Research-Led Practice within Architecture through Knowledge Transfer Partnerships

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Abstract—This extended abstract presents a research-led practice design project formed through a Knowledge Transfer Partnership (KTP) to examine how research-led practice when combined with academia through a systematic process, can be used as a tool to generate new knowledge to benefit the profession and build closer relationships between industry and academia. It can be argued that research-led practice through collaborative structures, similar to that of KTP’s can provide the platform for demonstrating the applicability of design research and theories in practice, thus promoting research-led practice within architecture. To demonstrate this, a research-led KTP case study project is highlighted to show how research can be used in practice to benefit the profession, practice and construction industry.

Keywords—Knowledge Transfer Partnership; Architectural Research; Research-led practice; Academic research; Design Research;

I. INTRODUCTION

The professional role of architects has been identified to be under threat for many years [1]. There is a general consensus among academia within architecture that the profession is in need for rigorous research to play a core role within practice whilst acknowledging the impact and contribution of knowledge to justify their practice and articulate the value of what they do [2]. Research within architecture has been prevalent within academia, however many identify that published literature in design research has had a minimal impact on society and that applied research architectural practice has the ability to generate a new body of knowledge through the innovation and real-life experimentations that occur in practice[3]. Despite repeated calls for more integrative and collaborative relationships to be formed between academia and architectural practice [4], very little has been done to facilitate this relationship formally. Knowledge Transfer Partnership’s (KTP) is a UK based programme which aims to combine the knowledge generated within academia into industry practice to stimulate industry-relevant research and innovation. This study examines how research-led practice within the context of universities through Knowledge Transfer Partnership (KTP) projects can provide a tool to bridge the gap between academia and practice within the architectural profession, while being recognised as scholarly outputs.

II. METHODOLOGY

This study uses Frayling’s often cited theoretical design research model of research ‘into’, ‘through’ and ‘for’ design [5]. Research into design explores existing knowledge derived from literature and historical precedents. Research through design is defined as the process of design practice to explore constraints and propositions with the ambition to innovate new design solutions and research for design is the development of artefacts that seeks to refine design concepts generated through design with embedded and new contribution to knowledge [6]. The case study provides an insight onto how design practice from an academic context through a KTP project can better work with architectural practice to look deeper into design issues that traditional architectural practices who do not have the time, money or knowledge to pursue in doing research.

III. CASE STUDY

This project supports the proposition that research-led practice projects can contribute to a new body of knowledge that can lead to benefits for the profession and construction industry. Sylvan Stuart Timber Engineers Limited, who engaged in a Knowledge Transfer Partnership with the Robert Gordon University, are a specialist timber design and manufacturing company providing log timber cabins and homes throughout rural Scotland.

The purpose of the project was to conduct design research into energy and construction to inform and develop a new housing typology for the Scottish market which would expand and form a new product range for the company whilst maintaining their specialist niche for alternative housing typologies. The new housing product would complement the existing manufacturing capabilities that existed within the company and use local home-grown timber supplies. Sylvan Stuart had manufactured and built a prototype house called the ‘Model-D’ house which was constructed to explore this initial development. Even though the Model D house worked very well, before launching the housing product to private clients and the self-build housing market, further testing and design
would be required to ensure the new typology was optimal in terms of design, construction and performance.

The scope of the project was to take the existing model D house prototype which was to be used to test and benchmark improvements against. This formed the next phase of the project to prototype development to product refinement, prototyping and ultimately production. Post-occupancy analysis was conducted using a range of techniques and tools. The methods were:

- Case study review of other affordable housing prototypes
- Thermal imaging and modelling
- Energy modelling and simulation
- Air-tightness testing
- 3D structural modelling

A. Identifying the problem (research into design)

A forensic review was undertaken on the Model-D house to establish performance and component costings to establish a benchmark from which to develop. A cost analysis was carried out with the manufacturer and constructor to establish the cost of the various components of the existing house which identified the two largest components of cost being the building fabric (structure, windows and external finishes) and the foundations.

Through the findings of the post-construction analysis research, the objective of the design work for the project and development of the typology was to further refine the performance of the building fabric and simplify construction. To simplify construction on-site and improve air-tightness, the fabric of the building should be pre-fabricated as much as possible with minimal junctions between structural components to minimise the number of joints within the air-tightness membrane. This form of research into the existing Model-D house design identifies design and construction issues with the existing house and construction methods.

B. Concept Development (research-through design)

A range of design and specification solutions considered and developed. All prototypes were assessed against performance as well as cost and buildability with component cost analysis and through consultations with the KTP industry partner Sylvan Stuart. Refinements were made using 3D modelling software to help understand thermal performance and on-site construction processes better. Energy evaluation software (SAP) was used to simulate the variations in performance based on the design/specification variables explored and determined long-term affordability through annual energy costs predictions. This was a valuable stage in the design process to refine the housing prototype further before constructing another model house.

C. Design outcome and Prototyping (research-for design)

The project followed a clear systematic process of design and development to successfully achieve the projects ambitions. Sylvan Stuart, for a private client, constructed a second Model-D prototype house based on the revised design and manufacturing features developed during the project. From a practice perspective, this project was useful for linking research with practice to create a commercially viable outcome in the development of an affordable housing typology for Sylvan Stuart Limited. With respect to Frayling’s design research theories, the artefact here synthesises the research where research into and through design is demonstrated through the Model-D housing typology. The knowledge gathered from the design process is embedded into the final artefact and through application in the built example and the knowledge embodied within the artefact is disseminated to the real world.

IV. CONCLUSION

This study demonstrates how by adopting a partnership structure, similar to that of Knowledge Transfer Partnerships, between architectural practice and academia can lead the profession in developing their research-led practices in the pursuit of generating a new body of knowledge that is relevant to the industry, while bridging the gap between academia and practice. Academics, whilst having the appetite and skills to conduct research, have the opportunity in such partnerships to “engage in doing design work… directly impact practice while advancing theory that will be of use to others” [7]. In this study the design process impacted on practice, through which the findings can be useful to others. Research-led practice is beneficial to practice-linked projects by developing ‘artefacts’ which are used to generate new knowledge and insights through recognised design research. The case presented is an exemplar project and housing typology where the application and new knowledge gained can be transferred into other housing design projects to advance housing practice and design standards.

REFERENCE