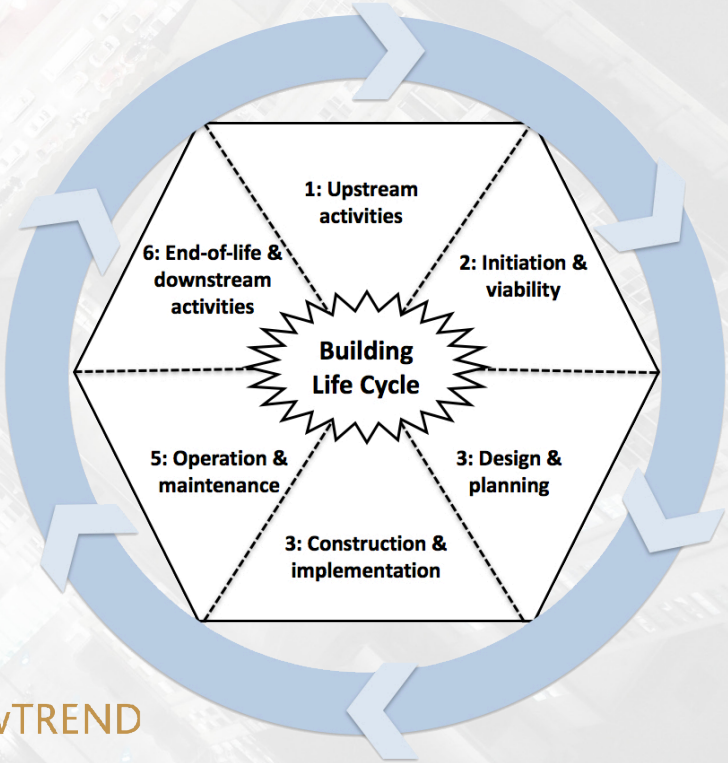
Value chain & design process in an IDP framework

Booklet 1



NewTREND

NewTREND, Booklet 1:

Value chain & design process in an IDP framework.

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Published August 2017

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1. Summary

As the major goal of NewTREND is to support the integrated design process (IDP), the involvement of stakeholders was targeted from the beginning of the project. To get their full profile, the stakeholders involved in the demo retrofitting projects were described and analysed.

Occupants' involvement in the IDP is supported by activities focusing specifically on their habit and user preferences. As an outcome, stakeholders' requirements were collected along with the usage pattern of buildings and districts. Based on this analysis, the design priorities and benchmarks could be defined and the legally binding energy efficiency requirements collected. To obtain this result three main previous actions were performed:

- in-depth analysis of the value chain associated with building refurbishment, at both individual building and district scales. Utilising the Hubs of Activity model developed within the UMBRELLA FP7 project and building on previous work characterising construction value chains, relevant actors were identified and characterised. Information on interactions within the value chains were collected from actors by means of semistructured face-to-face interviews and thematic analysis of resultant transcripts. The information obtained were used to describe and map the interactions of actors within the value chain and to ascertain the interests, drivers and motivations that influence their activities.
- analysis of the design process as it is currently formulated in building refurbishment (including energy retrofit) projects at both the level of individual buildings and in the context of district neighbourhoods. This analysis allowed the identification of current bottlenecks not only limited to the design phase of the refurbishment intervention but also in a larger framework of the whole life cycle of the building. The idea behind the analysis was to understand how an efficient design phase could positively impact on the subsequent management and operation of the building/district, as well as on its final performances. A combination of quantitative and qualitative data collection methods was used in this analysis.
- development of mechanisms to include building inhabitants and users in the design process, through a collaborative design system, comprising a pre-design facilitated multi-session 'community charrette' process and periodic and postoccupancy review workshops.

The VALUE CHAIN

2. Analysis of the value chain

The aim of Task 1.1 was to provide an in-depth analysis of the value chain(s) associated with building refurbishment, both at the individual building level, and in the context of the wider district. The research involved an in-depth engagement with 54 stakeholders associated with energy retrofit and refurbishment projects across several countries within the EU. Information on interactions within the value chain(s) was collected from these stakeholders in the form of semi-structured interviews and thematic analysis of the resultant transcripts. The information obtained by this qualitative analysis was used to describe and map the interactions of stakeholders within the value chain and to ascertain the interests, drivers and motivations that influence their activities. The work built on the Hubs of Activity model developed within the UMBRELLA FP7 project1, which provides a theoretical framework within which relevant stakeholders in building retrofit projects can be identified and characterised. Specific attention was also dedicated to the role of occupants and users in order to understand their specific needs and priorities, and ascertain how to involve them in the design of the refurbishment.

2.1 Theoretical Background

This section introduces the key concepts which informed the research, in particular those of 'value' and 'stakeholders'. Value theories refer to a wide range of approaches to understanding how or why people value things, ideas, or other people. Stakeholders are all those individuals or groups that can affect or are affected by a project or by the achievement of an organisation's objectives. It also outlines the 'Hubs of Activity' model, which provides a way of breaking down a refurbishment project into its various stages and assessing the interactions of stakeholders in each stage and how they contribute to generating value. Finally, we introduce the concept of 'participatory design' as a model for incorporating the needs and interests of building occupants and users in the design of a refurbishment

1 see http://www.umbrella-project.eu/

2.1.1 Value Theory

The concept of value chains and value chain analysis became prominent in business management literature in the 1980s. Porter's conception of the value chain provides a model for 'systematically examining all the activities a firm performs and how they interact' [1]. According to Porter, the 'Value Chain' concept 'divides an organization into the conceptually distinct activities it requires to do business. These activities create value, for which buyers are willing to pay. If the value exceeds the costs required to maintain activities, the organization is profitable. Thus, effective Value Chains generate profits' [3]. The value chain concept involves looking at construction as a system made up of subsystems, each of which has its own inputs, transformation processes and outputs involving the acquisition and consumption of resources [4]. How various benefits are distributed across the value chain depends to a large degree on the balance of power between suppliers and manufacturers [5].

Porter and Kramer subsequently updated the concept of the value chain to include what they called 'shared value creation'. This means value that is mutually beneficial to both the value chain and society [6]. It reflects a growing realization that a narrow focus on efficiency may result in reducing waste and costs but is unlikely to create any additional value [7]. Consequently, 'there is growing interest in looking beyond internal economic costs and benefits to investigate why and how to incorporate broader societal costs and benefits in ways which contribute to long term (sustainable) competitive advantage' [7].

2.1.2 Stakeholder Theory

Stakeholder theory concerns itself with the management and treatment of stakeholders by a business entity. Freeman describes a business as 'a set of relationships among groups which have a stake in the activities that make up the business. Business is about how customers, suppliers, employees, financiers (stockholders, bondholders, banks, etc.), communities and managers interact and create value' [8].

There are numerous definitions of stakeholders, and they are for the most part definitions from a corporate point of view. The most frequently cited definition is Freeman's, which defined a stakeholder as: 'any group or individual who can affect or is affected by the achievement of the organization's objectives' [9]. In addition to this, according to Freeman, 'the stakeholder approach is about groups and individuals who can affect the organization, and it is about managerial behaviour taken in response to those groups and individuals'. It is worth noting that the term 'stakeholder' is not synonymous with 'actor', as that would imply that all stakeholders actively participate in the project, whereas in reality some stakeholders are active, while others are passive.

The objectives of stakeholder theory are to consider the needs and impacts of various stakeholders [10], and to understand how value is created and traded [11]. The stakes for each stakeholder group are multi-faceted, and inherently connected to each other: 'no stakeholder stands alone in the process of value creation' [8].

Stakeholder theory can also be applied to projects, including construction projects. The construction industry is both firm and project oriented [12]. Projects by their nature are one-off occurrences. Construction projects involve networks or constellations of persons, or groups of persons, who are involved for a finite period of time and for a specific purpose. Design and construction teams are generally temporary multi-firm configurations, or TMFCs [13] that have been assembled for the purpose of a particular project. In the case of a project, such as a building refurbishment, the stakeholders are issue-focussed, and more likely to be part of, or in some way associated with a multi-stakeholder network, as opposed to an organization-focussed corporate situation [14]. Participation is often voluntary and engagement is often deliberative and collaborative.

However, many stakeholders in these networks tend to go unnoticed. In all types of Project Management (PM), including construction project management, stakeholder identification and management is now recognised as crucial to success. Integrating stakeholder knowledge adds flexibility to social-ecological systems because it reduces rigidity, represents multiple perspectives, produces different types of value and promotes adaptability in decision-making.

2.1.3 Hubs of Activity Model (HoA Model)

In seeking to identify the stakeholders in an energy retrofit and understand their relationships, it is helpful to break down the project into generic stages and distinguish the activities that take place during each stage. This is the purpose of the 'Hubs of Activity' model developed as part of the UMBRELLA FP7 project. Drawing on a broad-based review of the literature, including approximately twenty different models of the building life cycle, Dunphy et al. identified six stages in the life cycle of a generic building [13].

Although the stages are labelled one to six, this does not mean that they are intended to be strictly linear and chronological. Over its entire lifecycle a building may move forward and backward through the stages several times. A building can be designed, built, occupied, sold, then later redesigned,

extended, refurbished, reoccupied and so on. For any given construction project, life cycle impacts are also highly inter-dependent, as one phase can influence one or more of the others.

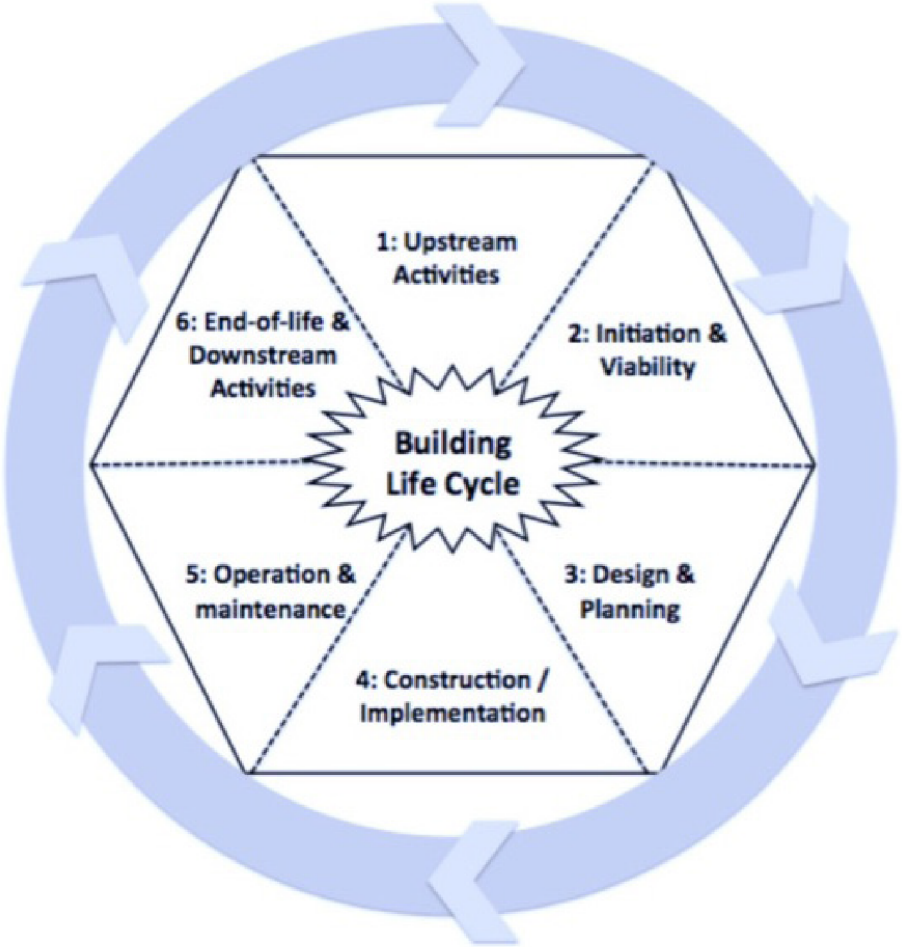

Figure 1 : The Umbrella Hubs of Activity Six-Stage Model of the Lifecycle of a Building [13]

Categorising activities into Hubs of Activity in this manner assists in the identification of key stakeholders. It also provides a framework for the analysis of stakeholder relationships, power flows, drivers, conflicts, and potential synergies. It is important to recognise that different stakeholders will have different ideas of what they require out of a project and of what constitutes success. These will depend on their individual concepts of value, as well as the characteristics of the particular project. The table below provides a list of potential stakeholders in a generic energy retrofit project.

Table 1: Typical Energy Efficiency Retrofit stakeholders associated with Hubs of Activities

Hub of Activity	Key stakeholders	Other stakeholders
Stage 1: Upstream activities	Manufacturers; Policy Makers; Legislators; Statutory Regulators; Investors	Primary Producers; Material Processors; Financiers; Standard Bodies; R&D Institutions; Retailers and Distributors; Logistics; End-users.
Stage 2: Initiation & viability check	Owners; Investors; Solution Providers; Designers	Occupants / Tenants; End Users; NGOs; Neighbours; Municipalities; Insurance Companies; Utility Companies; Financiers; Policy Makers, Legislators; Public
Stage 3: Design & planning	Designers; Owners; Project Managers; Investors; Solution Providers; Planning Authorities; Building control	Occupants; Public; NGOs; Neighbours; Financiers; Third Party Product Certification; Infrastructure providers / Utility companies
Stage 4: Construction and/or installation	Designers; Owners; Project Managers; Neighbours; Solution Providers	Occupants; Public; NGOs; Investors; Infrastructure providers; utility companies; Policy Makers; Legislators; Financiers
Stage 5: Operation and maintenance	Owners; Users; Occupants; Neighbours;	Designers; Investors; Solution Providers; R&D Institutions; Public; NGOs; Infrastructure providers; Utility companies; Financiers; Retailers and Distributors; Logistics
Stage 6: End of life and downstream activities	Owner; Planning Authorities; Waste Authorities; Local Government	Environmental Protection Agencies; Service Providers; Contractors; Public; Retailers and Distributors; NGOs; Infrastructure providers; Utility companies.

This is not an exhaustive list, since stakeholder groups have been summarised and classified broadly in order to encompass as many potential stakeholders as possible. Particular care must be taken in attempting to identify informal stakeholder positions, which are likely to occur on a case-by-case basis in individual projects e.g., a local protest group consisting of persons not otherwise connected who have been brought together by their common opposition to a proposed project. These groups are certainly not homogenous; they may span a broad array of demographics (gender, age, income, education, etc.), and will have varying attitudes and beliefs on other topics.For the purposes of this report, the first and last stages of the HoA model – upstream activities such as the mining and extraction of raw materials, and downstream activities such as recycling and incineration were felt to be not relevant and so were not included in the analysis.

2.1.4 Stakeholder Salience

Stakeholder salience involves determining the respective levels of influence or authority over a project which should be assigned to different stakeholders. Fassin states that two very important stakeholder traits are influence and power [10]. Stakeholders are often mapped on a 4 x 4 grid relating their level of power (or influence) and interest (or stake). This indicates the degree to which the project manager should attend to them – whether they should be merely kept informed of progress on an intermittent basis, or have a key role in decision-making.

Mitchell et al. extend this typology to cover three traits – power, legitimacy and urgency – describing stakeholder salience as the degree to which managers give priority to competing stakeholder claims. A stakeholder is said to be powerful if they can get another stakeholder to do something that they would not have done otherwise [15]. Powerful stakeholders may appear dormant; however, they can greatly affect the outcome of a project if they so wish.

The legitimacy of a stakeholder is a little more difficult to define; however, it can be approximated as a stakeholder that is recognised socially or morally as having rights or a claim to influence the project. For example, the occupants of a building do not own it, but – depending on moral, social and cultural circumstances – they would be considered to have certain rights. These can therefore be considered discretionary stakeholders.

There are also stakeholders whose claims are urgent and require immediate action, compelling a response due to the nature of a project or a time limitation. They are termed 'demanding' stakeholders.

Crucially, these stakeholder attributes are variable; they can change over time and they are socially constructed. In addition, stakeholders may possess more than one of these attributes at any given time [15]. Based on three overall attributes – power, legitimacy and urgency – it is possible to identify seven different categories of stakeholder, as indicated in Figure 2 below. Only one class of stakeholders possess all three attributes, and these are the 'definitive stakeholders' in a project or project phase.

- Dormant stakeholders (power);
- Discretionary stakeholders (legitimacy);
- Demanding stakeholders (urgency);
- Dominant stakeholders (power + legitimacy);
- Dangerous stakeholders (power + urgency);
- Dependent stakeholders (legitimacy + urgency);
- Definitive stakeholders (power + legitimacy + urgency).

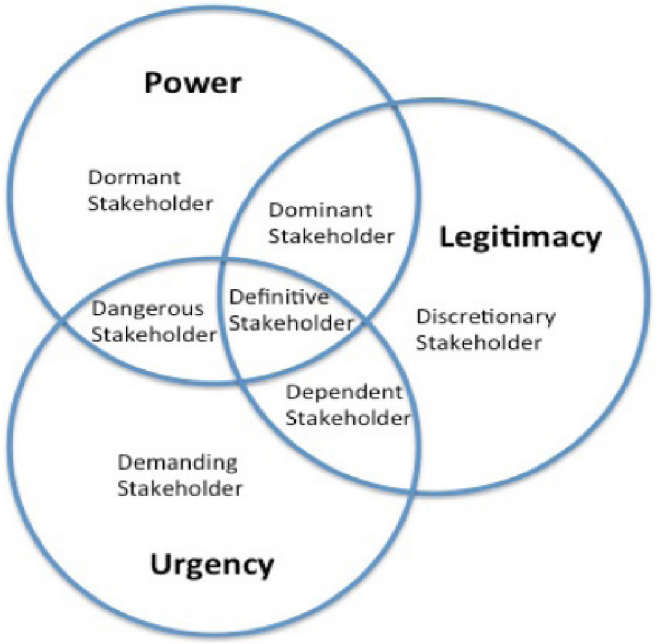

Figure 2: Stakeholder Typology [15]

This typology can be used to tease out the differential relationships of stakeholders to a building project, assessing the different levels of power they exercise and the legitimacy and urgency of their claims. Consequently, it provides a valuable tool for the mapping of stakeholder interactions within the value chain of energy efficient buildings.

2.1.5 Participatory Design

Participatory design refers to a family of approaches that attempt to widen participation in design and integrate the perspectives of end-users in the design process. Participation in this context is not just a matter of consultation or conducting research into end-users' habits or opinions. It involves a fundamental transformation of the user's role 'from being merely informants to being legitimate and acknowledged participants in the design process' [16].

Participatory design therefore promotes the active involvement of stakeholders, such as citizens, employees, customers and end users, who are not usually afforded a central role in the design process [17]. Robertson & Simonsen describe it as comprising 'the direct involvement of people in the co-design of tools, products, environments, businesses, and social institutions' [18]. They see the participatory design approach as 'a process of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants' [16]. Users move from being passive informants to having an active design role that is acknowledged by other stakeholders as both legitimate and valuable [16]. They are recognised as experts on their own experience, and consequently play a large role in offering knowledge, generating ideas and in concept development [19]. The design professional supports the user by providing tools for ideation and expression. Participatory design is therefore a two-way process of mutual learning for both designers and users [16].

2.1.6 Research

The research for T1.1 adopted a qualitative approach, aiming to provide an inside view of the relationships between stakeholders and their interests, drivers and motivations. Information on stakeholder interactions and value chains involved in building energy renovation was collected through 54 interviews carried out with individuals with experience in refurbishment projects in a variety of European countries. Semi-structured interviews using pre-formed open-ended questions were adopted as the most suitable method, given that interviewees came from across Europe and there would be only one opportunity to talk to each of them. The questions focused on four areas:

- Professional background of the interviewee and detail of a specific energy renovation project they had been involved in;
- Outline of the design process involved, including bottlenecks and integration with the district context;
- Stakeholder interactions in the project;
- Occupant and user participation in the design process.

The resulting transcripts were analysed with the assistance of NVivo software.

Interviewees were selected from the various stakeholder categories associated with building construction projects and recruited through the professional networks of partners in the NewTREND project in 8 European countries. Figure 3 indicates the background or profession of the interviewees selected.

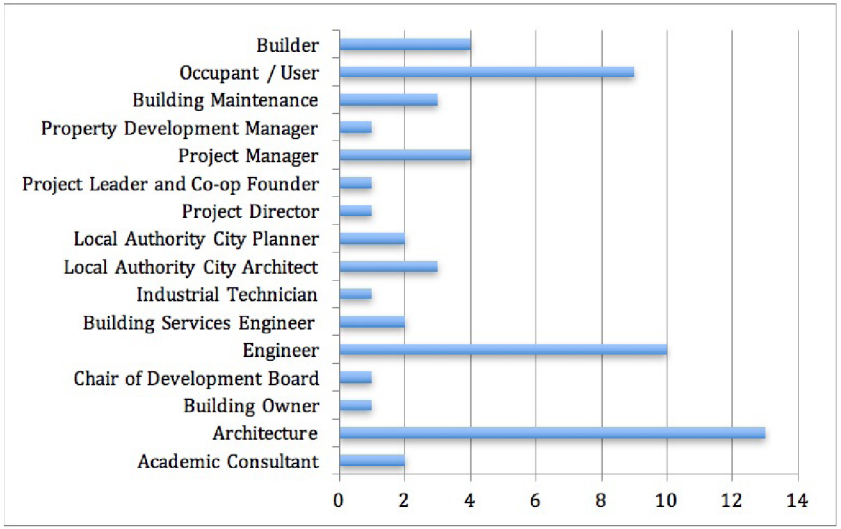

Figure 3 : background of Interviewees Selected

2.1.7 Findings

Identification and characterisation of stakeholders

A building or district scale energy retrofit is a significant project which draws on the skills and resources of many different organisations and professionals, impacts on a range of people from building occupants and users to neighbouring residents, and may have implications for municipalities, planning authorities, heritage bodies and utilities. In order to develop a useful typology of stakeholder interactions, it is necessary to reduce the wide variety of possible stakeholders to a limited number of generic categories. Consequently, stakeholders are grouped under four project roles which will be present in any retrofit project and eight stakeholder categories which include types of stakeholder who may or may not be relevant to an individual project.

The following table gives an overview of project roles and stakeholder categories and the kinds of individual stakeholders who may fall under each.

Table 2: List of Stakeholder Groups in Construction Projects

Project Roles	Client	Owner occupier, landlord, commercial developer, municipality, state agency, housing association, charity, special purpose vehicle, cooperative
	Design team	Architect, architectural technician, engineer (civil, structural, mechanical, electrical, services), planning consultant, quantity surveyor, energy consultants/assessors, energy service companies, architectural specialists (*e.g.*, landscape, conservation), interior designers, design specialists (*e.g.*, digital multimedia, exhibition designers, *etc.*), client representative
	Project manager	Architect, engineer, main contractor, client representative
	Construction contractors	Main contractor, sub-contractors, specialist services
Stakeholder Categories	Occupants	Owner-occupiers, tenants, sub-tenants, student residents, hotel guests, hospital patients, prisoners, tenants' associations, residents' associations
	End-users	Occupants, staff, customers, students, patients, tourists
	Building management	Facility management, ESCO
	Community and civic society	Nearby residents, nearby businesses, residents' and community associations, voluntary groups, business associations, municipalities, elected representatives, NGOs, civil society organizations, public
	Financiers and associated services	Shareholders, investors (traditional and 'green' focussed'), banks and other traditional institutions, public grant programme, energy supplier schemes, solution-provider backed schemes, donors, ESCOs, charities, insurers, quantity surveyors
	Public and statutory bodies	Municipality (planning, building control, heritage, traffic), planning appeals board, building control, statutory regulators, environmental protection agencies, health and safety agencies, fire service, EU, national and local legislators, standards bodies, green building certification schemes, waste authorities, EPAs
	Materials, solution and infrastructure providers	Primary producers, material processors, manufacturers, standards bodies, R&D institutions, retailers and distributors, solution providers, logistics, education and training institutions, utilities, infrastructure providers, waste contractors, recycling firms
	Consultants and third parties	Legal advisors, property valuation, auctioneers, insurers, planning consultant, media and marketing, utilities

Mapping of Stakeholder Interactions and Communication Flows

This sub-section describes and maps the interactions of actors within the value chain, and in particular the pattern of communication flows, building on the identification and characterisation of stakeholders. The model of stakeholder salience developed by Mitchell et al. is used to characterise the relationship of stakeholders to the project at each stage of its evolution [15]. Generic models of stakeholder salience (Figure 4), stakeholder communication (Figure 5) Activities & Outputs, (Figure 6) and Value

Creation (See Figure 7) were created for each of the four main lifecycle stages (initiation & viability, design & planning, construction & installation, and maintenance & operation stages) as well as for each of the five main stakeholder groups (owners, occupants, designers, builders and others).

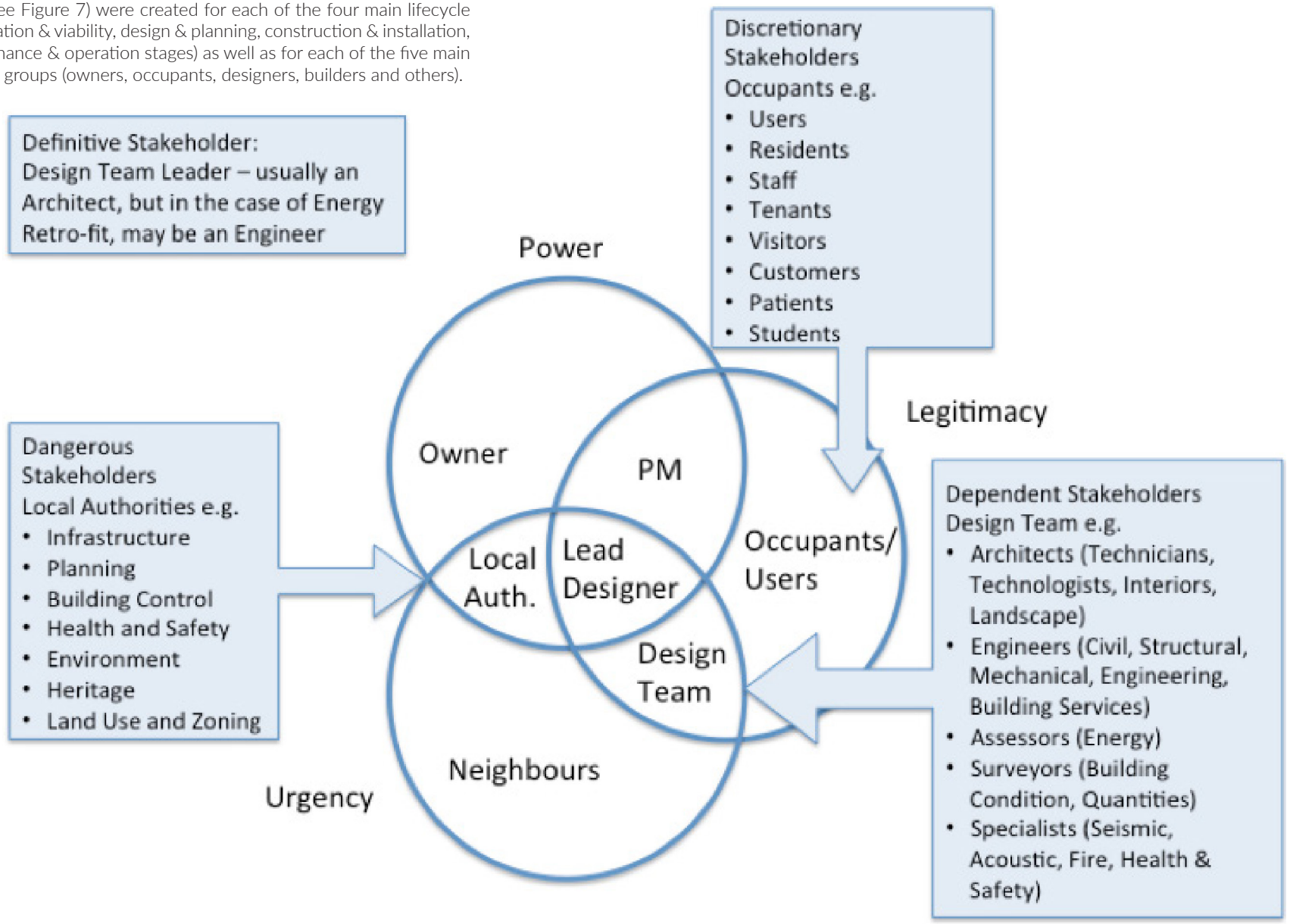

Figure 4: Generic stakeholder salience schematic for Design & Planning Stage

A number of general findings in relation to communication also emerged from the interviews:

- Informal communication based on long-standing relationships was the most popular communications style amongst the interviewees. Overall the common phrases or themes regarding communication that emerged as being most desired for success were diplomacy; trust, honesty and integrity; reliability and dependability; reputation; experience; professionalism; relationships and friendships; familiarity and informality.
- The importance of long-standing relationships and trust in facilitating collaboration and communication was frequently underlined. Developing good professional and personal relationships with potential stakeholders, clients, and others in the industry, and above all gaining a good reputation was described as crucial to both the success of communications on a project and the success of the project overall.

Face-to-face communication, as opposed to online engagement, seems to have been the most common and most successful form of communication with stakeholders used by the interviewees. At the same time, it is clear that online engagement is increasing. One instance where an anonymous, or online system would certainly be advantageous would be a comments and complaints facility.

Interests, Drivers and Motivations of Stakeholders

The interests, drivers and motivations of stakeholders in energy efficient building can be categorised into those which incentivise and those which disincentives investment in EeB. A substantial literature exists on this topic, and was drawn upon in formulating our research questions for stakeholders. Based on this literature, some of the principle factors operating as either incentives or barriers to energy efficient building include:

- Payback times / Return on Investment (ROI)
- Upfront Costs / Initial Capital Investment (Short term perspectives)
- Project Risks (especially with new and innovative technologies)
- Externalisation of Energy Costs (not considering global social and environmental effects)
- Impact on Property Value
- Split Incentives (those who pay for the retrofit are not those who benefit)
- Information (or lack thereof)
- National and EU Policy
- Regulatory Deficiencies or Inefficiencies
- Ownership and Tenure (owner-occupiers might be more likely to carry out retrofit works)
- Occupant and User Considerations (Comfort, Utility, etc.)
- Pro-Environmental Values (and Behaviour)
- Project Champions (individuals who champion a particular project)
- Fuel Poverty (which can incentivise public investment in EeB)
- Funding / Financing (public vs private, availability, application process, criteria, etc.)

There was a significant overlap between the interests, drivers and motivations of the stakeholders as discussed in the literature and by the interview participants. In addition to those mentioned earlier, the following were also identified as having a significant influence on the depth and type of energy retrofit carried out:

- Assessment and Certification (BREEAM, LEED, Passivhaus, etc.)
- Heritage Restrictions (working with listed and archeologically, historically or culturally significant buildings)
- The age and state of repair of buildings and their suitability for retrofit with certain types of technologies versus complete demolition and rebuild
- Familiarity of stakeholders with technologies and materials
- Integration with other technologies (e.g., with existing district heating systems)

The interests, drivers and motivations of stakeholders can be divided into those that provide incentives for energy efficient building; those which provide disincentives; and those which are variable, capable of acting as either incentives or disincentives depending on the circumstances.

- Incentives for energy efficient building are strongly driven by public policy (building regulations, certification schemes, feed-in tariffs, the planning system) and its impact on the market. The values and attitudes of key stakeholders are also important (pro-environmental values, comfort, the role of project champions). The familiarity and established character of technologies and materials is also a factor.

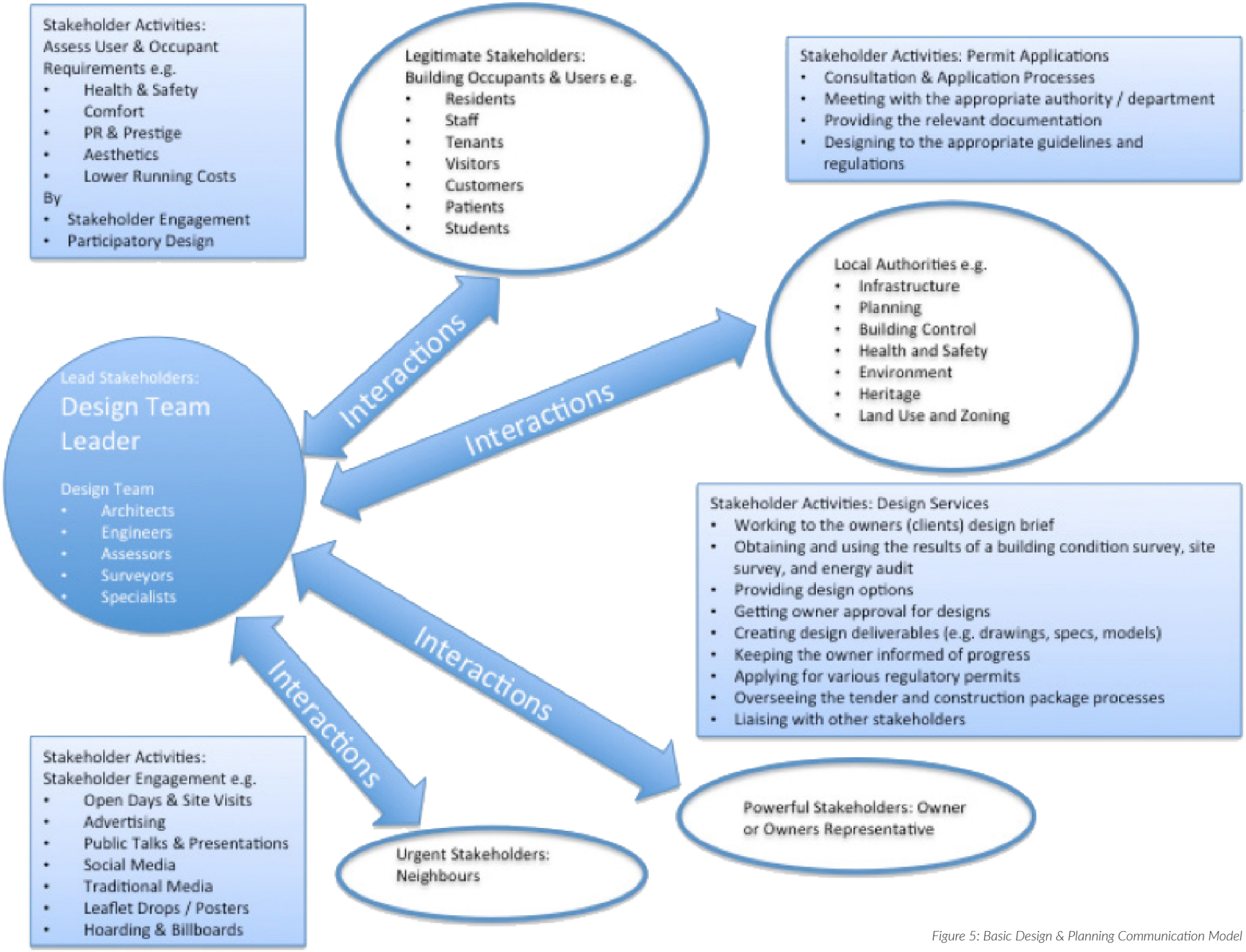

Figure 5: Basic Design & Planning Communication Model

- Disincentives for energy efficient building are dominated by market and financial factors (low return on investment, high upfront costs, information deficits, split incentives, long payback times), while public policy also plays a role in the form of regulations protecting heritage buildings.
- A significant number of factors can play the role of either incentives or disincentives depending on the context. These include market and financial factors (funding sources, ownership structure, return on investment), as well as the relationship of energy efficient technologies to the wider socio-technical system.

Consequently, stakeholder interests and drivers do not divide simply and cleanly into those which incentivise or disincentivise energy efficient building. Instead we need to understand them in the context of the wider socio-technical system, in which public policy and regulation, market forces, financial opportunities or pressures, technological development, and socio-cultural values and attitudes come together to create the environment in which decisions about building energy retrofit are made. Based on the interview material, it appears that public policy and personal and corporate values/attitudes are key drivers of energy efficient building. These in turn have the potential to shift the structure of market incentives in favour of energy retrofit, as well as helping new technologies move from niches to mainstream.

Occupant & User Needs and Interests

Consideration of occupants and user needs and interests are central to NewTREND, since they can directly impact the performance of a retrofitted building. The two main factors that affect the use of energy in buildings are the physical characteristics of the building and the behaviour of the occupants and users. The former can be altered through legislation and various incentives to promote more energy efficient buildings; however, occupant and user behaviour is not so easily changed by external means [20].

It is therefore increasingly recognised that occupants should no longer be considered as passive recipients of a set of indoor conditions, but rather viewed as stakeholders who play an active role in the maintenance and performance of their buildings [21]. The needs and interests of occupants and users can be incorporated in a building retrofit through a number of routes. This section of the report draws on the interview material to present a picture of the ways in which occupants and users' needs and interests are currently taken into account in energy retrofit. It therefore complements NewTREND deliverables D2.5 and D2.6, which offer suggestions for an improved participatory design process engaging building occupants and users.

The occupant and user engagement described by most interviewees would be placed towards the bottom or middle of Arnstein's 'ladder of participation', which provides a typology of levels of participation (see below) [22]. In many cases occupant and user considerations were addressed without the participation of actual occupants and users, with designers seeking to take account of the needs of generic or hypothetical future building users. When there was engagement, it usually involved, in Arnstein's typology, informing or consultation. In only a small minority of projects did it ascend towards the top of the ladder, involving partnership or even some level of delegated power. In these instances, it was frequently the case that the occupants were either themselves the building owners, or were numerous and well-organised with their own representative bodies.

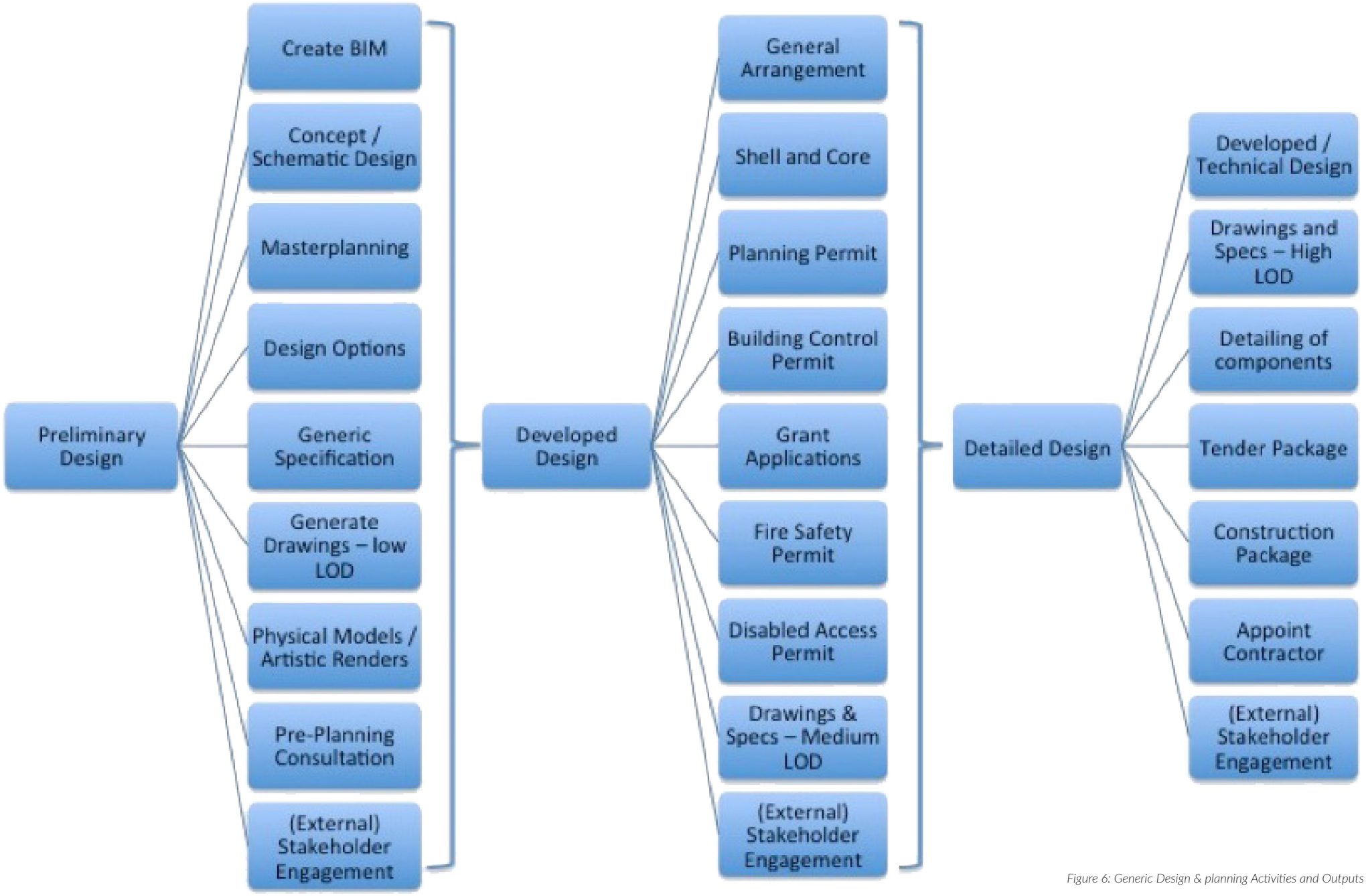

Figure 6: Generic Design & planning Activities and Outputs

Where occupants and users were involved it was usually towards the end of the design process, through consultation on a more-or-less finished design. However, in those cases where occupants were involved near the beginning the level of participation achieved was much greater. In general, the results show an awareness among building industry stakeholders of the need to take occupant and user considerations into account, combined with a frequently technocratic and managerial attitude towards them ('the design team know best') and an absence of effective mechanisms for occupant and end-user participation early on in design. Structured methods of incorporating occupant and user perspectives from early on in the design process could play an important role in improving both the design of building retrofits and the efficiency of their subsequent operation.

2.2 Conclusions & Recommendations

A wide variety of stakeholders can potentially be involved in building and district scale refurbishment projects. However, it is possible to categorise these according to a limited number of project roles and stakeholder categories for the purpose of analysing their relationship to the project, interactions within the value chain, and interests, drivers and motivations.

Stakeholders differ significantly in power, legitimacy, and urgency. Moreover, their position in regard to each of these can alter from stage to stage of a project. At the initiation and viability stage the building owner is the 'definitive stakeholder' characterised by power, legitimacy and urgency. Accordingly, they are at the centre of communications and stakeholder interactions. At the design and planning stage, the role of definitive stakeholder is taken over by the designers, and the design team leader becomes the central figure in communications. At the construction and installation stage, in most projects these roles are taken over respectively by the principal contractor and the construction team leader. Finally, at the operation and maintenance stage, the definitive stakeholders are the building occupants and most communications around the building will include them in one way or another.

The interests, drivers and motivations of stakeholders in energy retrofit can be viewed as falling into four categories, namely, those which are the result of (1) market and financial factors; (2) public regulations and policy; (3) factors integral to specific buildings and technologies; and (4) socio-cultural values and attitudes. Market and financial factors comprise a mixture of incentives and barriers to energy efficient building. Public regulations and policy generally act as an incentive, although some regulations can impose barriers. Factors integral to specific buildings and technologies have a mixed impact. Finally, socio-cultural values and attitudes can often play a key role in incentivising investment in EeB, even though energy efficiency and environmental sustainability are frequently not the main drivers behind an energy retrofit.

Building occupants and users can have a substantial impact on building energy use. Despite this, they are not always recognised as legitimate stakeholders in a project, if they are not the building owners. Occupant and user participation is most effective when they are offered a structured input into the design process, when this occurs from early on, and when they are provided with the appropriate tools and supports to facilitate participation. It is important that an engagement process leads to demonstrable results, rather than simply being a talking shop, if the interest and motivation of participants is to be maintained. Energy efficiency is not usually at the top of occupant and user concerns. Consequently, in order to be successful, any engagement process will need be open to the full range of occupant and user concerns, including issues of aesthetics, convenience, heritage, and utility, rather than focusing solely on energy issues. Post-occupancy evaluation and measurement is vital and, despite the challenges involved, should be recognised as an integral stage of the design process.

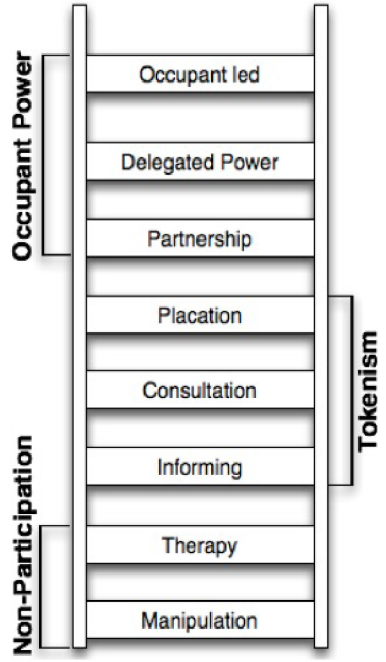

Figure 8: Ladder or Participation [23].

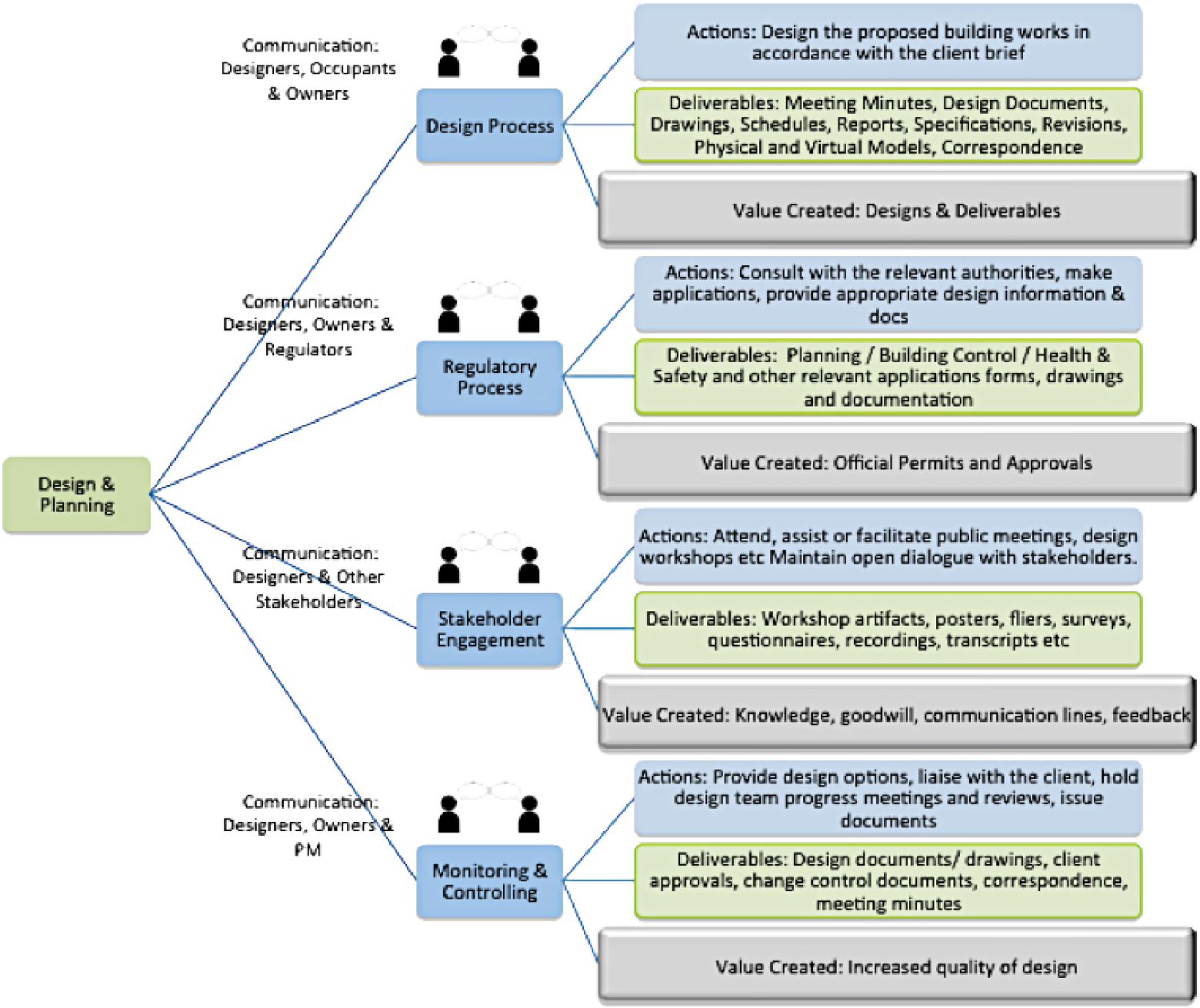

Figure 7: Value Creation Diagram for Designers at Design Stages

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Analysis of Design Process in refurbishment

3. Analysis of the current design process in refurbishment projects

The "Analysis of the current design process in refurbishment projects" combined an extensive literature review, in-depth interviews with stakeholders with experience on the design process, a survey of industry professionals, and a modified Delphi approach to access the views of both academic and industry experts. It outlined the main phases in the design process and its management; the key stakeholders involved and their levels of interest and influence; the principal models of decision-making; current bottlenecks in the process; the extent to which occupants and users are presently engaged during design; and the extent to which the district context is taken into account of in energy retrofit projects, as well as its challenges and potentials.

The construction industry faces a long list of challenges, not least the delivery of new low and net zero energy buildings (nZEB) as well as the renovation and retrofitting of the existing building stock across Europe in order to increase their lifespan and decrease their energy usage. If this particular challenge is to be met, the professions must address the fact that talented teams still deliver buildings that perform badly both in terms of their energy use and, most importantly, as places to live or work. Understanding the causes of this performance gap between design and reality is essential to cutting carbon consumption in the built environment. The reasons for this gap between design and reality are many, ranging from poor design, construction and installation to inadequate control and user training. One thread that weaves its way through from early design to building use is a failure to embrace and manage innovation.

If the environmental challenges laid out by regulation and policy measures are to be met by architects and engineers, accepted and established norms in design practice must change. Innovation comes with risks particularly when it involves an unfamiliar or new technology. Design teams can manage these risks by undertaking research and discussions with suppliers and manufacturers. Inevitably no matter how diligently this process of knowledge building is undertaken, a true understanding only develops when the innovation is tested in reality.

The risks associated with innovation are compounded by the design process in which decisions have to be made with often limited contextual information. As the design evolves, the context can change. If decisions are not revisited then solutions can become inappropriate, leading to a mismatch between design expectations and performance in use. Flexibility and adaptability throughout the design process can help capture knowledge while minimising the performance gap. It has the potential to enable

the professions to innovate with more confidence and to adopt solutions that are both appropriate and capable of delivering buildings that meet ever-increasing expectations in terms of energy efficiency, performance, and comfort.

The aim of this section is to summarize the work performed within the NewTREND project to characterize the existing design process in energy efficient buildings. It seeks to identify the main phases in design and the key stakeholders involved; the dominant approaches to the management of design, as well as the constraints and bottlenecks most commonly encountered; and examine the role currently payed by users and occupants, as well as the extent to which the design process takes account of wider district energy systems or potentials. A baseline from which NewTREND could proceed in developing an efficient collaborative design platform that takes account of current best practice in the design process for energy efficient refurbishments while aiming to improve on it was developed.

3.1 Methodology

The methodology adopted included both qualitative and quantitative research as well as a literature review and verification and corroboration through a modified Delphi-panel process. The analysis commenced with an extensive literature review of publications related to the design process in construction, including both academic research and industry standards. Based on this, an interview schedule was developed and semi-structured interviews were conducted with 30 industry stakeholders with experience of the design process in building refurbishments, drawn from across Europe. An online survey of building industry professionals which attracted 60 responses was conducted to provide a wider, quantitative, evidence base which might support or modify the results of the interviews. Finally, the draft conclusions of the research process were verified through a modified Delphi process involving a panel of industry and academic experts.

3.2 State of the art and literary review

From a general point of view, the design process can be defined as a decision-making process (often iterative) in which the basic sciences, architectural, engineering and systems sciences are applied to convert resources to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation (ABET). The design process, especially in the construction field, is often defined by the professional experiences and background that an architect, an engineer or a company project manager has developed during his/her career.

National and EU regulations, and transpositions of EU Directives into National Laws govern public procurement and the awarding of contracts to designers, builders and providers of services or products, for government and other publicly funded projects. As a result, certain operators, in particular small and medium-sized enterprises (SMEs), may find it more difficult to compete within the internal market and may miss out on important business opportunities where the weighting of tenders primarily concerned with the tender proposing to carry out the work for the lowest cost, with less weighting given to experience, existing working relationships, proven levels of quality and other factors.

In order to overcome these barriers, the EU in 2014, enacted three new Directives to regulate the concession contracts and the required steps that shall be performed during the execution of public constructions (2014/23/UE, 2014/24/UE and 2014/25/UE. With these directives, the European Commission defines three different design phases, according to three levels of successive technical insight; the three steps are:

- technical and economic feasibility study: identifies, among several solutions, which one offers the best balance between costs and benefits for the community, to meet the specific needs to be met and deliverables),
- detailed design: identifies the work to be carried out in compliance with the requirements, criteria, constraints, the guidelines and directions established by the contracting authority and, if present, from the feasibility study
- construction design: determines in every detail the work to be done, its estimated cost, the timetable consistent with that of the final project, and must be developed to a level of definition that each element is identified in form, type, quality, size and price.

The design process shall be considered in its complexity and going beyond international regulations: it's a creative, iterative and innovative dynamic workflow. In the early creative stages, the architects, engineers and other designers produce options, sketches, models, thoughts and ideas. These processes need to be open and to enable the achievement of best solution.

Several collections of guidelines define work stages in the building design process detail the tasks and outputs, and provide templates and models, giving the opportunity to create a bespoke organization of work, that at the same time reflects common working methods. The guidelines aim to provide a clear template for the scope of professionals' work through the different phases of a typical project: design, procurement and construction.

Other aspects that were considered were:

- stakeholders in energy retrofit projects
- decision making in energy retrofit projects
- design bottlenecks
- participatory design

3.3 Stakeholder engagement methodology

As a result of the previously mentioned reviews, the research involved a combination of methods, including interviews with design professionals with experience in building energy refurbishment, a supplementary questionnaire, and validation of the results using a modified Delphi-panel approach. This offered the opportunity for a two-step validation of the initial conclusions, with the results of the interviews being elaborated or qualified first by those of the survey and secondly by the experts involved in the Delphi process. It also facilitated the use of both qualitative and quantitative evidence. While qualitative data provides information on what is happening and how and why it is happening, quantitative data indicates how much of it is happening

Information on the design process involved in building energy renovation was collected through 30 semi-structured interviews carried out with individuals with experience in the design of refurbishment projects in a variety of European countries. Semi-structured interviews using pre-formed open-ended questions were adopted as the most suitable method, given that interviewees came from across Europe and there would be only one opportunity to talk to each of them. Interviewees were identified through the professional networks of the partners involved in NewTREND, as well as by directly contacting participants in selected large-scale building energy renovation projects. Professionals directly involved in the design process of such projects were targeted for interviews. Those recruited included architects, engineers, project managers, clients and academic consultants, among others.

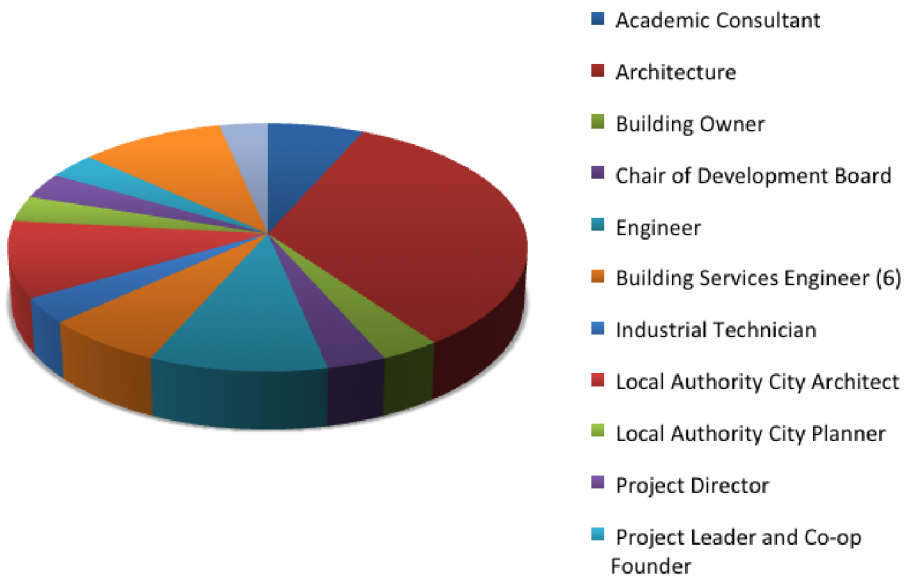


Fig1 Professional background of interviewees

A wide variety of projects were discussed during the interviews, including the renovation of public housing, government offices, commercial office buildings, university buildings and residential complexes.

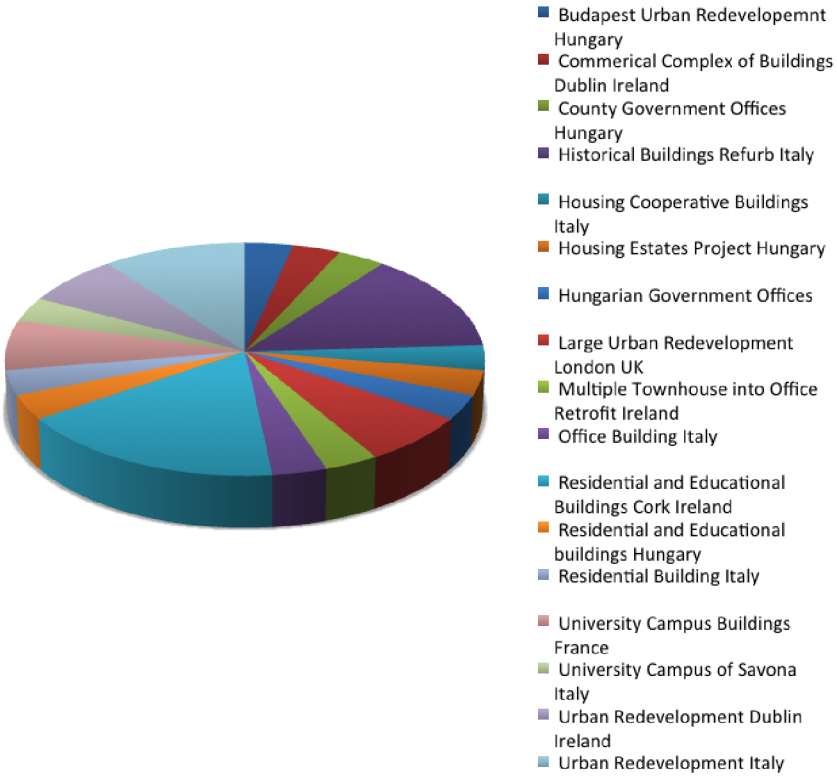


Fig. 2 Breakdown of projects discussed in interviews

The interviews were analysed using NVivo software, which facilitates coding, organising, linking and cross-referencing of material. NVivo supports both qualitative and mixed methods research, and is designed to help organise, analyse, and find insights in unstructured, or qualitative data. The interviews with members of project design teams were supplemented by a questionnaire survey targeting a wider group of industry professionals across Europe with experience of large scale energy retrofits. This offered a number of advantages, including a more diverse geographical reach and a larger pool of respondents against whose response the conclusions drawn from the interviews could be tested.

The online survey was composed by 25 questions and disseminated broadly, thanks to the collaboration of all partners, via professional networks and a mailing list of professional associations. In two weeks hundreds of professionals have been asked by email to fill in the questionnaire: 60 responses were collected from participants based in many different countries. The graphs below sum up the most important quantitative results

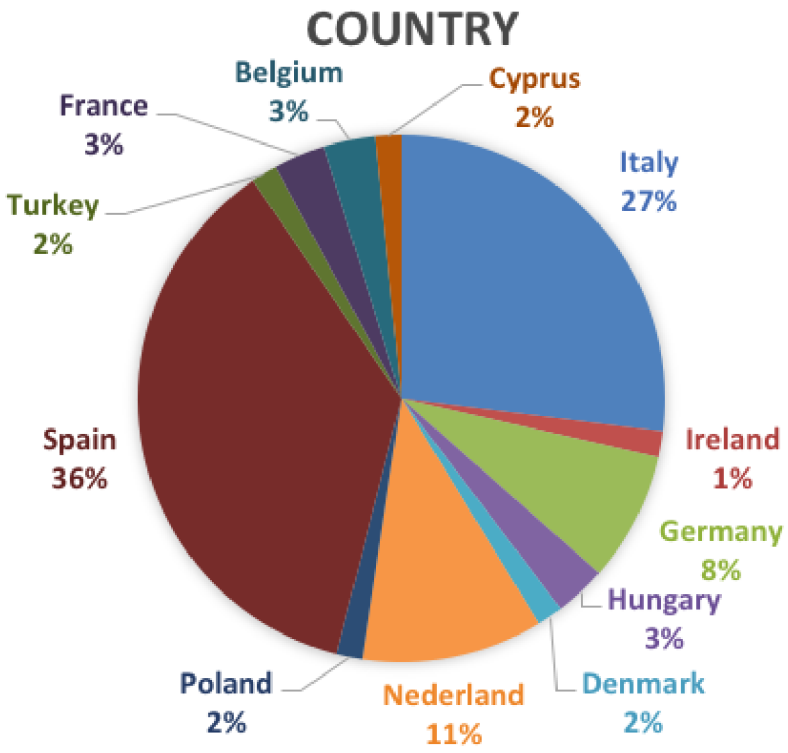


Fig3 Survey- EU Country covered by the survey

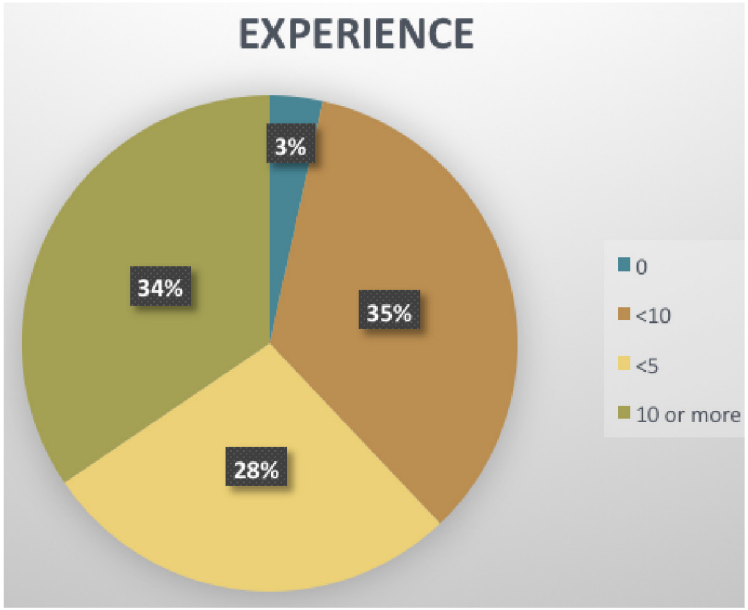


Fig4: Survey - Years of experience of the respondents

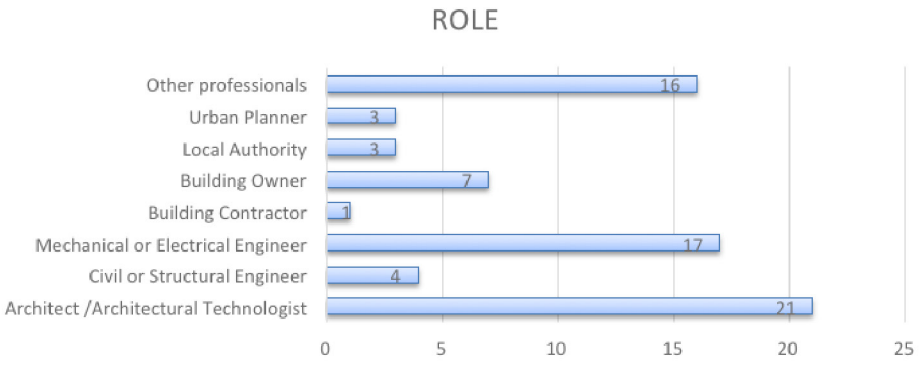


Fig.5 role of the respondents in the retrofit project

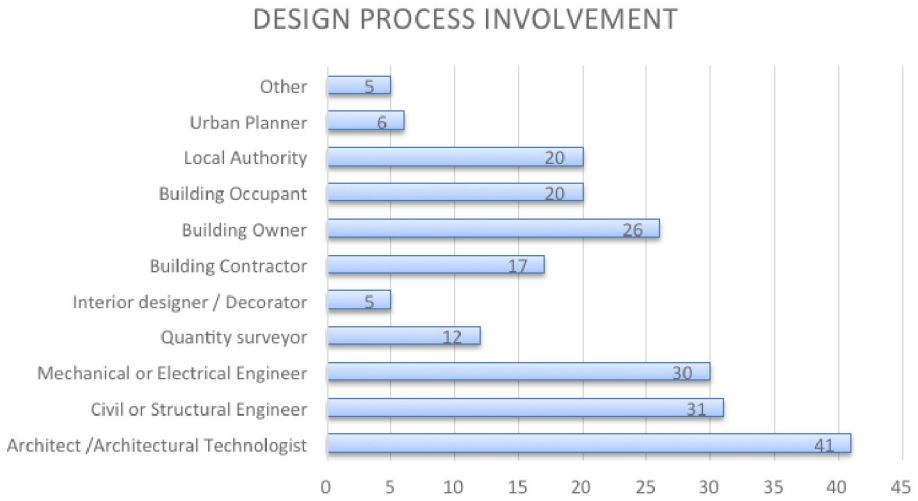


Fig.6 Survey - Additional Professionals and organisations involved in the project

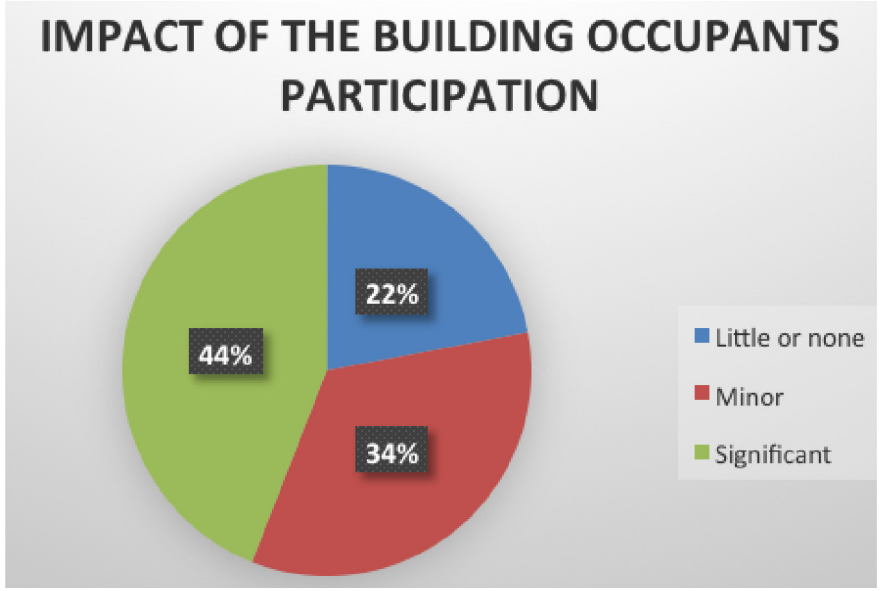


Fig 7 Survey - impact of occupants and users on the final design

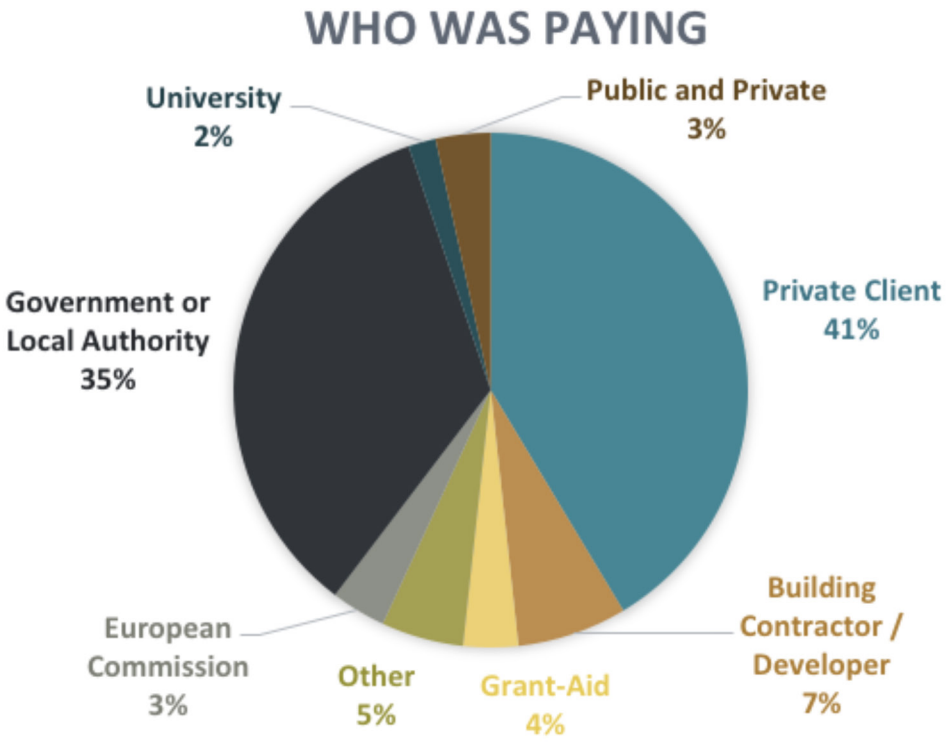


Fig 8 who was paying for the project

3.4 Findings and recommendations

3.4.1 Design phase

It should be acknowledged that in the nature of the interview process, some interviewees gave more detailed answers than others. Nonetheless, it is significant that none of the standardised plans of work cited in the literature review would fit all the proposed case studies. When the interview results were interpreted in tandem with the survey responses, it was clear that while standardised sequences of design stages were seen as offering a valid description of the design process in the abstract, in actual projects some phases come to be seen as more important, while others may be telescoped due to time pressure or project requirements. Some of the key findings are listed below:

I. In actual building renovation projects, the design phases can vary widely from the model, depending on the scale of the project and its objectives (structural renovation of a building or upgrading of building systems), the configuration of stakeholders, the influence of the planning process, and the participation of occupants and users

II. Many building industry professionals do not follow a standardised plan of work or see such plans as a particularly effective tool

III. Inclusion of an energy audit and post-occupancy review should be considered in any standardised plan of work for the energy renovation sector

IV. Participation of building occupants and users should be included in a structured way in standardised models of the design process

V. Early involvement of contractors in the design process can have a significant positive impact

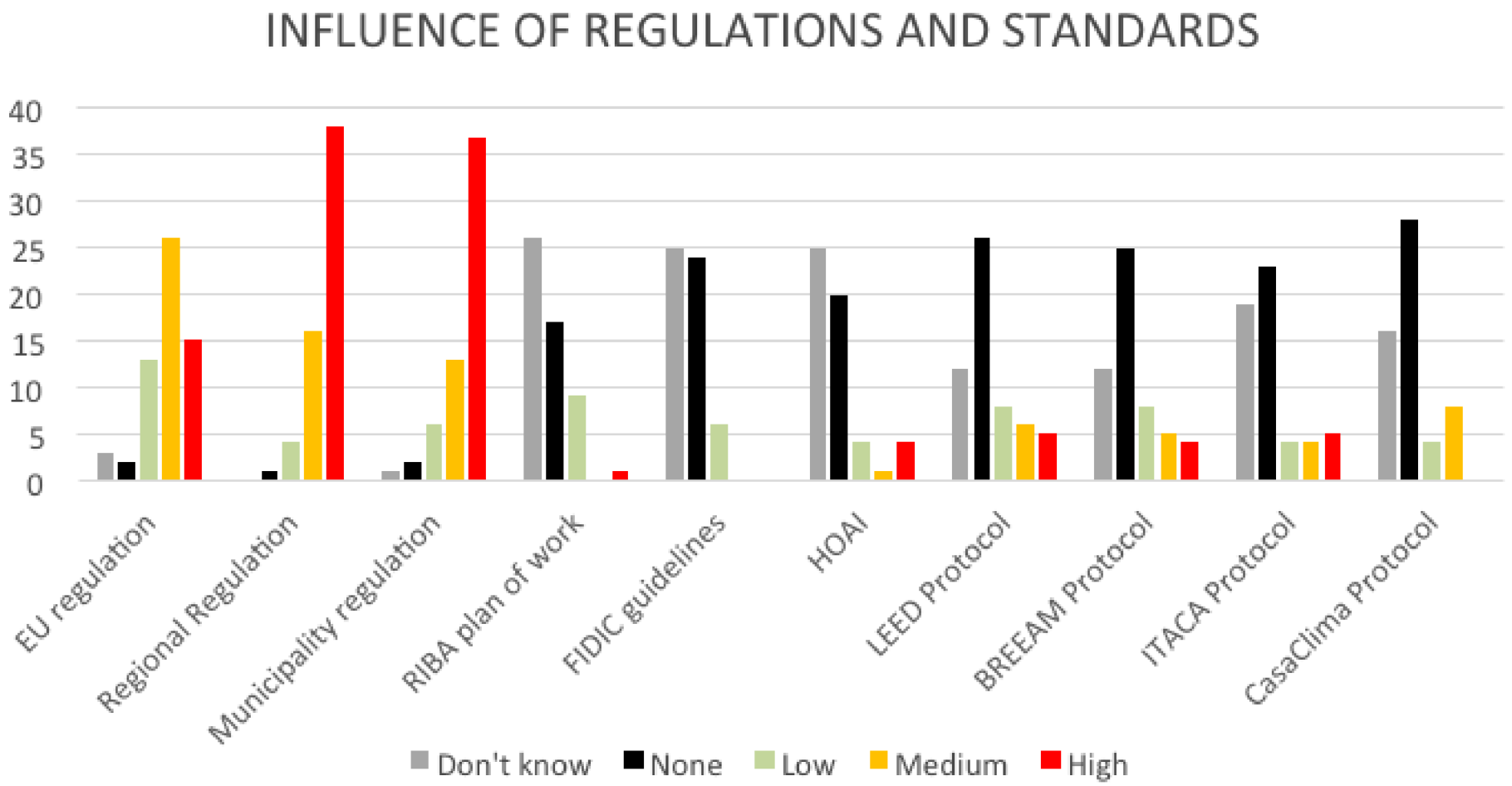


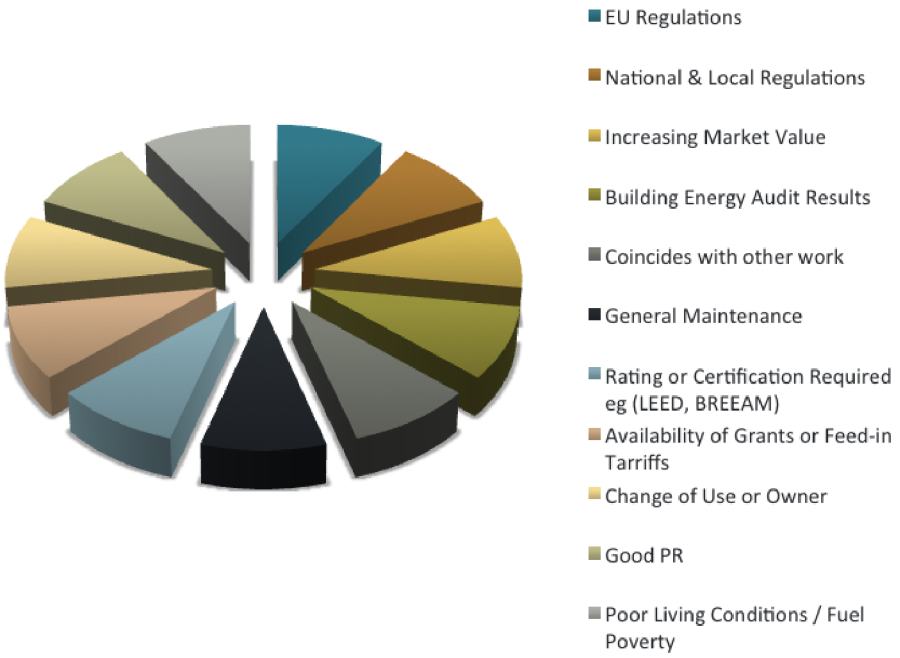
Fig 9 Survey – influence of standards and protocols

3.4.2 Stakeholder analysis

What emerged in this part is that stakeholders can be assigned to a limited number of project roles (client, design team, contractor, project manager) and stakeholder categories (financier, public and statutory bodies, end-users, occupants, neighbourhood stakeholders, consultants and third parties). These categories are often combined in building renovation projects; and complex stakeholder configurations, which vary from project to project are involved in multiple and articulate ways. The shape of these configurations impacts on the interests of stakeholders and the influence they can exert over the design process

3.4.3 Decision making and design constraints

Unsurprisingly given the focus of the research, energy efficiency and sustainability were identified as key design principles in many of the interviews. Increasing the insulating capacity of the building thermal envelope was the most popular method of improving the energy performance of buildings amongst the interviewees. The interviews confirmed the findings in the literature that energy improvements are seldom the main deciding factor in whether to go ahead with a building renovation project (see figure below). This is reflected in the design process, where energy is often one of several coinciding needs, such as comfort levels, heritage value, aesthetics, building modernisation, return on investment, etc. which need to be taken account of. The design principles are in turn largely determined by the configuration of stakeholders; those who have most influence will get to decide the design principles of the project.



Further elements that influence the design process are constraints or 'bottlenecks' encountered by design teams;

- one of the frequent problems is the challenge of buildings which have heritage or architectural value which needs to be preserved and which are protected by regulations. Numerous interviewees described how this limited their freedom in designing and implementing energy conservation measures
- delays in projects caused by dealings with local government and other authorities and by securing a variety of forms of certification and approval were mentioned by nearly all interviewees. These can result in the time available for the actual design work being restricted
- Inadequate infrastructure to facilitate construction works, or ensure accessibility to the site for potential users once the work has finished. Energy retrofit can be hampered by poor access to the site, or to particular parts of a building. Limitations on access can also determine the types of materials or renewable energy technologies specified for the project.
- A variety of structural issues can delay building renovations and limit design options. This is compounded by information gaps, especially in older buildings where plans and drawings are either missing or inadequate. Finding a material that can meet structural and fire safety standards, while achieving high levels of energy efficiency, can raise the cost of a project
- Opinions on the incorporation of renewable energy generation into buildings were mixed, but frequently unfavourable, due to perceptions that they offer little return on investment and create split incentives.
- Funding was most commonly cited constraint on the design process cited by survey respondents – 55% stated it was an issue. Funding was also mentioned in almost every interview, frequently in the context of its impact on decision-making in design. Who pays for a project is an important factor in the outcome, as there can be important differences in design principles and the design process depending on who is doing the funding. Private clients may be more open to new ideas, public clients may create more levels of bureaucracy, grant-aided projects may require more paperwork.

3.4.4 Occupant and end-user participation

Nearly all interviewees had something to say about the relationship between energy efficient building projects and the actual or potential occupants and users of the buildings. However, the extent, format, timing, and character of occupant involvement with design differed markedly between projects. Many projects had no engagement with occupants and users, either because they were dealing with an empty building or because it was not a priority for the client and design team. Others engaged in various levels of consultation, while for some significant occupant and end-user participation in the design process was a priority.

The next level of engagement is consultation, where users, occupants and neighbours are provided with information on the building plans and given the opportunity to voice their opinions. Usually this takes place when the plans are at - or close to - finalisation, so the scope to influence the design is limited to the possibility of having some particularly objectionable feature amended or removed. Several of the interviewees discussed how local communities, occupants, neighbours and the general public were engaged prior to the commencement of the work. In some cases, it was noted, that people were just glad to see the buildings being refurbished and reused rather than being allowed to remain unused and falling into disrepair. Simply being allowed into the process, and made aware of the proposals was seen as a positive.

In general, there are two sides to consider and it strongly depends on what type of lease is involved. On one hand we must consider that the building should be tailored to meet the needs of the occupant and enhance their ability to effectively manage the facility and minimise energy costs. Identifying the patterns and behaviours of the long-term occupants can inform the decision-making process when deciding on what energy efficiency measures to include in the design and squeeze some additional savings on the running costs.

On the other hand, if the building is not owned or on a long-term lease by the occupants, then it is better to create a generic energy-efficient building that will continue to operate at a low energy cost even if the occupant and occupant type changes significantly.

3.4.5 Energy retrofit in a district context

A striking feature of the interviews was the almost universal failure of the projects discussed to integrate the energy measures they applied with the wider district energy system. There was little attempt to develop district heating and cooling systems or energy hubs, district scale renewable energy generation, or to achieve economies of scale through bundling multiple buildings in district scale retrofits. A number of reasons for this may be suggested: energy retrofit was often only one of a number of goals in the refurbishment; perceived problems with the payback times of renewables; split incentives between building owners and tenants, residents and public bodies, which are amplified at district level; logistical problems caused by fragmentation of property ownership in districts; lack of incentives from municipal or national authorities; funding mechanism which concentrate on single-building refurbishment; a market characterised by a desire to achieve the maximum and shortest payback for the least money; and the fact building refurbishment is often initiated on an 'opportunistic' basis, for example when there is a change of tenant in an office building, which makes it difficult to plan a district scale renovation in advance. Most interviewees had never even thought of taking the wider energetic context into account.

3.5 Conclusion

Some key conclusions from the research can be found in summary below.

- Although design stages based on the RIBA Plan of Work, provide a fairly accurate representation of the design process, in actual building renovation projects, a standardised design process is often not followed due to factors such as the scale, objectives, stakeholders, the planning process, and the participation of occupants and users.
- Inclusion of an energy audit and post-occupancy review should be considered in any standardised plan of work for the energy renovation sector. Post-occupancy evaluation and measurement is vital and, despite the challenges involved, should be recognised as an integral stage of the design process.
- Early involvement of contractors in the design process can have a significant positive impact.
- Voluntary energy certification systems such as BREEAM, LEED and ITACA are well known and influential in the industry, but there is some disagreement about their effectiveness and no one system is dominant.
- Stakeholders can be assigned to a limited number of project roles (client, design team, contractor, project manager) and stakeholder categories (financier, public and statutory bodies, end-users, occupants, neighbourhood stakeholders, consultants and third parties).
- Building renovation projects are often delivered by complex stakeholder configurations, which vary from project to project. The shape of these configurations impacts on the interests of stakeholders and the influence they can exert over the design process. Maximum inclusion of all stakeholders, their interests and specific bodies of knowledge in the design process can help achieve the optimal blending of design objectives.
- Participation of building occupants and users should be included in a structured way in standardised models of the design process, however there is a lack of effective techniques to enable the participation of occupants and users as stakeholders in the design process from an early stage. Engagement is usually limited to consultation when the design is already complete, and occupant/ user participation is most effective when they are offered a structured input into the design process.
- Energy efficiency is seldom the only factor determining building design. Comfort, maximising rental value or return on investment, preserving heritage value, aesthetics, accessibility, flexibility, functionality, and saving operational costs were other design principles commonly cited. An effective design process will achieve the optimal blend of different objectives in the same building.
- Common constraints on the design include: heritage restrictions, delays in certification and approval, infrastructure issues, structural issues, skills shortages, return on investment, occupants and neighbours, tender process and funding.
- Incorporation of the district context into building retrofit design was often absent or limited. Where it took place, it usually involved established technologies such as CHP, solar water heating or photovoltaic panels.

Occupant involvement in Building Retrofit

4. Occupants involvement in new design methodology

The aim of Task 2.5 is to provide a collaborative approach for engaging with building users and occupants during the design process for building refurbishment. Task 2.5 outlines a range of mechanisms for including building occupants and users in the design process, and develops a collaborative design system that will be trialled in Task 6.2.

The report is based on a critical review of the existing literature on co-design, interviews with a range of stakeholders in building refurbishment projects across Europe, a series of focus groups involving occupants and users of the three demonstration sites, and an extensive survey and analysis of existing methods of engaging with building occupants and users.

The collaborative design system proposed in NewTREND aims to improve the effectiveness of energy efficient building retrofits by facilitating the participation of building occupants and users throughout the design process. The NewTREND collaborative design system aims to:

- Facilitate the selection of the retrofit solutions which best reflect the needs of building occupants and users, taking into account the objectives of the refurbishment project;
- Minimise conflict and delay by underpinning effective collaboration between building occupants and users, design teams, building owners and other stakeholders;
- Support the integration of the neighbourhood/district context in the design of building energy retrofits;
- Increase the effectiveness of the design process by ensuring the design team has detailed information about occupants' and users' energy use;
- Ensure effective use of building energy systems subsequent to the retrofit through taking account of occupants needs and practices at the design stage.

4.1 Occupant Engagement in Building Retrofit

The engagement of occupants and users can help in the more effective design of energy retrofit solutions. This reflects a recognition that their expectations and consumption patterns can defeat the most careful designs, and therefore it is crucial that designers seek ways of better integrating user involvement in building design and performance [1]. Studies show that household behaviour affects residential energy use to the same extent as equipment and appliances [2]. Even where buildings have been retrofitted to high thermal standards or incorporate energy-efficient technologies, they frequently consume more energy than expected [3][4].

Watson et al. claim that in research on building design, building users generally tend to be conceived as anonymous and autonomous individuals, with little attention to user identity or user interaction [5]. The describe existing research on the quality of building design as comprising a patchwork of relatively isolated studies of various buildings, which primarily addresses post-occupancy issues rather than design processes and how they relate to the quality and functioning of the building in use. Yet, as Baird, people can provide one of the best measures of building performance, stating that 'for many aspects of a building the true experts are the people who know most about using it – the users' [6]. When designers have a better grasp of what people want from buildings and how they behave, they are better able to estimate future energy usage and devise means to minimise it, and the risks of the rebound effect are reduced. Consequently, there is increasing recognition in the literature of the benefits of inclusive, collaborative approaches to building [7][8]. In particular, the involvement of occupants and other end-users in the design process has important advantages for building energy retrofit projects.

A useful means of approaching this is through the concept of 'co-design'. Co-design is founded upon inclusivity and the participation of building occupants and users, and their engagement in the co-creation of knowledge at the various stages of an integrated design process. Co-design refers to family of approaches that attempt to widen participation in design and integrate the perspectives of end-users in the design process. Participation in this context is not just a matter of consultation or conducting research into end-users' habits or opinions. It involves a fundamental transformation of the user's role 'from being merely informants to being legitimate and acknowledged participants in the design process' [9]. Co-design can also have the potential to bring designers and end-users closer through dialogue and continuous learning [10].

A key issue raised by the concept of co-design is how we are to understand the nature of participation. In her seminal article entitled 'A Ladder of Citizen Participation' [11], Sherry Arnstein presented a taxonomy of citizen participation divided into eight different levels of participation, which she grouped into three broad categories – non-participation, tokenism and citizen power. The eight levels are: Manipulation, Therapy, Informing, Consultation, Placation, Partnership, Delegated Power, and finally Citizen Control, with Citizen Control being the most desired level of participation. Lindsay's pyramid of user-based design aims to present an overview of the research methods available to designers to find out about people's lives [12]. The lowest level is Representations, followed by Limited Contact, Real-Life Contact, Co-Creation and at the top Co-Development. A fundamental belief underlying the 'Co-development' approach is the acknowledgement that users are already creative in finding solutions to their existing problems, which can be adopted and used in the design process. Both Arnstein's ladder of participation [11] and Lindsay's pyramid of user-led design [12] are useful tools for conceptualising a range of levels and kinds of participation in the design process.

It is also important to acknowledge that the level of user engagement which can be incorporated in a design process depends not only on the openness of the design team to engaging with users, and their experience in doing so, but on the characteristics of the users themselves. Some occupants and users may be motivated to act as co-designers throughout the design process, while others may not. 'It depends on level of expertise, passion, and creativity of the 'user'' [11]. It is important to bring people into the design process a way that corresponds to their level of interest and capacity. Consideration also needs to be given to how the depth of occupant and user participation in a given project intersects with the objectives of the building refurbishment and the interests of other stakeholders.

Co-design implies significant changes to the traditional roles of stakeholders in the design process, which some of them may find challenging. In particular, it promotes the active involvement of stakeholders, such as citizens, employees, customers and end users, who are not usually afforded a central role in the design process [14]. Users move from being passive informants to having an active design role that is acknowledged by other stakeholders as both legitimate and valuable [9]. They are recognised as experts on their own experience, and consequently play a large role in offering knowledge, generating ideas and in concept development [13].

The design professional supports the user by providing tools for ideation and expression. Participatory design is therefore a two-way process of mutual learning for both designers and users [9]. Siu advocates that instead of trying to foist 'one-size-fits-all' designs on users, designers should reconceptualise their role and see themselves as facilitators, thereby allowing more flexibility and opportunity for users to actualise designs and participate in the design process [15]. Consequently, participatory design threatens existing power structures by requiring that control over the design of a project be relinquished and given to potential customers, consumers or end-users [13] [16].has significant – and potentially challenging – implications for stakeholders such as architects and engineers, who have traditionally dominated the design process, as well as building owners and commissioning bodies such as public authorities.

Alongside the depth of a participatory process, the other key factor is its inclusivity. Processes can vary widely in the number and range of stakeholders involved and the methods of engagement used, and where inclusivity is important, care and attention needs to be taken in designing the process to facilitate this.

To date, participatory design has tended to be deployed on smaller-scale projects rather than on large-scale developments [17]. User involvement 'remains a vague concept and a highly varied practice' while 'design discourse has merely scratched the surface in unpacking meanings about participation and the ways these meanings affect design outcomes' [18]. In urban regeneration and planning, in particular, there is often a profound disconnect between the declared intention of participatory processes and their actual achievement in terms of community involvement and impact on project outcomes [19]. While inclusivity is acknowledged as a key component of new approaches to building design such as integrated design process, there is still no consensus on how to achieve it. This is the gap which the NewTREND participatory design methodology is intended to help fill.

4.2 Stakeholder Engagement Process

The NewTREND participatory design methodology was informed by a process of stakeholder engagement which included semi-structured interviews with industry stakeholders and building occupants and users across Europe, and focus groups involving occupants and users of the three NewTREND demonstration sites. The interview process consisted of over fifty in-depth semi-structured interviews carried out in England, Ireland, France, Spain, Hungary, and Italy. The three focus groups were held in Pestszentlőrinc in Budapest, Hungary, Seinäjoki in Finland, and Sant Cugat del Vallès, in Catalonia, Spain.

Key findings of the stakeholder engagement process are summarised below:

- While there may be broad recognition of occupants and users as stakeholders in the design process, this is not matched with effective techniques to enable their participation from an early stage. Indeed, frequently there is no engagement with building occupants and users at all, or else this is limited to utilising them as sources of quantitative data on energy usage.
- Where engagement with occupants and users takes place, it is often limited to a consultation when the design is already complete, although some projects do adopt a more participatory approach. Much depends on the relationships between stakeholders.
- Participation is most effective when occupants and users are offered a structured input into the design process from early on.
- Depending on the circumstances of the individual project, it may be useful to break down building occupants and users into a number of groups, with different levels of interest and capacity for co-design or other characteristics relevant to the kind of participation that may be expected.
- It is vital to offer building occupants and users appropriate supports if they are to participate fully in the design process.
- Even where there is consensus among project stakeholders that a co-design process should be initialled, participation on the part of occupants and users cannot be taken for granted. Those with limited time, or limited commitment to the building, may simply not engage.
- Energy efficiency is not usually at the top of occupant and user concerns. Any approach which involves occupants and users is certain to throw up a wide range of issues around the building, not all of which may be practicable to fix or within the initial remit or budget of the retrofit.

- If the interest and motivation of participants is to be maintained, it is important that an engagement process leads to demonstrable results, rather than simply being a talking shop.
- There will be cases – especially when a refurbishment embraces multiple buildings or seeks to integrate district energy systems – when stakeholders other than building users and occupants, including neighbours, local businesses, and community groups, may need to be included in the engagement process.
- Post-occupancy evaluation and measurement is vital and, despite the challenges involved, should be recognised as an integral stage of the design process.

4.3 NewTREND Approach to Occupant and User Involvement

Individual building projects differ enormously in their characteristics, including those of their occupants and users and other stakeholders. There are a wide range of potential methods of engaging occupants and users which can be used in different combinations over different stages of the design process. Consequently, it would be counter-productive to adopt too prescriptive an approach to occupant and user engagement, or to suggest that one particular method or system should be followed to the exclusion of all others. The approach we are recommending is therefore deliberately flexible. It focuses on guiding building stakeholders through the critical questions that need to be asked in planning a process of occupant and user engagement, and helping them navigate the many options available and choose among them to devise their own tailor-made solution. The approach adopted here is also modular: at each step it presents a number of options, with the aim of allowing stakeholders develop a process of occupant and user engagement customised for their individual project. There are three main steps involved:

- Deciding what level of occupant and user engagement is suitable for the project;
- Choosing the appropriate suite of methods;
- Combining these into a tailored engagement plan.

4.3.1 Level of Participation

The table below collates the different levels of participation identified by Arnstein [11], Lindsay [12], and the International Association of Public Participation (2016). In the final column it lists the equivalent levels of participation distinguished by NewTREND.

It is worth noting that while Arnstein focuses on citizen power [11], Lindsay is focused more on voice [12]. Arnstein's ladder of participation is calibrated according to the level of control citizens are enabled to exercise over a project; Linsay's pyramid of user-based design methodologies instead stresses the level of input and agency which different methods of engagement afford users. These distinct but closely related emphases are combined in the NewTREND typology, which ranks participation methods according to how they afford occupants and users both input into a project and control over the outcome.

Arnstein (1969)	**Lindsay (2003)**	**IAP2**	**NewTREND**
Manipulation	Representation		*Non-participation*
Therapy			
Informing		Inform	**Informing**
Consulting	Limited contact	Consult	**Consultation**
Placation	Real-life context	Involve	**Dialogue**
Partnership	Co-creation	Collaborate	**Collaboration**
Delegated power	Co-development	Empower	**Delegated power**
Citizen control			**Co-development**

The level of participation must be matched to the nature of the project, the needs of the stakeholders, and the goals of the project itself. A high level of occupant and user participation may not be feasible or appropriate in every retrofit project. In the case of an apartment block complex tenanted by owner-occupiers, a strongly participatory process involving the incorporation of occupants' perspectives in the design will be indispensable. On the other hand, in retrofitting an office building which has been emptied of tenants, participatory methods will be less important – although there might still be benefits in talking to potential tenants and taking account of their needs, expectations, and everyday practices in the design. It is therefore necessary to assess each project to decide what level of occupant and user engagement is feasible and desirable. This will depend on three sets of factors: the characteristics of the building and project, the characteristics of the stakeholders (in particular the client and design team), and the characteristics of the occupants and users.

The approach to occupant and user participation adopted in any given project represents a combination of three separate factors:

- How much control over decision-making are occupants and users able to claim, or other stakeholders willing to concede?
- How much input into the design will occupants and users have, in comparison to design professionals?
- How broad a group of occupants and users are to be involved?

The following table indicates some of the considerations which influence the level of participation.

Building and project characteristics	Building function, Building characteristics, Project objectives, Project scale, Technical characteristics, Timescale, Budget, Regulatory restrictions, District considerations
Stakeholder characteristics	Client's relation to occupants and users, Client characteristics, Design team characteristics
Occupant and user characteristics	Building occupancy, Building use, Continuity of occupancy/use, Tenure, Commitment to building, Socio-economic characteristics, Capacity for collective action, History of occupant engagement, Knowledge of building, Financial investment

4.3.2 Co-Design Methods

The table below outlines a wide range of methods which can be used to engage with building occupants and users and involve them in the design process. These are categorised according to the level of participation they facilitate and the stages in the design process where they can most effectively be applied.

Legend

Depth of participation:

- 1 – Informing
- 2 – Consultation
- 3 – Dialogue
- 4 – Collaboration
- 5 – Delegated Power
- 6 – Co-development

Appropriate design phase:

- SD – Strategic definition
- DB – Design brief CD – Concept design
- DD – Design development
- T&P – Tender and planning
- POE – Post-occupancy evaluation

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Public forum	1-2	Moderate	Several hours	Minimal	All stages	A public forum is an open meeting held to present information about a project to a wide audience. Public forums are a useful means of providing a large number of building occupants and users with information and affording them an opportunity to comment on a project. They are easy and cheap to organise. However, the depth of participation they enable is limited
Focus group	2-3	Variable	Several hours	Low	All stages	A focus group is a qualitative research tool whereby a group of people, usually consisting of from six to ten carefully selected individuals, are brought together to discuss their understandings, opinions, or attitudes around a particular issue, idea or product. Focus groups can help facilitate the involvement of occupants and users in the design process, however the agenda is likely to reflect the concerns of the project team and the issues they consider important, rather than being shaped by the participants. This limits the scope for genuine co-design, as does the fact that focus groups lack decision-making power
Workshop	2-4	Variable	Several hours	Minimal	All stages	A workshop is a face-to-face working session held with the purpose of discussing issues in order to reach an in-depth understanding of their various dimensions and agreement on the way forward. Workshops are an effective means of achieving face-to-face interaction between occupants and users and enabling them to express their needs and concerns in relation to a project, comment on a range of design issues, and choose between different design options or solutions. However, the level of participation will depend on the degree to which members of the project team are committed to take on board their contributions
Brainstorming session	2-4	Limited	Less than an hour	Minimal	SD, DB, CD	A brainstorming session is a method of generating a long list of possible ideas or answers to a specific problem or question, either verbally or in written form, from a group of people. Brainstorming can facilitate co-design, usually as part of a wider suite of engagement methods, where it takes place early in the design process and the project team are committed to user involvement
Visioning	3-6	High	Several hours	Minimal	SD, DB, CD	Visioning is a process in which participants are encouraged to think about how their building or community might be in the future and to find ways to clarify, strengthen and work towards that vision. Visioning can facilitate a substantial degree of involvement by occupants and users in the design process, when it takes place early in the design process and there is a commitment to take the ideas generated on board.

Table 3: Co-design methods

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Open Space Technology	3-6	High	Several hours to 3 days	Low	SD, DB, CD	In Open Space meetings, participants create and manage their own agenda of parallel working sessions around a central theme of strategic importance. Open Space technology is a powerful participative method, which can facilitate a high level of co-design if it is deployed early in the design process. It is strongly inclusive and empowering of the participants. On the other hand, to be successful it requires a substantial degree of commitment on the part of occupants and users.
Design charrette	4-6	Variable	One to several days	Moderate	SD, DB, CD, DD	A charrette is a participatory process that brings together stakeholders in a project in one or more intensive meetings which can last several days, with the aim of solving a particular problem or issue. Charrettes can enable a high level of co-design, allowing occupants and users take part directly in the generation of ideas and in decision-making, and offering them genuine empowerment. A charrette is not merely a consultative process; the project team need to agree in advance to delegate some of their control over the development, and afford participants a genuine role in decision-making.
One-on-one consultation	2	High	Several days or weeks	Minimal	DD, T&P	This is where occupants and users are engaged with individually to inform them about a project and canvass their opinions. One-on-one consultation does not constitute a participatory design process in itself, however it can play an important role in facilitating such a process by encouraging maximum participation on the part of building occupants and users.
Interviews	2	Limited	Several days or weeks	Moderate-significant	SD, CD, POE	Interviews involve interacting with an individual on a one-on-one basis, engaging in a discussion, with the researcher steering the conversation through a series of (usually) predetermined questions. Interviews can facilitate an in-depth understanding of occupant and user attitudes, values, needs and behaviour. However, they offer little in the way of empowerment or opportunity for collective engagement with the design process. Interviews are therefore best used to supplement other engagement methods, or as a tool for post-occupancy evaluation.
Surveys	2	High	Several days or weeks	Moderate-low	All stages	Surveys involve occupants and users completing questionnaires which ask them about their view on a project or proposal, energy consumption patterns, routine behaviours and attitudes. Surveys are of limited value in enabling co-design by building occupants and users, but can be a useful source of information, especially on occupant and user behaviour, to supplement other engagement methods

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Open day	2	High	One day	Moderate-significant	CD, DD, T&P	Open days provide an opportunity for a wide range of stakeholders, including occupants, building users and neighbours, to receive information on a project, talk directly to members of the design team, and offer their own feedback. A open day is a useful tool for informing and consulting with a wide range of occupants, users and other stakeholders. However, it would need to be supplemented by other engagement methods to ensure genuine participation in design
Participant observation	2	Limited	Several hours or days	Moderate-significant	SD, CD, POE	Participant observation involves a researcher accompanying the subjects of their research about their daily activities and recording their observations in a field diary. Participant observation does little to facilitate co-design, however it may be a useful source of information on occupant and user behaviour, especially around energy
Walk-through	2-3	Moderate	1-2 hours	Minimal	SD, CD, DD, POE	A walk-through is a type of usability inspection method that compliments other design methodologies. Walk-throughs are a quick and easy method of engagement, which can readily be combined with other elements of a participatory process to enable co-design
Design games	3-6	High	30 minutes-several hours	Low	SD, CD	Design games involve solving problems or generating ideas through compressing real-life situations into a short space of time, so that the essential characteristics of a problem can be examined. An issue or problem is identified, its essence is abstracted, and a simulation to capture this is devised (Sanoff, 2000). Design games can be an effective tool to enable co-design. They can be readily incorporated in other engagement methods, such as workshops or charrettes
Opinion poll/online poll	2	High	Several days to weeks	Low-moderate	All stages	An opinion poll is a type of survey designed to measure attitudes towards a specific topic or series of topics. Polls are of limited value in enabling participation by building occupants and users, but can be a useful means of consultation
Community appraisal	4-6	Moderate-high	Several weeks to months	Low-moderate	SD, CD	Community Appraisal is type of participatory research that involves capturing the perspectives of members of a community on particular issues. Community appraisal can be adapted to support co-design, but is only suitable where building occupants and users already have a collective identity or community infrastructure and a strong commitment to the building.

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Citizen Advisory Group	3	Low-moderate	Multiple meetings over the course of a project	Low	Throughout lifetime of project and into post-occupancy	Citizen advisory groups (CAGs) typically involve between ten and thirty members of the public sitting as a committee to inform and advise decision-making on a particular topic. This usually takes place over an extended period of time. CAGs are potentially a powerful tool for user and occupant engagement, facilitating ongoing dialogue over the course of a project. However, it is vital to ensure that participants are in fact representative of the wider group of occupants and users
DEMOCs	2-3	Low-moderate	Several hours	Low	SD, CD	Deliberative Meeting of Citizens (DEMOCs) is a low-cost engagement method that helps participants to take on often quite detailed information, and makes it meaningful to them through an active learning process. DEMOCs are a potentially useful tool for user and occupant engagement. However, it is important to note that they are consultative only and are not empowered to take decisions. Furthermore, the views of the participants may not always be representative of the building occupants and users as a whole.
Deliberative polling	3-4	Moderate	Several days	Significant	All stages	Deliberative Polling is a method that aims to capture a representative sample of the target population based on their gender, ethnicity, education and socio-economic backgrounds. Deliberative polling is a costly method which can facilitate the in-depth engagement of occupants and users around a small number of strictly delimited issues. It may be useful where there is a need to gain agreement among occupants and users on a divisive or controversial aspect of a project
21st Century Town Meeting	4-6	High	Up to one day	Moderate-significant	SD, CD	21st Century Town Meetings are a form of deliberative democracy that bring together a large number of people to talk about local, regional or national issues. The facilitate inclusion of the widest possible range of occupants and users in a deliberative process, during which they have the opportunity to receive information, debate issues, express their opinion, and agree the way forward. Because the format seeks to generate a consensus, it is suitable for projects where there are a large number of occupants and users and it is desirable to achieve agreement on the broad parameters of the design
Consensus conference	1-3	Moderate-high	Several hours	Moderate-significant	SD, CD, DD, T&P	A Consensus Conference typically comprises of a panel of citizens, building users, etc. who engage with experts at a public event on a specific topic that affects them. The method empowers participants to put questions directly to members of the project team or invited experts. It is suitable for use at project definition stage, where it can offer occupants and users the opportunity to engage with a particular problem or issue that affects them, reach an informed opinion on the means to address it, and communicate this to the project team.

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Appreciative Inquiry	3-6	Moderate-high	Up to several weeks	Low-moderate	SD, CD	Appreciative Inquiry is a structured form of visioning which can facilitate a significant level of co-design. Because it is conducted by building occupants and users themselves, it is most suitable for a context where these already have a measure collective identity or community infrastructure, and where the project team is committed to take account of the results
Citizens' jury	3-4	Moderate-high	Several days or weeks	Moderate-significant	SD, CD, DD	A Citizens' Jury is made up of randomly selected people from the group in question (community members, building occupants, *etc.*). The jurors cross-examine experts, who provide them with an array of perspectives, before producing a summary of their findings by way of a report. A citizens' jury empowers participants to inform themselves on issues and put their own questions directly to members of the project team or invited experts. It is can be especially useful when some aspect of the project is controversial.
E-panel	2	Variable	Several days or weeks	Moderate-significant	SD, CD, POE	E-panelling is a methodology where data is collected from participants by conducting interviews, usually on products or concepts, using information communication technology (ICT). E-panelling may be useful on large projects, affecting significant numbers of occupants and users, where for some reason it is felt desirable to use ICT rather than face-to-face interviews or a Citizens' Advisory Group. However, it affords limited empowerment of occupants and users and is best used to supplement other engagement methods, or as a tool for post-occupancy evaluation
Online consultation/online forum	2	Moderate-high	Several weeks or longer	Variable	All stages	Online consultations are another method where researchers use the internet to engage with a large group of people on an issues, usually at the early stages of a project. Online forums may be useful as a consultative tool in large-scale projects, where they can help reach people other methods would fail to engage. However, their capacity for enabling meaningful participation is very limited, so they are best used a supplement to other engagement methods
Public participation GIS	1-6	Variable	Limited	Moderate	SD, CD	PPGIS involves collaborative mapping using digital maps, satellite images, simulations and other spatial tools. It is a planning and participation tool used to empower local communities and help them express their views on development projects. PPGIS may be used to supplement other engagement methods on larger projects, but is unlikely to be employed on its own.

Method	Depth of Participation	Inclusivity	Time	Cost	Design phase	Summary
Hackathon	4-6	Limited	Several hours to one week	Moderate	SD, CD	A Hackathon is method of bringing together a diverse range of participants can stimulate practitioners to produce innovative, usable solutions to a problem. A Hackathon can offer a useful tool for the inclusion of a wide range of stakeholders in generating and discussing design ideas for a project. However, it may be more suitable for use where occupants and users are predominantly professionals who are highly engage in the project, rather than with more diverse groups of occupants and users who may be less motivated and have less expertise
Citizens' Summits	4-6	High	Up to one day	Moderate-significant	SD, CD	In Citizens' Summits, large numbers of people are brought together though public meetings and a topic is debated and explored using ICT. A Citizens' Summit enables the inclusion of a wide range of occupants and users in a deliberative process, during which they have the opportunity to receive information, debate issues, and express their opinion. It may be suitable for projects where there are a very large number of occupants and users and it is desired to involve them in a participative process
Social Media	1-3	High	Minimal	Minimal	Initiation through to post-occupancy	Social media can be useful as a tool for providing information, keeping occupants and users constantly updated throughout a project, and enabling ongoing feedback. However, its capacity for enabling meaningful participation in decision-making and design is limited, so it is best used in combination with other engagement methods

In the table below, these methods are collated into six 'families' based on the type and degree of participation which they facilitate.

'Family'	Example	Description
Qualitative research methods	Focus group, Interviews, Surveys, Participant observation, Opinion poll/online poll, E-panel	These methods primarily involve the gathering of qualitative data on building occupants and users, their needs, desires, motivations, attitudes and behaviours, which can be used to inform the design. While these methods can provide a baseline of information about occupants and users at the outset of the design process, they do not in themselves afford a high level of participation.
Information and consultation methods	Public meeting , One-on-one consultation, Open day, Online consultation/online forum, Social media	These methods allow the provision of information to, or consultation with, large numbers of occupants and users, but do not afford a deeper level of engagement and participation
Community visioning methods	Visioning, Open Space Technology, Community appraisal, 21st Century Town Meeting, Appreciative Inquiry, Citizens' summits	These methods allow large numbers of participants collaborate to produce a vision for the future of their building or neighbourhood. They are strongly participative, however the format may limit the degree to which participants are enabled to engage with detailed design problems and solutions
Collaborative design methods	Workshop, Design charrette, Hackathon	These methods allow participants engage with specific design problems and solutions, reach a consensus and make decisions. However, the number of participants who can be involved is limited and this may lead to problems with inclusivity
Deliberative methods	Citizen advisory group, DEMOCs, Deliberative polls, Consensus conference, Citizens' Jury	These methods enable a representative group of occupants or users engage in a detailed, informed discussion of a key issue, and potentially reach a consensus
Combination methods	Brainstorming session, Walk-through, Design games, Public participation GIS	These methods are not generally used on their own, but can add value to a participatory design process when used in combination with other tools of engagement

4.3.3 Models of Engagement

By combining the different levels of participation with the families of engagement methods identified above, five different models of occupant and user engagement can be distinguished.

1. Community Visioning Model

This is most suited to projects on a district scale, or where there are very large numbers of occupants or users who have strong views about the redevelopment. These may have a sense of collective identity and some form of organisation. The community is either initiating the project, or the other stakeholders are open to very high degree of community participation and control. The parameters of the project are not set tightly in advance, so there is wide room for fresh ideas, visioning and long-term planning. Engagement will be characterised by a high level of both participation and inclusivity, and the methods used will be predominantly those from the family 'Community Visioning Methods'. The focus of the engagement will be on developing a shared vision of the future building/neighbourhood, rather than on the technical characteristics of the project, and the engagement will be concentrated in the earliest phases. Examples might be the regeneration of a public housing estate, or the refurbishment of a community-owned facility such as a local hall.

Community Visioning Model	Pre-design	Community appraisal
	Design and planning	Open Space Technology Citizen Advisory Group Social media/Online forum
	Construction/installation	Citizen Advisory Group Social media/Online forum
	Post-occupancy	Citizen Advisory Group Social media/Online forum

2. Collaborative Design Model

This is suited to a situation where a very high level of participation is required, but where in-depth discussion of specific design options is more important than broad scale visioning. Occupants and users will be committed and engaged, but the community are less likely to be initiating the project and it may be more focused on a particular set of issues within a building than on generating a broad vision of the future. In-depth engagement on the part of a representative cross-section of occupants and users is more important than including all members of the community. The methods used will come predominantly from the family 'Collaborative Design Methods'. Ongoing involvement of occupants and users throughout the design implementation phases and into post-occupancy evaluation will also take on greater importance.

Collaborative Design Model		
	Pre-design	Design charrette
	Design and planning	Design charrette Social media/Online forum
	Construction/installation	Social media/Online forum
	Post-occupancy	POE workshop Social media/Online forum

3. Deliberative Design Model

This is suited to a situation where a moderate level of occupant and user participation is required, usually centred around specific issues. The project team maintain the predominant role in decision-making, but they want a degree of involvement from occupants and users which goes beyond a once-off consultation. The engagement is less about devising a long-term vision for the building or generating creative design solutions, than facilitating occupants in giving an informed response to the plans or choosing from among a set of potential design solutions. There is a stress on achieving consensus through deliberation. This model may be particularly useful where some aspects of a building project are controversial and it is desired to achieve agreement on the way forward among occupants and users or in the wider community. The methods used will come predominantly from the family 'Deliberative Methods'. Formalised occupant and user engagement will be maintained from the design phase through construction and into post-occupancy.

Deliberative Model		
	Pre-design	Consensus conference
	Design and planning	Citizen Advisory Group Social media/Online forum
	Construction/installation	Citizen Advisory Group Social media/Online forum
	Post-occupancy	Citizen Advisory Group POE workshop Social media/Online forum

4. Research Model

This is suited to a situation where the priority is not so much giving occupants and users input into and control over the design process, as gaining an understanding of their needs, attitudes and concerns and, in particular, their behaviour and the drivers of their interactions with energy and technical building systems. Occupants and users are engaged as objects of study rather than active participants in co-design, and the process is largely driven by the interests and concerns of the design team, although an element of consultation is also included. The focus is likely to be on the technical aspects of energy retrofit, maximising energy efficiency, understanding user behaviour, and making sure the energy systems installed are suited to the occupants and will be used effectively. The methods used will come predominantly from the family 'Qualitative Research Methods'. Post-occupancy evaluation will play an important role, as a means of assessing the effectiveness of the energy solutions implemented.

Behaviour Research Model		
	Pre-design	Focus group Interviews Survey
	Design and planning	Open day Social media/Online forum
	Construction/installation	Social media/Online forum
	Post-occupancy	POE focus group Social media/Online forum

5. Information & Consultation Model

This is suited to a situation where a relatively low level of participation is required, but where inclusivity is important to ensuring the smooth implementation of a project. The client and project team may be reluctant to cede power, occupants and users may be disengaged, or the project may be highly technical. Engagement will therefore make little demands on occupants and users, and will be characterised by the provision of information and a basic level of consultation, primarily orientated towards enabling occupants and users inform the project team of objections or problems as they arise, and so facilitate troubleshooting and ensure the smooth implementation of the project. The methods used will come predominantly from the family 'Information and Consultation Methods'. A modest level of engagement will continue throughout the project, to address any problems which arise during construction or post-occupancy.

Information and Consultation model	Pre-design	Public forum
	Design and planning	Open day, Social media/Online forum
	Construction/installation	Social media/Online forum
	Post-occupancy	Social media/Online forum

4.3.4 Implementing a participatory Design Process

The final stage is to draw up a detailed plan for occupant and user engagement, outlining when each of the engagement methods is to be carried out, how it is to be implemented, who is responsible for each task, how potential participants will be encouraged to get involved, what resources or supports will be required, and what will happen with the feedback generated. The following steps should be included in this plan:

- Achieve a shared understanding of the goals: It is important from the outset to achieve a shared understanding among all participants around the goals of the process and its limits.
- Set out the timescale for participation: The greater the level of participation desired, the earlier building occupants and users should be included in the design process.
- Maximise participation: Assess what steps can be taken to maximise participation. This may involve everything from simply publicising the process through social media, to dropping leaflets and putting up posters advertising events, to calling door-to-door to building occupants, to hiring a public relations company.
- Assess the supports that may be needed: In order to be successful, some methods require more support to be provided to participants than others.
- Ensure inclusivity: It is also important to consider the inclusivity of the process, making sure all occupants/users have the opportunity to have their voices heard and that events are not dominated by 'usual suspects' such as established community spokespeople.
- Outcome of engagements: There needs to clarity on the outcome of each engagement and its status
- Feedback and implementation: After each engagement, it will be necessary for the design team to assess the feedback provided by occupants and users and see how it can be integrated into the design.

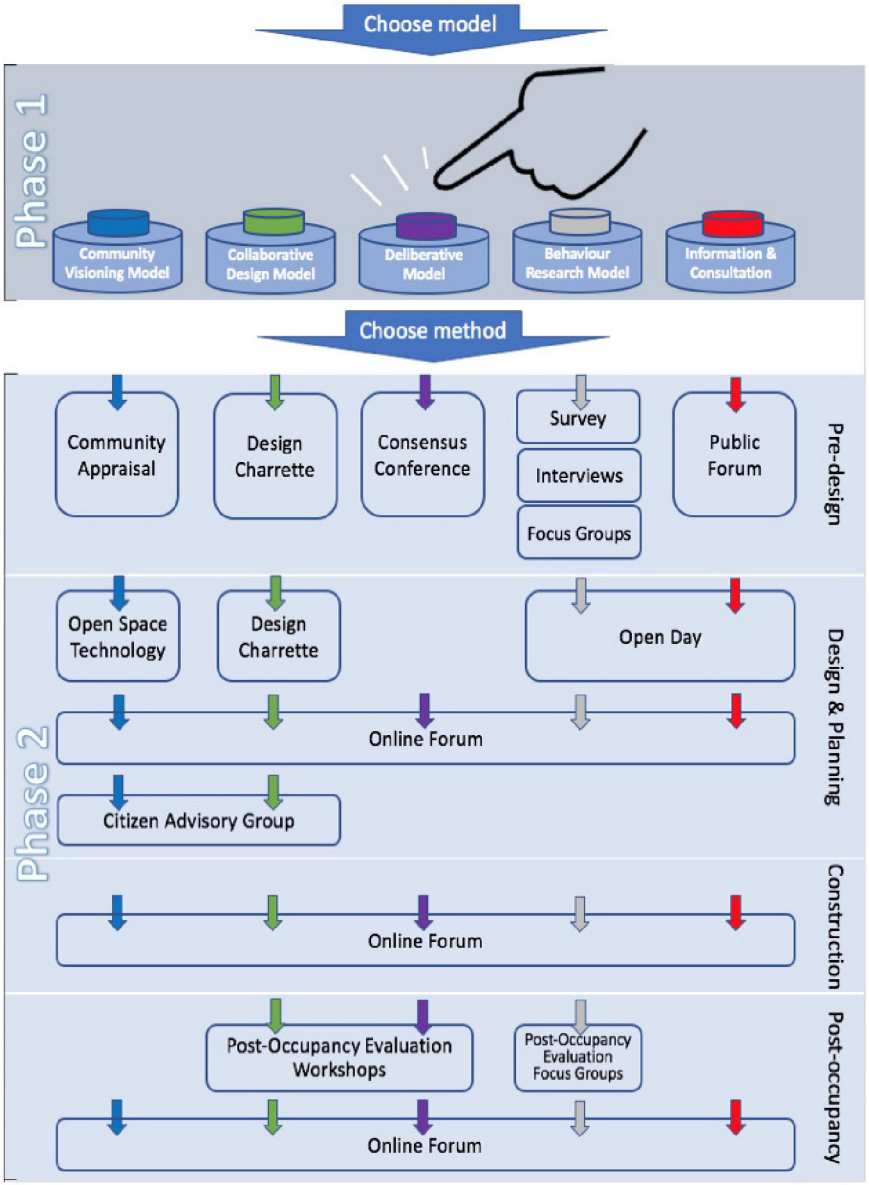


Figure 1: Overview of NewTREND approaches to Occupant and User involvement in design

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The research leading to these results has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement 609222.

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