7 Recommendations

This final chapter closes this dissertation and provides recommendations for future research.

Recommendations

From this research several recommendations for future research follow.

Firstly, it goes without saying that bridges must be functional, strong and durable. However, bridges equally need to be beautiful and elegant, no matter how small or how modest the budget. Bridges are meant to stand in the public realm for a long time, a hundred years or more, and are used by thousands of people on a daily basis. In his TED talk the renowned British engineer Ian Firth says "*Nobody will remember the costs or if a bridge was delivered on time. But if it is ugly it will always be ugly, or just dull. Beauty on the other hand enriches life, it enhances our wellbeing. Ugliness and mediocracy do the exact opposite. We become numb to it. It is like institutionalized large scale vandalism*". That is why every bridge, no matter how small or how modest, deserves our fullest attention when it comes to good design that fits the context.

Secondly, it is for the above mentioned reason that bridge commissioners need to make aesthetics part of the design brief once again. We need to embed design in the day to day working practices of those responsible for programme delivery. For that leadership, integration, collaboration, early engagement, sustainability and a user focus must be part of the planning and delivery of our infrastructure. The recommendation is to establishing independent infrastructure design panels at all levels of governance, to act as a design champion and to prepare new infrastructure design principles. All infrastructure projects should be subject to review and consideration by these independent design panels. Authorities need to invest in design upfront. Upfront investment in concept development and design information minimises risk, providing both quality and cost certainty by reducing information asymmetry in the procurement process. Really successful outcomes can be achieved by reframing the brief to think more broadly about how infrastructure could deliver social, economic and environmental benefits, as opposed to a single fix solution.

Thirdly, it is recommended that for every bridge design a chief architect is appointed to fulfil the role of the design integrator throughout the design phase and the building phases. The role of the architect is not to be the omniscient master builder of old, but instead to be the conscience of the design and to direct and tie all design aspects of a bridge together.

Fourthly, an integrated design approach can greatly benefit form modern computational developments. With the current parametric software it is now possible for all parties involved in the design of a bridge to work together in one single computer model, parametrically programmed to facilitate interdisciplinary exchange of information and with the flexibility to make quick adjustments to the design without having to start all over again. In order to make this work we must find a mechanism that stimulates sharing of information and intelligence.

Fifthly, sustainability can be a driver in bridge design projects when approached as part of a fully integrated design process, but should not be seen as a technological gimmick. Instead, the whole life cycle of a bridge must be addressed through a circular approach. Durability of the composing materials of a bridge, and a focus on the residual value of a bridge and of its components, should be part of every design process.

Finally, the most effective way in the long run to improve integral design skills and to enhance the mutual understanding between architects and engineers is through education. It is therefore strongly recommended to invest in cross-faculty multidisciplinary courses and research in the field of design of bridges and all other kinds of civil structures.