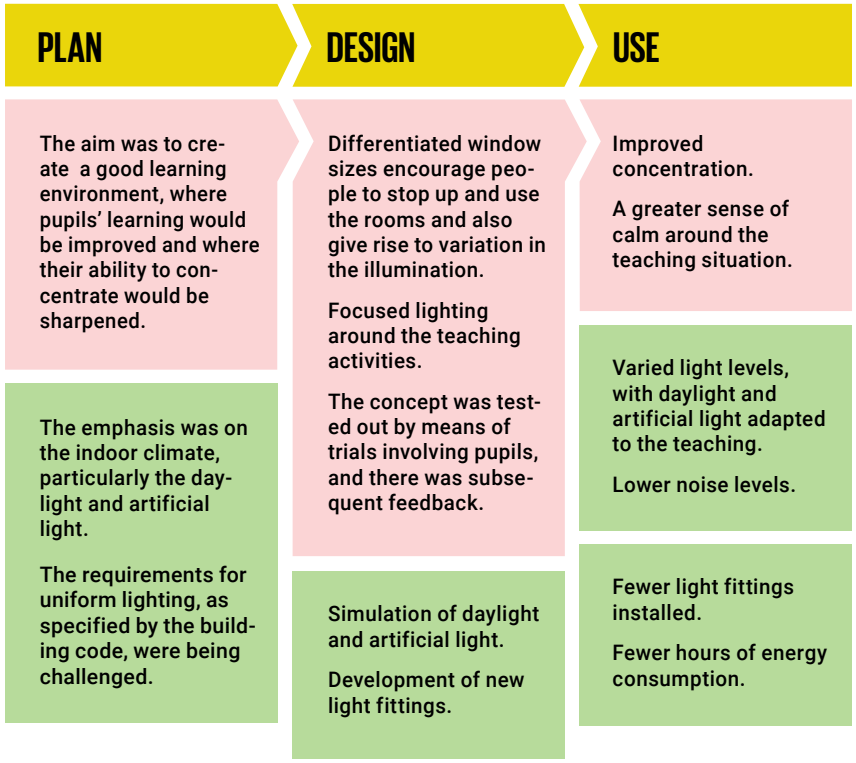
PRACTICAL EXAMPLE:
HENNING LARSEN ARCHITECTS

In the early phase of the design process, simulations were used to challenge the interaction between light and learning at Frederiksbjerg Skole. After the building was put into use, measurements and observations at the site have borne out that the light design is having a positive effect on pupils' behaviour and learning.

Light simulation as a business case

Focused light helps children to concentrate. Replacing industrial ceiling lights with pendant lights that centre the light, like the ones people have suspended over their dining room tables, has a significant effect on noise levels in classrooms. These were the findings of the research project at Frederiksbjerg Skole, created in collaboration between Henning Larsen Architects, gpp arkitekter, the municipality of Aarhus, Frederiksbjerg Skole, KADK, the Technical University of Denmark, Sweco, Aarhus University, Fagerhult and the Danish Centre of Educational Environment (DCUM).

By trying to understand pupils' needs, by means of light simulations and user tests during the early design phase, Henning Larsen Architects managed to develop a lighting design for Frederiksbjerg Skole that challenged the requirements for consistent lighting, as specified by the building codes. This unique design improves the pupils' concentration, reduces the number of light fittings and reduces the school's energy consumption.



Project	FREDERIKSBJERG SKOLE
Location	AARHUS
Completed in	2016
Developer	MUNICIPALITY OF AARHUS
Advisors to developer	COWI, SCHØNHERR, PLUSKONTORET
Architects	HENNING LARSEN ARCHITECTS, GPP ARKITEKTER, MØLLER & GRØNBORG
Engineers	NIRAS
Contractors	HOFFMANN A/S

Photo: Peter Nørby

The rules and regulations that we meet when it comes to artificial light have been created by people who manufacture light fittings. They tell us that we need lots of light, and that it must be evenly distributed everywhere. Here, we made two different tests.
We compared a room with constant illumination to one where the ceiling lights create "islands of light" above the tables. This means to say that this room is not compliant with the requirements in the building code. What we can see is that learning is improved when the lights are centred. We need fewer fittings and moreover, further materials can consequently be removed from the building, because we are also able to control the acoustics.

Jakob Strømann-Andersen
Henning Larsen Architects

PRACTICAL EXAMPLE: VANDKUNSTEN

The architectural firm Vandkunsten uses Life Cycle Costing (LCC) and Life Cycle Assessments (LCA) to understand design-related potentials of better resource management.

Internal value

Vandkunsten has been working in partnership with the Technical University of Denmark to develop an LCA tool as a plug-in to Revit, as well as working in partnership with SBi to develop a similar tool for LCC analysis. Both elements are part of a strategy centred on reinforcing the company's expertise and knowledge. These tools calculate environmental impact and costs for the entire service life of the building and they save time – what previously took a couple of weeks to calculate can now be performed within the office in just a few minutes. Life cycling costing analyses and life cycle assessments highlight the economic and environmental consequences of material- and design-choices and reinforce the practice's insight into the long-term implications of the building.

External value

LCA is used when the Client wants to minimise the environmental impact of a project in connection with obtaining a sustainability certification, for example, or because Clients or Users are working with corporate social responsibility. LCA turns the project's overall environmental impact, over its entire lifetime, into figures that can be used to calculate the carbon footprint of the building, for example. LCC is used to assess what solutions are most profitable in the long term when operation, maintenance and replacements are all taken into consideration. The analysis ensures that quality and the long-term consequences of solutions are being assessed as a single unit. Both LCA and LCC provide improved control over the economy and environmental costs, but they can also be used to document value creation in the form of significant improvements in resource efficiency.

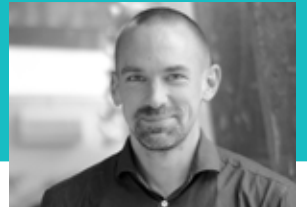
Why is it important to document value?
Søren Nielsen: "The value of any work has to be apparent. We are focusing on Users' everyday lives. You can supplement and you can argue in favour of the solution with Life Cycle Costing, but models and drawings are definitely absolutely a form of value creation documentation in themselves."

What external value is being added in relation to your Clients and collaborative partners?
Jan Kauschen: "When you minimise the environmental impact of the building, this gives the Client a specific and sellable narrative. You can turn this into numbers by using a life cycle costing assessment. In reality, Life Cycle Costing is economic risk management, and many Clients are interested in this. The interesting thing is that we are well aware of where the issues are seated in the design. There are 10-15 rules of thumb that we can extract from all the calculations we have performed. If we follow these, reduced environmental impacts and and lower life cycle costs will go hand-in-hand."

What internal value does this add to the practice?
Søren Nielsen: "We do things here because we think they are important. Sustainability is one of the cornerstones of what we are working with here at our studio."

Has it strengthened your business?
Søren Nielsen: "It's still not very common for Clients to ask us to carry out LCCs and LCAs, as stand-alone services. But as far as we are concerned, this is not where the value lies anyway. We are being awarded more assignments and we are creating better architecture because we can actually provide and supply this. I've calculated that the money we have invested in research and innovation has been recouped 25 times over."

Søren Nielsen
Vandkunsten
Partner, Arkitekt MAA



Jan Schipull Kauschen
Vandkunsten
Architect MAA, Ph.D.

DANMARKSHUSENE

RENTING PREMISES COMPARED WITH AVERAGE AFFORDABLE HOUSING ↓22%
RESOURCE CONSUMPTION ↓50%
CARBON FOOTPRINT ↓68%

We managed to create a really good neighbourhood because, in solidarity, we are looking after our area. People want to be kind to one another here because we share a common interest that is centred on our building. We feel it is ours. And in turn, this gives us more security and a better quality of life, because we are looking out for each other.

Jette Baker Jakobsen
Chair at Danmarkshusene.
KAB 2016

Photo: Stamers Kontor

PRACTICAL EXAMPLE: VANDKUNSTEN

Design for user-driven operation and maintenance is having significant social, environmental and economic benefits.

From concept to realised value

AlmenBolig+ is an affordable housing concept developed by KAB – a major Copenhagen affordable housing association - where the basic idea has to do with getting residents involved in the operation and the maintenance of their own buildings. The building has been created with prefabricated solutions, in order to ensure low construction costs and a high level of technical quality.

With Danmarkshusene, Vandkunsten is demonstrating that the concept can be implemented with markedly reduced life cycle costs which saves tenants more than 20% on their rent. The project's climate impact is also being reduced by 68% when compared to reference buildings, thanks to the architects' choice of materials – with good climate profiles, long service lives and plenty of opportunities for recycling. The specific design solutions give the residents the opportunity to adapt their apartments to suit their own needs and they also support the residents in their collective maintenance of the building. This enhances the sense of community and the feeling of co-ownership of their own public housing building. Moreover, satisfaction among the residents is running high and the incidence of people moving out is minimal.

Vandkunsten makes makes use of life cycle costing and life cycle assessments to highlight the building's value creation and to show that the extra money being spent on more expensive materials is insignificant when compared to the added value that is generated by using materials of higher aesthetic quality and with longer service lives.

PLAN	DESIGN	USE
Residents were encouraged to work together on future operation and maintenance.	Buildings and open spaces were designed so that the residents, working together, could run and maintain the building.	Working together on operational tasks brings about a sense of coherence, positive neighbourly relations, and a high level of satisfaction among the residents.
Low-energy construction. Focus on the indoor climate.	Materials and constructions were selected on the basis of experiences related to economy and environmental impact.	A life cycle cost assessment indicates that climate impact has been reduced by 68%, when compared to reference buildings.
Cheaper housing thanks to self-reliant operation and maintenance.	Design using prefabricated structural elements kept the price of construction down.	One consequence of the project's reduced life cycle costs is a 20% lower rent than average for affordable housing units of similar sizes.

Project	DANMARKSHUSENE
Location	RØDOVRE
Completed in	2014
Developer	BOLIGSELSKABET AKB RØDOVRE V. KAB
Advisors to developer	DOMINIA
Architects	VANDKUNSTEN
Engineers	SLOTH MØLLER
Contractors	GVL ENTREPRISE
Knowledge partners	ESBENSEN RÅDGIVENDE INGENIØRER, BM BYGGEINDUSTRI

> An LCC analysis can be quite an effective tool of persuasion. We use Life Cycle Costing to choose better materials and thus create better architecture.
> To us, this is value creation. We supply better building designs and in turn, we receive recognition, in the form of good references, which we can then use to obtain new assignments.

Søren Nielsen
Vandkunsten

Photo: Stamers Kontor

PRACTICAL EXAMPLE: SIGNAL ARKITEKTER

SIGNAL Arkitekter work with user data as the basis for their business model: optimising the use of space and buildings in ways that benefit the Users' and Clients' business performance.

Internal value

Since the company opened in 2000, SIGNAL Arkitekter has been using observation studies, interviews and questionnaires to analyse the needs of their clients. SIGNAL Arkitekter's analyses of space and behaviour, taken from several hundred projects, have been compiled into a database that SIGNAL Arkitekter draws upon for use in all of its assignments. By obtaining new information regularly and comparing it with existing data, SIGNAL Arkitekter is creating an evidence-based foundation for their design principles and solutions.

Not only is SIGNAL Arkitekter able to draw on its knowledge of clients' specific challenges. The studio is also able to implement solutions from similar types of projects – buildings that house educational, health and commercial services – with well-documented social and financial effects.

External value

Deploying user involvement throughout the entire advisory process gives Users, Clients and advisors insight into the specific needs that are to be met by the project. Formulating values and objectives collectively brings into effect a shared foundation for and understanding of the assignment. By testing design proposals and prototypes through playing and through practical application, Users have the opportunity to make their own mark on the solutions to meet their needs as widely as possible. The dialogue involved creates a sense of co-ownership of the project and a better understanding of the potential at the time that the project is put into use.

Why is it important to document value?
"At SIGNAL, we work with concepts so that we are always able to explain what we're doing, why we're doing it, with whom we're doing it, and what the outcome will likely be. We always describe what the objective is and how we create value in all our processes and throughout the course of our interim steps. After all, if we can't explain what we're doing and why, why should our clients buy advice from us?"

What external value is added in relation to your Clients and partners?
"As far as we're concerned, everything revolves around our Clients and Users. This is definitely a different way for architects to think. As architects, we've found ourselves in a difficult place because we were standing on the moon and speaking a language without communicating with the people who are eventually going to be the end users. What we're always emphasising in the SIGNAL model is the fact that users come first, and spaces are in second place."

What internal value does this add to the practice?
"When we turn up at sales meetings, we know our clients before they walk in the door because we have a vast knowledge of various industries, thanks to our data. That knowledge gives us a solid credibility at sales meetings. Clients can see that they've come to the right place at their very first meeting with us."

Has it strengthened your business?
"If you want to enter the building industry's food chain, you have to be able to process data. This means you need to introduce a systematic approach to the way in which you enquire about the client, and to your processes at the office. You've got to be clear about how to analyse your data and how to understand the user. It's all about being extremely analytical. User data and user relations are clearly an unexploited force in our branch."

Gitte Andersen
SIGNAL Group
Head of SIGNAL UK
Global Head of workplace Management & Design
Architect MAA, Construction Economist MDB

> Spaces are never neutral. They will always prevent or promote the relations and activities that we wish to succeed among people. That's why we need to take spaces seriously. Data makes a world of difference between believing and guessing, and thinking and knowing – and being able to document the whole thing.
>
> **SIGNAL Arkitekter 2017**
> Kloge Kvadratmeter

Photo: Kontraframe

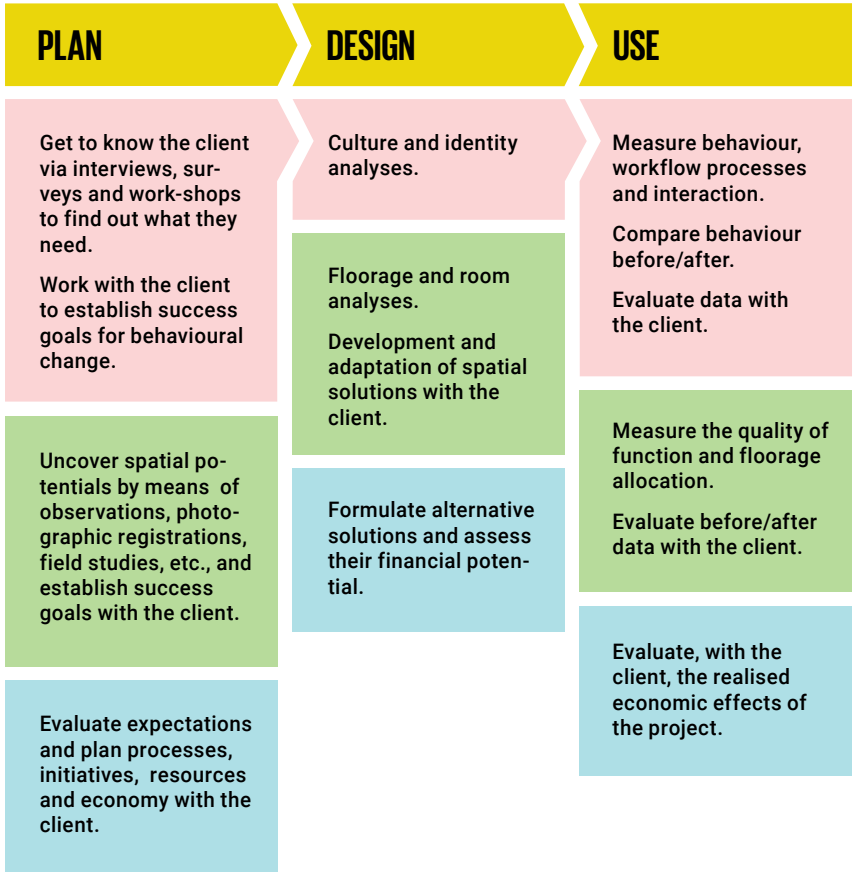
PRACTICAL EXAMPLE:
SIGNAL ARKITEKTER WITH SOCIAL DATA AT THE HEART OF THE BUSINESS

SIGNAL Arkitekter uses data as a strategic tool. The data is used to understand the needs and preferences of Users, when defining the assignment, and in specifying the values that you want to create.

Value creation based on data

SIGNAL Arkitekter focuses on creating value by means of planning and programming, and uses space as a tool in order to improve the performance of companies and organisations. SIGNAL Arkitekter maps out how spaces are used, and when and by whom, so that the drafting studio can point out untapped potentials, and create new links and collaborations between Users, or come up with suggestions for new arrangements and facilities, with better internal links and optimised use of floorage.

After one has teamed up with the client to describe the starting point for the assignment – a Baseline – and after one has defined the assignment's success criteria, it is possible to assess and compare how well the solutions are working throughout the entire process, with respect to the social and business-related parameters.



Data collection and design go hand-in-hand

By identifying both recognised and unrecognised needs, SIGNAL Arkitekter creates cultural and identity analyses in parallel with its design work. These analyses form the basis for programming, design and organisation of the physical framework, and contribute to concrete bids on functional allocations and spatial allocation. This allows floorage and workflow processes to be optimised to the greatest possible extent.

Most comprehensive collection of key indicators of space and behaviour in Denmark

The SIGNAL Arkitekter database is the result of several years of information-gathering and analysing data from studies of space and behaviour. These analyses serve to ensure innovative, future-proof solutions, since they provide an in-depth insight into SIGNAL's clients' unrecognised needs, untapped potentials and resources.

The process tool "10+1" is used to keep track of data. This tool includes custom-made methods and process descriptions for design, management, strategy development, workshops, identification of needs, communication, design and evaluations, and it has been developed in-house. The SIGNAL Benchmark department handles all of the internal data management and analysis.

> **Minimising the floorage used for fixed workstations and creating more variation makes it possible to make room for more shared facilities and free up funds that the client can invest in new activities, more staff, and innovation, etc.**
>
> **SIGNAL Arkitekter**

Project SKOVSKOLEN
Architect RØRBÆK OG MØLLER
Photo ADAM MØRK

Can architects afford a situation where Clients, Users and Community
fail to understand and recognise the value created by architecture,
simply because it is not being documented and rendered intelligible?
Documenting the value that architecture creates will offer major business potential.
Demonstrating tangible value will serve to provide the foundation for any business model
– including those of the Clients, the Users and the Community.

EXPERIENCES

NEW ROSENHØJ

Location	VIBY SYD, AARHUS
Completed in	2017
Developer	BOLIGFORENINGEN ÅRHUS OMEGN
Architects	EFFEKT ARKITEKTER, ARKITEMA ARCHITECTS
Engineers	VIGGO MADSEN
Contractors	ENEMÆRKE OG PETERSEN, VICOTEC KIRKEBJERG
Knowledge partners	CENTRE FOR SPORTS AND ARCHITECTURE, URGENT.AGENCY

RESIDENTS FEELING INSECURE ↓50%
TRUST IN NEIGHBOURS ↑37%
YOUNG PEOPLE WHO HAVE DROPPED OUT OF SCHOOL ↓62%
ADULTS OUT OF WORK ↓19%
PEOPLE MOVING OUT ↓2,7%

PLAN

Boligforeningen Århus Omegn wanted to re-vitalise the socially deprived residential area of Rosenhøj by making physical changes in collaboration with the residents, the housing association, the Clients and the consultants.

A number of studies bore out that the area was marked by a prevailing sense of insecurity and social challenges, among these being unrest and rampant unemployment.

The housing association focused in particular on democracy among the residents, involving residents in workshops and workgroups. This gave rise to an unprecedented degree of commitment and a sense of ownership about the remodelling project.

DESIGN

EFFEKT Arkitekter and Arkitema Architects won the architectural design competition to revive the area with a master plan that involved demolishing some of the buildings in order to create better links to surrounding urban areas.

A number of new housing types with mixed kinds of ownership were introduced. This helped to make the area more manageable and punctured the monotony of the uniform residential blocks.

New and inviting play areas and landscaping were laid out.

The homes were renovated so as to comply with current standards.

The housing company made great efforts to persuade the contractors working on the job to set up apprenticeships for unemployed residents during the construction period. This served concomitantly to reduce the number of conflicts during this time. More of the residents subsequently found jobs with contractors.

USE

The building design was evaluated thoroughly.

The combined strategy – involving physical changes, democracy for residents and employment in the construction process – has entailed that security has increased significantly.

Employment and the number of young people sticking with education have risen.

Photo: EFFEKT Arkitekter

SEB BANK

Location	COPENHAGEN
Completed in	2010
Developer	SEB EJENDOMME
Advisors to developer	EMCON
Architect	LUNDGAARD & TRANBERG ARKITEKTER
Landscape	SLA
Engineers	RAMBØLL
Contractors	E. PIHL & SØN, MJ ERIKSEN, BRØNDUM, LINDPRO
Knowledge partners	FINN REINBOTHE

BRANDING & PUBLICITY ↑
ATTRACTIVE PLACE TO WORK ↑
MOTIVATION & COMMITMENT ↑
RECRUITMENT PROCESS FACILITATED ✓
CUSTOMER ACCESS & NEW ENQUIRIES ↑
ENERGY CONSUMPTION DOWN 20%
BIODIVERSITY ↑
CHILDREN & YOUNG SKATERS OCCUPYING AND USING URBAN SPACE ✓

PLAN

SEB wanted to gather all its employees in one place in order to effectuate synergy, internally, within the concern.

The site on which SEB Bank was constructed was configured as an entrance to an urban park in the planning of urban development in the area carried out by the municipality of Copenhagen.

DESIGN

The two firms, Lundgaard & Tranberg and SLA, won the architectural design competition for development of the area. Their proposal included a hilly landscape that could serve to coalesce two sinuous office buildings and form a link to the urban park, which is elevated 7 metres above ground level.

The sinuous design entails that all work stations have a view over the city and the harbour area, and gives rise to a sense of intimacy and clarity.

An atrium in the largest building spawns a visual link between the various floors.

The landscape in between the buildings guarantees accessibility and invites pedestrians into the urban park.

SLA introduced biodiversity and climate adaptation solutions to their design that went beyond the requirements defined for the area by the municipality of Copenhagen.

USE

SEB is using the building as a distinctive visual marks just as much as it's using its logo.

The landscape between the buildings is a popular meeting place for young skaters.

The climate solutions came to provide a role model and a point of reference for the municipality of Copenhagen's subsequent climate protection initiative.

The buildings won several awards and received more than 500 positive mentions in the press in the first year.

The readily recognisable architecture creates financial value, due to increased awareness and the branding of SEB.

SEB's leasing of offices is improved, and an increase in customer enquiries has been registered.

Photo: Adam Mørk

SØNÆS

Location	VIBORG
Completed in	2015
Developer	MUNICIPALITY OF VIBORG, ENERGI VIBORG
Architect	MØLLER & GRØNBORG
Engineers	ORBICON
Contractors	SVEND E. MADSEN
Knowledge partners	LOKALE OG ANLÆGSFONDEN, REALDANIA, DANISH NATURE AGENCY, VANDPLUS

POPULARITY ↑ FACTOR 20
CYCLING ↑ FACTOR 15
INTEREST IN HOMES ↑
EXPENSES INVOLVING CLAIMS ↓
100-YEAR RAIN EVENT ✓

PLAN

Sønæs transformed an existing recreation area into a recreational water landscape in order to protect the adjacent urban areas from flooding in the event of extreme rainfall.

DESIGN

The facility has been designed so as to offer a wide range of experiences and activities based on water. Among other things, schoolchildren can obtain information about the water cycle.

USE

Sønæs has resulted in a major boost when it comes to the attractiveness of recreational areas in the landscape of Viborg Syd.

The project protects the district from flooding.

It has been possible to implement the combined solution for climate protection and recreational areas at no additional cost, and with the added benefit of a great deal of recreational amenity value.

Real estate agents are calling attention to Sønæs in their marketing of homes in the area.

Photo: Carsten Ingemann

SOLHUSET

Location	HØRSHOLM
Completed in	2011
Developer	MUNICIPALITY OF HØRSHOLM
Architects	CHRISTENSEN & CO, KRAGHGBERGLUND LANDSKABSARKITEKTUR & URBAN DESIGN
Engineers	RAMBØLL
Contractors	HELLERUP BYG
Knowledge partners	VELUX, LIONS BØRNEHUSE, VKR HOLDING

CARBON NEUTRAL 100%
SELF-SUFFICIENT IN TERMS OF ENERGY 100%
HYPO-ALLERGENIC ✔

PLAN

The ambitions with Solhuset were to introduce new standards in climate solutions and to create a nursery school that supports the children's well-being and development through programmatic interaction with nature.

DESIGN

The building has been designed with an emphasis on daylight and the indoor climate so as to support the children's development as effectively as possible.

Materials and constructions have been selected so as to provide the best possible support for the vision of providing a positive contribution to the environment.

The simulation of daylight, energy consumption, air quality and ventilation was used for resource and energy optimisation and for reducing the carbon footprint.

USE

Evaluation of energy consumption and indoor climate during operation.

The building has served as living laboratory and a pilot project for technical indoor climate solutions.

Photo: Adam Mørk

UPCYCLE HOUSE

Location	NYBORG
Completed in	2013
Developer	REALDANIA BY OG BYG
Architect	LENDAGER GROUP
Engineers	MOE
Contractors	EGEN VINDING & DATTER, MAKVÄRKET
Knowledge partners	SBI, AALBORG UNIVERSITY, TECHNICAL UNIVERSITY OF DENMARK, ET AL.

CARBON FOOTPRINT ↓ 86%
MATERIALS THAT CAN BE RECYCLED 100%
UPCYCLING 100%
ORGANIC MATERIALS 90%

PLAN

Upcycle House is one of a number of demo buildings created as part of the Realdania development project 'Mini-CO2-buildings'.

These buildings have been constructed in order to test out the possibilities offered by various design principles for reducing the carbon footprint of single-family homes.

Upcycle House shows principles for how to work with recycling in architecture.

DESIGN

Lendager Group works with circular economy principles in their architecture.

All materials were completely or partially made from recycled materials, and strategies were devised to ensure that the materials could come to be included in new recycling processes when their service lives in the building have come to an end.

LCA was used actively during the design process in the context of a collaboration between the architects and the engineers around minimising the carbon footprint and resource optimisation, through recycling and upcycling of materials.

USE

The environmental impact – including CO2 savings – of all Mini-CO2 buildings has been calculated.

Upcycle House reduces the carbon footprint by 86%, when compared to a typical single family home reference building.

Photo: Jesper Ray

HERNING LIBRARY

Location	HERNING
Completed in	2014
Developer	MUNICIPALITY OF HERNING
Architect	ARKITEKTFIRMA KRISTIAN H. NIELSEN, GPP ARKITEKTER
Engineers	RAMBØLL
Contractors	CC CONTRACTOR
Knowledge partners	LAMMHULT BIBLIOTEKSDESIGN, EXHAUSTO

↑ VISITOR NUMBERS MORE THAN TRIPLED
↓ CARBON FOOTPRINT, INVOLVING RECYCLING
↓ ENERGY CONSUMPTION BY MEANS OF LIGHTING & VENTILATION

PLAN	DESIGN	USE
At Herning Library, a former department store in this city has been repurposed and retrofitted, retaining the original building's concrete structure. The project aimed at bringing forth a cultural meeting point that would benefit from the pedestrianized area and create new connections to the rest of Herning.	Resource optimisation through the re-use of the concrete structure. Reduction of energy consumption by means of LED lighting and heat recovery.	Reduced carbon footprint by means of energy optimisation and the re-use of an existing building. Visitor numbers to the libraries of Herning tripled after the newly renovated building's opening, mainly at the new facility.

Photo: Carsten Ingemann

CYKELSLANGEN

Location	COPENHAGEN
Completed in	2014
Developer	MUNICIPALITY OF COPENHAGEN
Advisors to developer	DISSING+WEITLING ARCHITECTURE
Architects	DISSING+WEITLING ARCHITECTURE
Landscape architect	MARIANNE LEVINSEN LANDSKAB
Engineers	RAMBØLL
Colour scheme	MALENE BACH
Knowledge partners	LIGHTCONSTRUCTOR

CYCLING TRAFFIC 2014 ↑25%
CYCLING TRAFFIC 2014-2016 ↑80%
BRANDING VALUE FOR COPENHAGEN AS A CITY FOR CYCLISTS ↑
ESTIMATED ADDED VALUE FOR THE COMMUNITY ↑ 5 MILLION DKK

PLAN

Cykelslangen was an infrastructural investment that aimed to save time for people who are commuting by bicycle, while also making cycling safer.

DESIGN

DISSING+WEITLING ARCHITECTURE designed the bridge as a steel structure that could be constructed with a varied line sequence. This served to ensure a delightful and safe cycling route with reasonable construction costs.

USE

Cykelslangen attracted a great deal of international media attention and has become an international icon that brands Copenhagen as a city for cyclists.

The value of the media publicity has not been calculated, but a survey from Wonderful Copenhagen shows that the cycling culture was one of the three most important reasons for choosing Copenhagen as a place to visit, according to more than half of the tourists who were being asked.

Cykelslangen saves commuters more than DKK 5 million worth of precious time each year.

Photo: Rasmus Hjortshøj

PLUG N PLAY

Location	ØRESTAD, COPENHAGEN
Completed in	2009
Developer	BY & HAVN
Architect	KRAGH&BERGLUND LANDSKABSARKITEKTUR & URBAN DESIGN
Engineers	LEMMING & ERIKSSON, FRI
Contractors	NCC
Knowledge partners	NATIONAL OLYMPIC COMMITTEE AND SPORTS CONFEDERATION OF DENMARK, LOKALE OG ANLÆGSFONDEN, MUNICIPALITY OF COPENHAGEN, TEAM JIYO, NORDEA FONDEN

IMPROVES THE IMAGE AND THE DEVELOPMENT OF THE AREA ↑
ESTIMATED MEDIA VALUE ↑2.6 MILLION DKK

PLAN

Plug N Play was established as a temporary urban park with the aim of stimulating more urban life in Ørestad, improving the image of this district, and consequently making it more attractive to citizens and

DESIGN

The park offers a wide range of free facilities designed to encourage activity and motion and designed to encourage spending time in the park.

Kragh & Berglund designed the urban park so that it could be adapted over time, or even moved someplace else, eventually, at minimal cost.

USE

A media analysis carried out by Infomedia spotlighted 121 positive mentions of Plug N Play in Ørestad Syd in the printed and digital media. This has generated a media value of around DKK 2.6 million.

An evaluation of Plug N Play by Lokale og Anlægsfonden showed that this urban park has given a real lift to visitors' perception of Ørestad, and that the investment in the urban park is profitable in socio-economic terms.

Photo: Kragh&Berglund Landskabsarkitektur & Urban Design

NR. VIUM SKOLE

Location	NO. VIUM, VIDEBÆK
Completed in	2016
Developer	NO. VIUM SPORTS- OG KULTURCENTER
Architect	ERIK BRANDT DAM ARKITEKTER, CORNELIUS VÖGE
Engineers	INGENIØRGRUPPEN VESTJYLLAND
Colour scheme	MALENE BACH

GATHERING TOGETHER OF LOCAL COMMUNITIES ✔
CREATES A FRAME FOR LEISURE & CULTURE IN THE PARISH ✔
COUPLING OF DAYCARE CENTRE, YOUTH CLUB, SPORTS FACILITIES, A COMMUNITY CENTRE, AND OFFICE SPACE ✔

PLAN	DESIGN	USE
Development of the building programme received local support. When the school was forced to shut its doors as a school, the residents got together to purchase the building and to plan for its future. In collaboration with the architects, the local politicians and the institution itself, the building programme was further developed.	Equal cooperation was emphasised throughout the design process – among the residents, the institution and the architects alike. The involvement of artists and local businesses further anchored the project in the community.	Readapting the disbanded school into a multifunctional community space is a tangible reminder of the achievements of the local community, all of which led the project towards being awarded the RENOVER prize.
	Recycling of materials, retrofitted insulation of roof and external facades. Selective demolition of existing building parts.	Reduced expenses in heating due to a reduction in the building mass, retrofitted insulation and new energy-friendly installations.

Photo: Laura Stamer

Project KLIMATILPASNING KOKKEDAL
Architect SCHØNHERR
Photo CARSTEN INGEMANN

GLOSSARY

Returns: Financial earnings on an investment. Total revenues minus total expenses.

Construction costs: The total cost of the construction of a building, not counting operation and maintenance.

Baseline: A reference value, e.g. measuring the state before a change process is initiated.

BIM – Building Information Model: A digital building model with linked object attributes. BIM is also used as a verb meaning 'modelling digitally'.

Users: The people who are most frequently using or spending time in the building. These can generally be split into several 'user types': for example, at an educational institution, students, teaching staff, management and technical personnel.

Client: The key decision-making person or group of people owning and investing in a project, responsible for paying the architect and the construction team. This may frequently be a constellation of multiple stakeholders, such as project developers, investors and user organisations.

Design simulation: The use of digital models to simulate the properties of a project before it is built to optimise its performance, e.g. studying the physical qualities such as indoor climate and energy consumption. The term can also be used to describe analogue models that are tested in use.

Impact measurements: Comparative measurements of a predefined success parameter before and after the implementation of a change process.

Evidence-based design principles: Research-based design principles with well-documented social, environmental and/or financial effects.

Business model: A description of gains to be made by implementing an initiative/activity, with an estimate of the revenues and expenses that this may bring forth for a company and its clients.

Stakeholders: Everyone affected by the implementation of a project and that might have an interest in influencing it.

Stakeholder analysis: A systematic assessment of who is affected by a project, what interests and preferences they may have with respect to the project, and the advantages and disadvantages of the project for the various stakeholders. In practice, this requires an assessment of which stakeholders are to be involved in the project and designating representatives for them.

Interview: A dialogue-based survey that is used to identify social and cultural motivations, experiences, attitudes and intentions. Very helpful for finding reasons for and patterns in social and cultural behaviour.

Short-term money: An expression describing investors with a short investment horizon, such as property developers who are building for project sales but are not involved in operation and maintenance.

Long-term money: An expression describing investors with a longer investment horizon, such as pension funds that build with longer periods of ownership, operation and maintenance in mind.

LCC: Life Cycle Costing, an assessment of the overall costs of a building or a building component over its lifetime, including the maintenance and replacement of parts. LCC integrates net present value calculations of future expenses associated with building ownership and tenancy.

LCA – Life Cycle Assessment: An overall assessment of the environmental impact of a building or product over its life cycle, from production, use and maintenance to disposal or recycling. Databases are used to calculate the environmental impacts of the construction and the use of buildings.

Media value: The value of media coverage, assessed in terms of what similar coverage would have cost had it been paid advertising.

Added value: In classic financial terms, the difference between the sales price and the cost of producing a product. This term is also used frequently to refer to extended functionality or amenity value that distinguishes a product on the market.

Environmental measurements and simulations: Methods used to describe the physical, environmental attributes of a building and relate these to functional, experience-related qualities.

Net present value: Calculation of todays' value of a future cost or revenue stream. Compensates for the fact that future costs and revenues are typically not weighted as heavily as current costs and revenues.

Observation studies: Methodical study of behaviour, social and cultural patterns and their links to the physical environments within which they are unfolded.

Community: An organised society on a larger or smaller scale, such as a local community, nation or global community. In stakeholder analyses, the community is usually represented as a group of stakeholders that includes neighbours, owners' guilds, municipalities, etc. These stakeholders' interests are often formalised in regulations and local planning.

Questionnaires: A method well suited to measuring values based on experiences and attitudes: expressed, for example, as degrees of satisfaction/dissatisfaction with an experience or the extent to which the respondents agree/disagree with a statement concerning value.

Successive calculation: Calculation of construction costs that gradually becomes more precise as more details are decided upon and implemented within a project.

Total value: An economic valuation of the most significant advantages and disadvantages of a project over its lifetime, including social and environmental factors. Uses qualitative descriptions of effects that cannot adequately be described in economic terms.

Life Cycle Costing: See LCC

Universal design: A understanding of design that focuses on bringing about accessibility and equal opportunities for everyone, regardless of age and abilities.

VDC – Virtual Design & Construction: An expression referring to the use of BIM – Building Information Modelling – to design, simulate and control architectural projects and construction processes, especially in economic terms.

Value creation: The use of creative thinking and design to create new products, environments and activities that generate as much value as possible, value that is perceived by as many stakeholders as possible, with wise and responsible use of resources – ideally viewed in the light of a global perspective.

YOUR LEARNING CONTINUES HERE

More information and background material related to the individual cases can be found under the 'Architecture creates value' tab at **www.danskeark.dk**, and on the websites of the various architectural firms presented there. .

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Value is created by people working together – let's never forget that. Architects don't work alone, although we'd love to boast about their achievements here. Outstanding architecture would be impossible without Clients who harbour a desire and an ambition to create value for Users and Community.

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We'd like to have made room for more businesses and cases, but you'll have to have a look at the collection of examples entitled 'Architecture creates value' on our website – www.danskeark.dk – if you'd like to know more. We're keen to share our experiences with an international audience and would love to know more about your experiences, cases and stories

Peter Andreas Sattrup

How does architecture create value?

How do we create the most value by making the best possible use of the resources invested in the built environment?
How can we go on adapting our surroundings to support the needs of people and businesses – needs that are constantly changing?
What solutions create the most value? How can we reduce our consumption of resources? How can we build sustainably
– socially, environmentally, economically and aesthetically?
Being significantly more precise when it comes to how architecture creates value presents us with a challenge.
But it also presents us with a major potential to sharpen our skills when working out how these values can be assessed, measured,
and passed on in a way that give resonance beyond the architectural profession.
This book is a guide to how architects and the many stakeholders of their projects can create value and document it. The book presents
an introduction to a set of methods that will allow and inspire you to get started reaping the knowledge of what really works,
and turning it into business for you and the people you work with. The social, environmental and economic effects of architecture
may be surprisingly distinctive, as you will see from the many cases in ARCHITECT – document your value creation.

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