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Designing towards the leverage points in an open innovation project for digital urban transport interventions

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Introduction

Public transport provision is a wicked problem (Rittel & Webber 1973), in which many stakeholders have a vested interest in the way the services are delivered such as councils, transport service providers, local retail destinations, advertising companies, and citizens. Many of these stakeholders have quite different views of what a good design outcome is. Transport provision is one of the most complex, politically charged issues for most cities, and increasingly so in many locations, due to physical capacity constraints in developed areas, with already at capacity infrastructure to service the cities growing needs. Digital customer information systems have been seen as a low cost means to improve customer experience on the transport network, while simultaneously improving the efficient use of physical infrastructure. For example, stations and train carriages, through assisting to manage crowds at peak periods or at times of disrupted service. But how can these digital information systems exist within the highly constrained transport environments, where physical space and citizen attention are a highly sought after resource from all stakeholders involved?

Case

An academic research team along with four partner organisations has been tasked with designing 'digital customer information technologies' in transport interchanges in Sydney's inner city that will both improve efficiency of the physical infrastructure and customer experience. This research project is funded by an Australian government funded grant operating between three Sydney universities and four major stakeholders; the local council – The City of Sydney, consultancies ARUP and Grimshaw Architects, as well as the state public transport planning organisation - Transport for New South Wales. The academic and industry platform has regular workshops and a consistent level of participation and support from all stakeholders. The major challenge of the project must be delivered in a way that ensures the decisions and effort be applied to those ideas that are valuable to all those stakeholders in the project. As such the emphasis on this paper is on the social, stakeholder interaction of the innovation platform, exploring the evolution from a system-oriented perspective, demonstrating the complexities, and competing goals of stakeholders in the creation of digital customer information systems.

As the project has developed since August 2012, the academic research team has uncovered inflexibility in the current transport system to experiment with new technologies on the existing network, due to existing contractual and implicit agreements between all relevant stakeholders. Over the course of the project the design focus and aspiration has changed quite significantly due to the repeated interactions with stakeholders and various attempts to prototype and test design interventions at various locations on the transport network. The development of the research has been constant iteration between our understanding of the problem definition and proposing a problem solution (Buchanan 1992) in our unique design context. As described by Nelson & Stolterman (2003 p.98-99), we must embrace adequate design, as we do not have unlimited freedom, resources, information, or time to fully understand the context. In this case, we arrive at an Adequate design through a complex social negotiation between all stakeholders vested in the project. This paper takes a specific case of the design of elements a bus interchange, observing it through the lens of Donella Meadows (2008) – Leverage points, to explain the key pivot points in the direction of our design interventions as we try to achieve an adequate outcome for all stakeholders. Donella Meadow's (2008) *Leverage Points* were developed after a career in system's thinking, seeing patterns across all systems. She describes twelve *Leverage Points*, describing where to intervene in systems. They are ordered from lowest level of effectiveness (12) to highest (1). Once you intervene at a certain level, all levels below will tend to change to adapt to the higher order goal. As an example, let's say a bus driver has a goal (3) 'to be on time', if you change that goal to be 'great customer service'. Bus drivers will modify their behavior to meet that changed goal. They may wait for a slowly walking elderly passenger to get to the bus rather than close the doors and leave. If goals such as this change, the levels below, for example, the information flows (6), and rules (5), must also change, you must now measure great customer experience, rather than just if the bus is running on time. Below are examples of how Donella Meadow's (2008) *Leverage Points* were relevant to the design of a bus stop within the context of Sydney. The focus of most of our recent design work of the bus interchange is between Meadow's (2008), Leverage Points 5-2.

Leverage Point 5: Rules – the incentives, punishments, constraints

The rules of a system define its scope, its boundaries and its degrees of freedom (Meadows 2008). In this case, the rules of the bus stop are set being the incentives, punishments and constraints in operation of the bus stop. These are within existing contracts, and verbal and non-verbal agreements with the state transport provider, the city council, and the advertising organisations that operate the interchanges. Changing these rules takes clear-evidenced cases, targeting changes in the next contractual term, accepting only a small margin to edit what exists. We have no agency to alter these rules directly.

Leverage Point 4: Self-Organisation - the power to add, change or evolve system structure

Self-Organisation is a system's ability to make itself more complex in order to more efficiently achieve its goals (Meadows 2008). The bus stop's system structure is locked in place due to the advertising business model that exists. Ads must be a certain size, people must be able to see the ads, therefore all sides must be glass, there is little flexibility to reinterpret how these multiple goals of the bus interchange can be achieved. We have no ability to re-arrange how the bus stop delivers on this goal. As such, transport information must only take up a small and defined area, so as not to

distract from the advertisements. The system self-organisation that currently takes place is to optimize revenue of the advertising. Others involve meeting disability and safety standards. To intervene at this level would involve pitching an advertising model that re-arranged the system components in order increase the advertising revenue.

Leverage Point 3: The Goals - the purpose or function of the system

The goal is superior to self-organisation ability. The primary goal of the Sydney bus stop is to generate revenue, principally through advertising. In this case the existing bus interchange is limited by existing contracts with advertising service providers. This is the big leverage point – to change the business model of the bus interchange through a new means of community engagement will create freedom for better customer information services to exist at the bus interchange. Design and Discussions at this level, have had much greater traction, and ability for creativity, as a re-prioritisation of purpose, clearly sits outside the contractual bounds of existing shelters.

Leverage Point 2: The mindset or paradigm out of which the system arises

There are unstated assumptions about what a good design/business model for the bus stop. The privatized nature of the advertising centric model forgoes much potential benefit for using the artifact as a tool for community engagement or to promote local businesses as opposed to the current model of large-scale advertising campaigns based at a city-wide level. Paradigms about collaboration between stakeholder groups in open dialogue are also new within this context. The mental models from which the old business model has arisen are what we have to explore in the workshops that we regularly have with our stakeholders. Shared social systems about the nature of reality – are tested when the stakeholders come into contact with each other and the academic research team.

Conclusion

The academic team's backgrounds, which have been mainly technology based, have been tested to lift the level of their conversation to higher levels of intervention just in order to create the space required for the digital information interventions. The design project as such has shifted from strictly product design into what Buchanan (1992), called the 'Fourth area' of Design - exploring the role of design in sustaining, developing, and integrating human beings into broader ecological and cultural environments, shaping these environments when desirable and possible or adapting to them when necessary.

The principal finding of the design activity in this built environment context is that design is not a task of simply creating new – but implementing and finding space to implement adequate design inside a highly regulated, constrained and contractually binding urban space in which many stakeholders currently operate in some form of equilibrium that has come about over the history of the transport system. In order to create space the team has needed intervene in the system at a much higher level above existing contracts, which bind innovation to limited incremental improvements. Urban environments are constrained; as such the competition over what services and systems can exist there is fierce. Competition from public services, retail and advertising compete for attention, foot traffic and financial gain.

Significance and Innovation

Many of the previous RSD3 working papers have discussed abstracted principles about learning overall from multiple projects/theories. This working paper draws a specific link between a case – Sydney’s bus stop design and how it links to Donella Meadows (2008), *Intervention Points*. This working paper establishes a broad theory of work for this type of strategic system-oriented design in multi-stakeholder urban projects. More broadly, reflection will be offered on how to more rapidly identify the opportunities that are available for design implementations in increasingly common highly constrained and regulated multi-stakeholder and transdisciplinary project settings.

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