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# Towards Developing a Framework for User-Driven Innovation in Refurbishment

Towards  
Developing a  
Framework

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## Abstract

**Purpose** – User-driven innovation has been proven to successfully increase the value of products and services in companies with direct linkages to the end-user. The construction industry demonstrates low productivity and innovation performance. In refurbishment the end-users are very visible and can either be seen as an innovation potential or burden. The purpose of this study was (1) examine the level of UDI in refurbishment, (2) develop UDI framework suitable for refurbishment and (3) mapping of UDI enablers.

**Method** – The research design is a case study of renovation within social housing associations, and where user involvement processes have been the primary scope of analysis. The data analysis consisted of the mapping of user-related activities regarding the level of involvement and the extent of power allocated to the end-user in influencing the end product. Additionally, a literature review on UDI has been carried out.

**Findings** – This research validated a possible theoretical implementation of UDI on refurbishment projects. In addition, the research identified present barriers related to the current form of procurement and incentive structures.

**Limitations** – The research was only based on Danish refurbishment projects.

**Implications** – This exploratory research has resulted in the development of a potential new paradigm of applying UDI in the construction industry. This research takes the initial steps towards creating a body of knowledge within UDI in the context of refurbishment projects.

**Value** – This research is pointing towards higher degree of user-driven innovation in refurbishment and in the construction industry in general.

**Keywords** UDI, User-driven innovation, User involvement, User participation, Innovation, Construction industry, Renovation industry, Social housing associations, Holistic value creation

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## 1. Introduction

Investments in social housing are big business (BL, 2017). Society suffers from massive expenses deriving from groups of marginalised citizens. Expenses, being both capitalised and environmental, create socially deprived areas with high crime and unemployment rates. CEPR (2015) has calculated that the total economic annual cost of Denmark having citizens (500,000 people) living a marginalised life is 6.05bn EUR. For each citizen that is demarginalised, the ROI is 2m EUR over a lifetime (BL, 2017). Besides creating social capital, a high return in economic value is generated. As this is recognised by society, social housing receives huge funding for refurbishment projects. In only five years, social housing refurbishment in Denmark accounts for 2.5bn EUR (UIBM, 2016).

Social housing refurbishment often introduces elements of great complexity by aiming to change the composition of residents, thus making an area transformation and raising area attractiveness. Knowledge about current and future user needs is a key to value creation and obtaining project goals. The Danish project REVALUE is researching holistic value creation by working on quantifying subcategories of value, and has illuminated the fact that value can not only be defined as the physical building and the business it generates. A trend is appearing where clients of the Danish social housing associations focus on holistic value creation and creating social capital through refurbishment projects. Turnkey contractors, architects and interdisciplinary process consultants have responded to this trend by focusing business development towards this area and, from this point, benefiting from both offering user related services and branding themselves. They too have recognised the fact that works on social housing is big business and a potential blue ocean emerging from the user involvement trend. This research takes the initial steps towards creating a body of knowledge within UDI in the context of refurbishment projects which adds to the REVALUE purpose of understanding holistic value creation.

### 1.1. User-driven innovation in the framework of the construction industry

User-driven innovation (UDI) has proven successful in increasing the value of products and services in single companies with direct linkages to the end-user, and has both empirically and theoretically been proven to increase innovation and market capabilities in companies (Hippel, 1988, Chesbrough, 2003, Baldwin *et al.*, 2006). The current situation in the construction industry (CI) demonstrates a lack of user knowledge and knowledge on how products and services are in fact used by end-users and, in continuance of this, which needs, desires, wishes, values and practices the end-users have (Wandahl *et al.*, 2011). The project-oriented production behind the business structure of the CI diverts from the successful company-oriented implementation from which UDI originates. As such, the UDI approach is not directly applicable to the CI without further developments.

The CI has poor productivity development and low innovation performance (Lassen *et al.*, 2010). Especially the refurbishment industry stands out in the CI as it suffers from particularly low innovation performance and is characterised by specialised work, low standardisation and a very labour intensive process (Havelund, 2013). Poor innovation ability is a primary cause of the low productivity of the CI (Winch, 2003). Buildings' evolution from simple structures towards high-performance products implies that poor innovation ability also causes the inability of the CI to fully satisfy client expectations (Fischer *et al.*, 2014).

Especially in Refurbishment projects, the end-users are very visible and can either be seen as an innovation potential or as a burden. Naturally, it is, therefore, highly topical to investigate the opportunity of successful adaptation of a classical B2C UDI model to a network-based model fitting the nature of project-based production. Starting with social

housing projects, you must identify, study and develop their mandatory user involvement processes and transform it into the UDI approach. Moreover, the current form of business structure (BS) in the CI is considered. It is discussed how altering innovation processes of the BS will induce barriers to implementing UDI, hereby illuminating the necessity of developing existing organisation forms within the current BS. In this context, it is discussed how Integrated Project Delivery (IPD), that introduces project delivery through a collaborative approach, will dissolve these barriers.

### 1.2. Research Questions

Based on the theoretical report by [Kæseler \(2017\)](#) made as part of the Danish research project “REVALUE”, which is researching assessment and evaluation of added value for holistic refurbishment projects and innovative construction processes, this research presents a study addressing the following questions:

- RQ1. What is the current state of user involvement processes in connection with social housing refurbishment projects?*
- RQ2. Is a theoretical implementation of UDI in refurbishment projects possible?*
- RQ3. How should a model of UDI in a network perspective be developed to fit the construction process?*

Little is known about how to work with and exploit the benefits of UDI in settings highly dependent on network cooperation. This is an essential premise in many industries and, therefore, a necessary extension of the concept of UDI in the construction context. In low-tech/low-innovation industries the managerial and practical knowledge of approaches to innovation is often scarce but recognised as highly important. There is a continuous need for facilitating innovation in such settings.

## 2. Methods

This research builds on the premise that enhancing the ability to innovate within the CI involves several tiers in the value chain of the project. Moreover, a framework of conducting systematic end-user involvement (tenants) in the construction process, i.e. UDI, has the potential to create innovation and enhanced value creation from which all parties benefit.

A UDI-process implies user involvement. Social housing associations have mandatory residential democracy which implies that the refurbishment projects are legitimised by vote of tenants. To explore the potential of UDI within the CI, studies of refurbishment projects in social housing have been conducted based on an exploratory research design with a case study approach.

Seven cases of refurbishment projects within social housing associations have been selected and the end-user involvement processes have been the primary scope of analysis. With generalisability in focus ([Yin, 2014](#)), the case study design was built upon two strategies. Strategy one was based on a “one holistic” single case design in which one extreme case was found that served as the study’s main case. The main case represented an example of a refurbishment project concerning the transformation of a social housing area for it to become safer. In accordance with RQ1, the reason for selecting the extreme case is to clarify current state of end-user involvement. The main case claimed to have an exceptionally ambitious end-user involvement process in which the end-user helps define elements of the project scope. Strategy two was based on a “multi-embedded” case design where seven cases concerning social housing refurbishment were chosen to identify general trends. Here, data analysis was made on multiple units of analysis.

Regarding RQ1, multiple methods were applied to achieve a qualitative contextual understanding combined with an in-depth knowledge of the user-involvement processes that were part of the refurbishment projects. Three sources of data collection were used: documentation at hand, semi-structured interviews and direct observations. Seven semi-structured interviews were held with parties involved in the cases including three clients and four consultants. The question information level was adjusted to the organisational position of the informant, asking questions from a strategic, tactical or operational perspective (Yin, 2014). Activities regarding the end-user involvement process were identified for each case and mapped for further analysis.

To address RQ2 and RQ3, multiple methods were applied in three steps to identify variables necessary for the successful development of an UDI framework compatible with the CI. Firstly, an extensive literature review on UDI was conducted. Secondly, a literature review was carried out on fundamentals behind value creation, productivity, ability to innovate, CI business structure and social housing efforts from a socio-economic perspective. Thirdly, four unstructured interviews were held, all with consultants pinpointed to possess expert knowledge within CI business structures or UDI-processes.

Data analysis was based on the principle of triangulation using mixed methods to enhance research validity. The analysis consisted of mapping user related activities regarding the level of involvement and rating the user involvement processes regarding the extent to which the end-user had power to influence the end product (the refurbishment project). User-related activities were rated according to Merit and Nielsen (2007) graph of user involvement extent. Arnstein's (1969) ladder of citizen participation consists of eight steps going from "manipulation" and "informing" to "partnerships" and "delegated power". The involvement process of each case was evaluated according to the eight steps of the ladder.

### 3. Findings

Firstly, the current state of user involvement processes in social housing refurbishment projects is presented addressing RQ1; secondly, this research's paradigm for implementing UDI in refurbishment projects is presented addressing RQ2 and RQ3; and thirdly, it is accounted for how the UDI process is to be integrated as a part of the project strategy addressing the UDI framework.

#### 3.1. Current state of user involvement processes

The current state of user involvement processes within refurbishment projects of social housing has been evaluated based on the analysis. The end-users (tenants) were mainly used for information gathering, design verification and, to a small degree, idea development. The current state of user involvement processes was found not to contain actual examples of UDI. It was clear that end-user-need information was used as a source of inspiration for the individual project rather than a source of innovation. Based on the analysis, power delegation levels were found equivalent to degrees of tokenism (Arnstein, 1969), which indicates that no actual power is allocated to the end-user. The overall purpose of the involvement process was primarily to create a feel of ownership of the project and, secondly, to create a custom design.

#### 3.2. Framework for UDI on refurbishment projects

Based on an extensive literature review on UDI and the analysis of the current state of user involvement processes in social housing refurbishments, variables necessary for the successful adaptation of a classical B2C UDI model to a network-based model fitting the CI have been identified. Based on these variables, a paradigm of systematic implementation of UDI in refurbishment projects has been created (see figure below). The framework has a



network perspective. Adapting the UDI approach to a construction project transforms the project organisation towards working as an innovation network (Gertsen *et al.*, 2006).

The UDI-framework is illustrated as a logical sequence and a stage-gate model. The process of UDI is in fact an iterative process. In practice, this implies that user activities are to run concurrently with the additional processes of a project. The three tracks of the framework represent activities orientated towards (1) the client, (2) the project organisation and (3) the user.

### *3.3. Business strategy becoming project practice*

The development of a strategy for the UDI process comes down to three fundamental premises: “Why”, “When” and “How”.

“Why” refers to the determination of the strategic purpose of the UDI process. One of the key elements of applying an UDI process to a refurbishment project is identifying the client’s strategic position. The strategy for the UDI process should work as a tactical element serving the project strategy which, again, is a tactical output of the client’s business strategy. Having the client’s business strategy as a basis for the project strategy will lead to an UDI process functioning as a natural integrated element of the overall project. This will influence the choice of which user related activities that are to be applied, the intention of the user involvement process and the level of power delegated to the user to influence the end solution.

“When” refers to the tactical configuration. 1) *Securing project agility*: Traditional project management, based on WBS and transformation theory, is focused on initial planning and eliminating operational uncertainty. This entails making vital decisions at a project stage where the lowest amount of knowledge is obtained (Christensen and Kreiner, 1991). When integrating the UDI approach in a project, it is therefore crucial to incorporate certain amounts of emergent strategy in the project strategy (Barrett and Stanley, 1999) to be able to pursue ideas that arise during the UDI process. Modern PM is about working with uncertainty and identifying it as a future learning potential and as an opportunity for increasing value creation (Christensen and Kreiner, 1991). 2) *Overall planning of user activities*: In accordance with the UDI strategy, categories of UDI methods are selected and mapped into the UDI process. 3) *Securing information infrastructure and establishing UDI-facilitator role*: Transforming the project organisation into an innovation network requires facilitation. Facilitation must focus on establishing an information infrastructure including knowledge management, managing project supply and value chain integration and integrating innovation management in the overall PM – all drivers for catalysing the merging of need information generated by users and the solution information generated by professionals. It is desirable to create an information infrastructure that makes user knowledge accessible to external companies, establishing a direct link to the end-user that in current BS is absent.

“How” refers to the mapping of the content of the UDI process. Based on a user segmentation that maps the types of end-users present and which of these that are suited for involvement, a determination of user roles will form the basis of the work within different specified work areas defined by the UDI strategy. Methods for the different activities are selected in accordance with the level of involvement and the role of the user. Throughout the process, considerations must be made with regard to which form of information output that is to be expected, matching the user role and hereby securing workshop efficiency.

#### 4. Discussion

UDI has successfully been incorporated in the innovation strategy of companies in various industries. Adapting UDI to fit the CI involves developing a framework that runs on radically different premises than those from which UDI originates. There is a significant change in BS, going from traditional production industries towards the project-oriented nature of the CI. The construction project is engaged and managed by a buyer-controlled procurement process. UDI is originally developed in a business structure dominated by a seller-driven marketing model (Kristensen, 2011). Smith-Innovation (2016) defines the overall BS by three elements: form of innovation, form of production and form of organisation. To develop the innovation forms in the BS of the CI, alterations are needed in both production and organisation forms. Throughout this research, it has become clear that UDI, being a new form of innovation, is not compatible with the form of organisation in current BS. Barriers to implementation arise owing to a CI BS with a highly fragmented value chain and an incentive structure bounded by the transactional forms of contracts, leading to sub-optimisation and lack of a holistic approach (Matthews *et al.*, 2003). It is clear that no direct incentive is present for the professionals of the project organisation to contribute to the UDI process, other than according to the terms stated by the contract. This emphasises the necessity of implementing a new project delivery system, changing the CI BS. Integrated Project Delivery (IPD) is a process innovation made for delivering high performance buildings through a collaborative approach. This is done by aligning the incentives and goals of the project team through shared risk and reward, early involvement of all parties and a multiparty agreement (Kent and Gerber, 2010). Implementing the IPD system in construction projects will change both the current form of production and organisation, and will be an enabler of integration of the UDI in the project organisation.

The question is how the UDI process will support the IPD system in forming a BS that supports innovation. Neve *et al.* (2017) has earlier shown that UDI and Employee-Driven Innovation (EDI) has ten overlapping enablers of which IPD supports all except one, a shortlisted innovation process. The framework of UDI seems to be the answer to this shortcoming. The BS of an IPD project enables innovation and the use of this research's UDI process, which also looks like a missing piece in enabling both UDI and EDI in future IPD constructions projects.

#### 5. Conclusion

This research presents the current state of user involvement processes in Danish social housing refurbishment projects. The power delegated to the end-user to influence the end product is equivalent to degrees of tokenism. Users are mainly used for information gathering, verification of solutions and, to a small degree, idea development. The user involvement process is not to be compared with an innovation process given the fact that user input was used as a source of inspiration rather than a source of innovation.

This research has developed a potential new paradigm of applying UDI in refurbishment projects. It was validated that a theoretical implementation of UDI in refurbishment projects is possible. In addition, looking at current procurement and incentive structures in the CI, it is revealed that barriers to implementation are present. A change in business structure is needed to obtain full value through UDI project integration. IPD, being a project delivery system based on a collaborative approach, can be the answer to dissolve these barriers and seems fully compatible with the UDI framework of this research.

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