Understanding Innovation:
An evolutionary social learning model.

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Abstract: VicUrban, the Victorian state government urban land development agency, is showcasing its sustainability credentials in their new 8000-home Aurora Estate. Aurora will have environmental features which, amongst other initiatives, require the use of materials that are more environmentally sustainable. The EcoSelector was designed to guide the builders in their selection of materials. More or less points are awarded, depending on the materials used for the floor structure, framing, wall cladding, roof cladding, fittings and finishes, and landscaping. The builders are required to meet a minimum overall score for a proposed house before it can be approved by VicUrban. The EcoSelector can be seen as an innovation for sustainability within the volume house building sector. The experiences of the people directly and indirectly involved with the development of the EcoSelector are examined to provide a phenomenological basis for theorizing innovation. Schumpeter's (1934) concept of innovation, while identifying habit as a cause of resistance to innovation, fails to explore the phenomenon socially, relying on explanations based on individual differences. An evolutionary social learning model that draws on Vygotsky's (1978) developmental psychology, Bourdieu's (1977) concept of habitus, and Wittgensteinian (1958) thought is proposed to define innovation, and identify its dialectical form.

INTRODUCTION
This paper sets out a framework that lifts the lid on the "black box" (Landau et al. 1986; Nelson et al. 2005) called innovation. It attempts to resolve the lack of a satisfactory theoretical understanding of change (Caldwell 2006). A case study of the development of a tool designed to make builders select more sustainable building materials is presented and analyzed to illustrate an evolutionary social learning model of innovation.

First the paper identifies the relevant debates within the innovation and building literatures. Second, the paper presents the case study, based on the first-hand experiences of the people involved in the development of a tool designed to make a particular master planned community (MPC) more sustainable. Third, the paper sets out a model for understanding the phenomenon of innovation. The paper concludes by considering the literature on innovation in light of the proposed model.

Conceptions of innovation
Innovation is a widely used but elusive concept. Definitions of the term are often circular or *ad hoc* and rarely get further than the common-sense understanding of using something new (For example see Gann 2000). Within the building industry literature that problematizes issues of sustainability, 'innovation' can take on moral undertones, often couched in terms of what 'they' need to do to become more environmentally prudent, and/or to be more customer focused (Barlow 1999; Barlow and Ozaki 2003; Burdock et al. 2001; Crabtree 2006; Dewick and Miozzo 2002). But just what innovation actually is, or what is required to facilitate or cause it to happen, is, at best, disputed but most often ignored or treated as a black box (Landau et al. 1986; Nelson et al. 2005).

The debates within the literature revolve around three themes. First is the form of innovation. Is innovation a continuous iterative process (Brannan et al. 2008; Jørgensen et al. 2006) or is it a discontinuous and radical phenomenon (Schumpeter 1934; Schumpeter 1939)? Is innovation bounded, happening within closed systems, or boundless (Harty 2005)? These debates underpin the second theme, which questions where innovation happens. The locations range from creative and or entrepreneurial individuals (Mostert 2007; Schumpeter 1934; Schumpeter 1939; Watson 2007), individuals interacting, groups, and complex multilevel systems (Watson 2007), creative cities (Berry 2005), knowledge clusters (Pohoryles 2007), networks (Considine and Lewis 2007; Dewick and Miozzo 2004; Garcia-Lorenzo 2006; Marceau 1999; Pittaway et al. 2004), and particular governance structures (Johns et al. 2006). If there is a conclusion that can be reached regarding this literature, it is that innovation is ubiquitous.

The third theme explored by the innovation literature is behavioral, encompassing both positive and negative attitudes and responses to innovation. These studies examine: being open to new ideas and sustaining them (Ross 1974), active group learning (London and Sessa 2007), the role of tacit knowledge (Howells 2002), the freedom and readiness to take risks (Lassen et al. 2006), the role of necessity, and or how crisis can drive innovation (Benn et al. 2006; Krozer and Nentjes 2006), how peoples roles, positions, and self definitions effect their responses (Considine and Lewis 2007), complexity (Mitleton-Kelly 2006), cooperation (Alves et al. 2007), collaboration (Kaltoft et al. 2006; Middel et al. 2006), performance based regulation (Greig 1992; Krozer and Nentjes 2006), the direct involvement by Government, (or the freedom of the market from) (Landau et al. 1986), whether strong leadership does or does not foster innovation (Benn et al. 2006), the 'right' time *vis* wider debates that may facilitate or retard opportunities (Dudley 2005), and the readiness of organizations (Holt et al. 2007) and industry (Crabtree and Hes 2007). This literature implies that innovation can be a function of seemingly countervailing forces. Assuming that innovation can be deliberately pursued, which of these orientations or attitudes is necessary for innovation to be done? Or, are all, or a set of them implicated in the doing of innovation, and if so, why? One is left to conclude that innovation is difficult to do, but why, remains elusive.

The importance of innovation
One of the earliest and most significant engagements with the concept of innovation was by Peter Schumpeter (1934), who placed the phenomenon at the centre of his model of economics. Schumpeter theorizes that innovation is what

> incessantly revolutionizes the economic structure *from within,* incessantly destroying the old
> one, incessantly creating a new one. This process of Creative Destruction is the essential fact
> about capitalism. (Schumpeter 1962) Italics in original.

For Schumpeter, innovation is the creative implementation of the new that takes place against a resistive background of path dependant everyday activity; the circular flow (Schumpeter 1934). While Schumpeter identifies this key contradiction; business as usual / business anew, the mechanisms that he proposes which embody this contradiction are problematic. Schumpeter identifies resistance to

change as belonging to a type of person - all of those that are habituated to the circular flow. Schumpeter sees this adaptation as being both positive and negative:

> The very nature of fixed habits of thinking, their energy-saving function, is founded upon the fact that they have become subconscious, that they yield their results automatically and are proof against criticism and even against contradiction by individual facts. But precisely because of this they become drag-chains when they have outlived their usefulness. (Schumpeter 1934)

Schumpeter makes a convincing case regarding the role of habit in daily activity. He locates resistance to innovation in three spheres: competition with competitors, getting people 'on-board' by convincing them of the merit of the proposed change, and, marketing the innovative product or process. However Schumpeter is not convincing when explaining how these become manifest. Schumpeter declares:

> We neither can nor need go fully into this matter, but will be content to point to the common-sense justification of our emphasis on this difference in behavior. (Schumpeter 1939)

Schumpeter offers the following:

> First,…(r)esistance may consist in simple disapproval—of machine-made products—for instance— in prevention—prohibition of the use of new machinery—or aggression—smashing new machinery. (Schumpeter 1939)

Second, the existing support services that are available may be inflexible:

> lenders readily lend for routine purposes ; labor of the right type is available for them in the right place ; customers buy freely what they understand. (Schumpeter 1939)

Third, people may be wary of the new.

> (C)onsider the possibility of setting up a new plant for the production of cheap aeroplanes which would pay only if all people who now drive motorcars could be induced to fly. (Schumpeter 1939)

In conclusion, Schumpeter defines resistance as inflexible existing conditions and a fear or disapproval of the new. No compelling rationale is provided that might explain the significant difficulties that change engenders. Both of these conditions are unsatisfactory. As far as inflexible existing conditions, while this may be true for part of a market, there are more often than not, high risk-takers that will deliver services that others may not. Indeed, it is hard to conceive of a market that does not operate without companies that service it, who make it their business to exploit innovative opportunities, but are protected from the possible failure of the particular proposed innovation by extracting high returns or having a large customer base. As for a fear or disapproval of the new, Schumpeter's "obvious" example, is, unfortunately not as self-evident as he insists. The destruction of industrial machinery, as carried out by the Luddites and other labor movements, was not about taste but about protecting existing working conditions. These were political acts that sought to hold back innovation so that the workers might maintain the quality of their working conditions and control over their own labor power. As for the supposed difficulty of getting consumers on board, while people may be wary of trading in their cars for airplanes, today's rampant consumer culture seems far from resistant to the new. It is in explaining and taking account of these *agentive* acts where Schumpeter's theorizing is weak.

The antithesis of habitual-doing is embodied in the second type of person inhabiting the Schumpeterain world; the harbinger of innovation, the Entrepreneur. Schumpeter's theorizing of entrepreneurial activity is less resolved than that of resistance to change. Here he offers no concrete examples of the act of innovation, instead he falls back on an almost mystical treatment of the Entrepreneur. Even with the best of planning,

> the success of *everything* depends on intuition, the capacity of seeing things in a way which afterwards proves to be true, even though it cannot be established at the moment, and of grasping the essential fact, discarding the unessential, even though one can give no account of the principles by which this is done. (Schumpeter 1934) Italics added.

> It is, therefore, more by will than by intellect that the leaders fulfil their function, more by "authority," "personal weight," and so forth than by original ideas. (Schumpeter 1934)

Hence, the willful, intuitive leap of faith is the hallmark of entrepreneurial leadership. Without directly specifying it, Schumpeter alludes to the use of power in creating change but offers no reason why Entrepreneurs have or need to use that power and why habituated types do not. Primarily, this failing is a function of Schumpeter's assumption that the difference between those in the circular flow and those working against it - the entrepreneurs - can be explained by individual differences. For Schumpeter these differences are as significant as being tall or short - you are either one or the other. It is in this insistent division of labor that the evidence which Schumpeter marshals is found wanting. Yes, there can be resistance to change, but this is not necessarily about being stuck in a rut, rather it is about being actively engaged in resisting change for a particular reason. Similarly, it is argued

below that pursuing change is not simply a personality trait or an act of will, but a function of trying to create an adaptation to a particular context. Before returning to these theoretical issues, I examine an example of innovation in pursuance of sustainability by a land developer operating in the volume housing market in Victoria, Australia.

THE CASE STUDY
Method
The research was conducted as a part of a project done in conjunction with VicUrban, the Victorian State Government's land development agency, that was designed to examine their inter- and intra-organizational relationships and how these relationships affected their decisions regarding their sustainable housing estate, Aurora. An ethnomethodological (Garfinkel 1967) approach was used. The researcher had open access to the work place and conducted a series of formal and informal interviews with staff and stakeholders involved in the development of the EcoSelector, a sustainable building materials selector. The formal interviews were conducted using a set of standard open-ended questions designed to elicit the personal experiences (Patton 2002) of the interviewee. A document analysis was conducted of relevant documents and the interviews were transcribed verbatim and read for thematic content (Patton 1987). There was a complex interplay between the researchers understanding of the process, the data collected (Kvale 1996), the literature, and the development process of the theoretical model of innovation, developed herein. Space restricts an elaboration of extent of how these relationships played out[1], but it is important to note that research can never be neutral (Foucault and Gordon 1980) and, in fact, is co-constructed (Horner 2003) via elaborate socially sanctioned procedures that creates particular understandings derived from extra-ordinary processes. The following narrative was constructed with the assistance of some[2] of the interviewees who were invited to comment on the parts of the story that directly related to them.

A tool for change: the EcoSelector
The EcoSelector[3] is a building and landscaping materials selection tool that was developed specifically by VicUrban for their Aurora Estate. Aurora is a staged development, due for completion in 2023, which on completion will comprise 8000 houses. Aurora is VicUrban's sustainability 'showcase'. They define sustainability broadly, having adopted and developed a triple bottom line policy framework. This framework is articulated through VicUrban's Sustainability Charter (VicUrban 2006) which is used to evaluate proposals, design projects, and measure the performance of their developments. The EcoSelector dovetails with the Sustainability Charter addressing the specific issue of the impact of building materials on the environment.[4]

The EcoSelector was designed specifically for the Aurora project to provide the builders with information about the environmental benefits of more sustainable building materials, where to source them, and whether there was a cost difference. The EcoSelector addresses two related phenomena; the way builders think about sustainability and, how they do it, that is, the activities of building. Indeed, it is evident in the story of the development of the EcoSelector, described herein, that the resolution of these two purposes, as a means of consciousness raising and/or as a means of changing practice, helped shape how the tool was intended to be used, the manner in which the builders have had to comply to it, and why organizations external to the project sought to intervene.

The issue of the purpose of the EcoSelector, as were other issues discussed by its developers, arose within a particular context that afforded particular constraints and opportunities. These defined both the 'problems' that the EcoSelector designers sought to address as well as the scope or level of innovation that could be achieved.

The constraints included dealing with an industry that is driven by neo-liberal assumptions regarding the operation of markets and consumer choice, as well as being defined by economic pressures that are resolved through Fordist manufacturing and assembling processes. Furthermore, sub-contractual relations define the way the industry operates; from the professionals that design and engineer the estates and houses through to the trades people who assemble them. The land development industry is highly stratified (Charter Keck Cramer 2006). VicUrban and its predecessors manage their work by contracting in the required expertise to do the specific tasks that they require.

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[1] The reader may conclude, on reading this paper that the author does not subscribe to neat objectivist renderings of research, or methods. These methodological issues will be explored in future publications.
[2] Not all of the interviews we completed at the time of writing this article.
[3] A synopsis of the EcoSelector can be found at
http://www.vicurban.com/cs/Satellite?c=VPage&cid=1171606213246&pagename=VicUrban%2FLayout&oaid=1163385910773 , retrieved 15/06/07
[4] The EcoSelector is limited in its scope to the Aurora Estate, while the Sustainability Charter guides all of VicUrban's projects.

The opportunities for the EcoSelector included the growing community awareness of unsustainability, in part driven by local experiences of prolonged drought and bushfires, and, global issues, such as the growing recognition and acceptance of climate change. These changes in the Zeitgeist[5] have contributed to the issue of unsustainability being taken up by government and professionals.

There are several relationships that affected the outcomes of the development process of the EcoSelector. The primary relationships were those arising from VicUrban contracting the designers of the EcoSelector, the Royal Melbourne Institute of Technology University's (RMIT) Centre for Design (CfD), and the builders, whose behavior was to be changed. There were also other pre-existing relationships that were changed by the development process. Those are between the builders and their suppliers and the manufacturers of building products. Furthermore, there were relationships that were engendered by industry representative bodies that sought to intervene with a view to changing the outcomes. These interventions drew in the State Government and its departments who also sought to affect the outcomes.

Pursuing innovation
The creation of the EcoSelector can be seen as confluence of forces, embodied in the actors that came together in a particular place afforded by a particular opportunity. That place was the Urban and Regional Land Council (URLC), one of two government statutory authorities that would later be amalgamated to form VicUrban in 2003. (The other organization amalgamated to create VicUrban was The Docklands Authority.)

The URLC's Aurora project provided the *raison d'être* for the EcoSelector. But Aurora has its own genesis, as did the URLC (eg., Troy 1978). The story of Aurora as a sustainability showcase does not start with a rational or god-like "let's build our sustainable future there". Instead, Aurora came about because the URLC was able to purchase the land cheaply because there were significant problems associated with its development, due to the difficulty with providing connections to Melbourne's existing sewage and storm-water infrastructure. It was the decision to invest in on-site facilities to manage water and waste that led a small team, with the support of the CEO, to be encouraged to 'push the boundaries' regarding what might be achievable for a sustainable master-planned community (MPC). There had been a shift in the practice of dealing with storm-water with many recent MPC's having significant storm-water retention systems. The idea of having local sewage treatment and, as it transpired, reuse, as a part of a more holistic approach to water management, can be seen as a 'logical' progression. However, it was also the broader context that enabled a small team of professionals to explore ideas for sustainability that were gaining currency.

Contexts for innovation
The URLC's Aurora project management group (APMG) worked with a team of about 25 consultants who set out to rewrite what a MPC could be. The goals that were set included six-star energy efficiency (the then, and current, State mandate is five-star[6]), smaller correctly oriented lots for passive solar design, extensive on-site water management and reuse, and sustainable materials. All of this was to be done within the paradigm of a typical privately funded, designed, and built, MPC.

At the same time, other government agencies and private companies were working on other sustainability projects. For the EcoSelector story, an important example of this activity was the EcoHome project, supported by the URLC (and its successor, VicUrban), Metricon Homes, the Building Commission, Origin Energy, City West Water, Melbourne Water, Sustainable Energy Authority of Victoria (SEAV), Hassell Architects, and RMIT's Centre for Design (CfD). This project examined the implementation of sustainable urban design principles into a conventional suburban 'spec' home. The house was designed and built, and continues to be evaluated.

Dr. Dominique Hes, then at the CfD, presented the EcoHome project to the Aurora project team at the URLC. Barton Williams, another key figure in the EcoSelector story, who was with the SEAV at the time, advising the URLC on getting Aurora houses to a six-star energy rating, was also present. Barton's work at the SEAV was primarily concerned with energy consumption, but he, as did many of

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[5] For example it was reported in the Courier Mail http://www.news.com.au/couriermail/story/0,23739,21624334-3102,00.html on April 26, 2007 that a CSIRO survey found 90% of 1800 Queenslanders surveyed believed climate change is an issue vital to the nation's future. Similarly an international poll fund that 69% of Australians said that climate change is a serious problem requiring urgent action even if this is costly and, a further 23% said that it's a gradual problem requiring gradual steps that are low in cost. Only 8% were unsure about whether climate change is a problem, as such no steps should be taken that would have a cost.
[6] http://www.sv.sustainability.vic.gov.au/buildings/5starhousing/index.asp accessed 02/07/07

the other people involved in the Aurora project, had a greater vision regarding sustainability. Jill Lim, a member of the APMG, said that the consultants were unusually excited by the project, with many senior staff attending meetings that would normally be attended by more junior personnel.

The relationships during this period can be described as a coming together of like-minded individuals, supported by their respective organizations, to tackle the issue of a sustainable MPC. The brief for the EcoSelector was drafted in this context. However, it had a contradiction embodied in it which would be a source of disagreement latter on. The contradiction was that the project brief, titled,

> Development of an Embodied Energy and LCA[7] framework

included the following guidelines:

> To provide guidance to the builders.

But also,

> Builders that participate in this housing project will be required to adhere to a strict set of sustainable building design guidelines.

Here, then, are potentially two different purposes for the tool; to provide guidance (advice) or to provide a strict set of guidelines (rules). However, the view of the APMG and the CfD was that the primary purpose of the EcoSelector would be to educate the builders. As such, this was consistent with the 'provide guidance' purpose. The tool was seen as a resource that builders could use to select materials that were more sustainable than the products that they would normally use. This purpose helped inform the initial design for the EcoSelector – known as the flip-chart. However, the 'rules' purpose would eventually transform the EcoSelector into the scoring assessment tool that it became.

The CfD's design process was profoundly shaped by two phenomena; the budget and the commitment of the people involved. First, the budget for the project was a modest $10,000, which was not nearly adequate to develop a scoring assessment tool. However, the way the project was envisioned by the CfD, this was a more than adequate:

> We propose a $10,000 retainer program where we will invoice every 3 month based on the hours spent talking to builders, organising further workshops, and developing the guide. This could be settled by an MOU[8] or an exchange of letters. We do not envisage that all the $10,000 will be required but this will allow a structured resourced framework to develop the project.
> Tasks that will be carried out as needed:
> - talking to builders - hotline
> - adding and updating the guide
> - answering questions
> - working with the government stakeholders on the toxicity and biodiversity issues
> - working with manufacturers
> - workshops as needed
> - developing and maintaining the website[9]

It is clear that the CfD saw their task as information-gathering, sharing, and facilitating better communication between the builders, architects, and building product manufacturers. To this end, workshops were organized where manufacturers could showcase their products to the Aurora builders. Dr Hes saw these workshops as a highlight of the project, although she thinks that the workshops could have been more successful, had the building company's product specifiers been present too, not just the company Principals.

The second phenomena that profoundly shaped the EcoSelector were the commitment of the people involved. It is a feature of the development of the tool that the personnel and the organizations involved had a commitment to the overarching concept. From the EcoHome presentation to the URLC and the SEAV, through to the expert panel drawn together to design the EcoSelector, all were, at the very least, sympathetic to the idea of the EcoSelector, if not out right acolytes.

The idea of information sharing informed the overall methodology that the CfD used to develop the EcoSelector. A group of experts were called in to 'workshop' the idea. It was this group that came up with the basic structure of the EcoSelector which was to breakdown a house into its main assemblies, for example, floor, framing, roof, and to then identify the main materials and products that might be specified for that assembly. Substitute products were then identified that would be more sustainable. In keeping with the idea that providing choice was the critical role for the tool, information was provided regarding any cost differences, the reason that the preferred product was better, and where it

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[7] Life-Cycle Assessment
[8] Memorandum of Understanding
[9] Outcomes from the workshop_final.doc

could be sourced. The products were assessed against one or more of four unsustainability criteria; embodied energy, resource consumption, toxicity, and biodiversity, depending on which were considered the most relevant for the specific product. For example, embodied energy was not considered when rating paints, but toxicity was. Similarly, biodiversity was the key criteria used to consider timber.

The flip-chart design embodied the idea of easy-use. It had features like having the row with the most sustainable product printed against a green background to make their identification easy. A builder could flip to the relevant section, have their eye drawn to the preferred product by the green background, and immediately see the environmental rationale for it, get an approximate cost variation, and be provided with the name and phone number of the supplier. However, the EcoSelector would significantly change from this quick and easy to use format.

With the amalgamation of the URLC and the Docklands Authority into VicUrban in August 2003, many of the URLC people left, possibly as a result of a change in the management style of the new organization, which was more command oriented. For example, the idea 'if I can measure it, I can manage it' became prevalent. Although a reliance on measurement can be criticized because of the 'rubbery' nature of the numbers and problems associated with objectification, what is important here is that this idea became part of the organizational culture and was embodied in the EcoSelector. This meant the EcoSelector gained a scoring mechanism where points were allocated to each product which were a function of the assessment of the product's sustainability credentials. This radically changed the orientation of the EcoSelector from being a quasi-educational tool to being a hurdle requirement for the builders to get planning approval. As a result, each proposed house at Aurora currently requires a report, based on the EcoSelector, which shows that it will meet a minimum score of 100 points[10]. Each of the six divisions within the EcoSelector have a minimum score that is based on the selection of materials and the percentage of the total of that material used in that house.

Fighting for innovation
The idea of 'a minimum standard' is a critical reorientation of the EcoSelector from educative to requirement. It is this shift that opened the door to criticism from the industry bodies that felt threatened by, what they perceived as, unwarranted regulatory discrimination against their products.

As a guide, the flip-chart was indicative rather than absolute. However, the flip-chat was, at best, indifferent to the use of Australian native hardwood timbers, having the 'green' flooring option being concrete with recycled aggregate and waffle pods.[11] Furthermore, while the flip-chart identified Forest Stewardship Council (FSC) certified timber as acceptable, no non-plantation sources were, or are, available in Australia and plantation sources are limited. Thus, all Australian native hardwoods logged from forests are not included in the flip-chart. With the shift of the EcoSelector from guide to requirement, the timber industry saw it as a threat to its market, despite, what they argued, are sustainable government-regulated forestry management practices. The timber industry was particularly troubled by what they perceived as a bias in the EcoSelector against the use of Victorian native hardwood timbers. This debate raged, embroiling the Victorian Association Forestry Industries (VAFI), VicForests, and the Timber Promotion Council in a protracted dispute with VicUrban and the CfD. Also involved were the Department of Primary Industries, Department of Sustainability and Environment, Sustainability Victoria, the Building Commission, and the Minister for Major Projects.

The pursuant imbroglio saw criticism of the methodology used by the CfD, the sustainability of the State governments' hardwood harvesting policies and practices, a scrutinizing of the relative merits of two different timber certification schemes, and accusations regarding restrictive trade practices.[12] This issue is now resolved through the recognition of certified timbers (Wallis et al. 1997) by the EcoSelector, although it is interesting to note that while FSC timbers are specified, Australian Forestry Standard (AFS) timbers are 'allowed' but not yet specified.[13] In an interesting return to the original brief for the Aurora Materials Selector, the idea of life-cycle assessment is now firmly back on the table with a working group looking at the issue from an industry-wide perspective, not just that of one project.[14]

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[10] In 2007 the minimum score went up from 80 to 100 points.

[11] Waffle pods are polystyrene blocks that create voids in the slab, reducing the volume of concrete.

[12] The threat of legal action is a weapon that is being used regularly against environmental groups, even when a case may have little or no merit. See Walters, B. (2003). *Slapping on the writs: defamation, developers and community activism*, UNSW Press, Sydney.

[13] Manufacturers can apply to have their products included in the EcoSelector

[14] It is fascinating that LCA was fore-grounded in early discussions during 2002 but was not actively pursued, but now, after the intervention of VAFI and others, is now likely to be the preferred methodology for future work in the area of materials selection.

To summarize, there is a discernable interplay between competing agendas in this story. There was the early didacticism preferred by the CfD. There was the new managerialism at VicUrban exemplified by the 'if I can measure it, I can manage it' attitude. The result of this struggle inadvertently opened the door to other forces like the timber industry which, in turn, embroiled other governmental bodies. All of this took place against a growing consciousness regarding unsustainability within the community, professionals, and government.

This interplay of forces saw the EcoSelector go from being an easy to use guide to a hurdle requirement for the builders. These forces were also responsible for changing the way in which the EcoSelector would be used. For example, early prohibitions against the use of rainforest timbers at Aurora have been dropped although they are still discouraged. Other fine tuning also occurred. Up until recently the minimum score for the flooring could not be met by a timber floor, even if the timber specified was not harvested from forests. So, what we have is a series of often unforeseen interactions coming about through the actions of various people on behalf of various interests. This led to the EcoSelector not only changing but being a catalyst for further industry-wide investigation and the possibility of change.

(RE)THEORISING INNOVATION
The story of the EcoSelector is illustrative of Schumpeterian innovation at two levels. First, there is evidence of resistance. The timber industry was hostile to the EcoSelector because of a perceived threat to member's livelihoods. Also there were subtler resistances too. The CfD was not happy with the reorientation of the EcoSelector from educative to requirement. However, none of these resistances were a function of a fear of the new nor being stuck in a rut. The timber industry fought to protect their interests and the CfD saw their role as being of most benefit, in the long term, if they could change the builder's values via teaching.

Second, there are clear 'entrepreneurs' in the story. However, they are not one or two willful, intuitive individuals making leaps of faith. They are many 'fellow-travelers' who exploited the context that they inhabited by setting and implementing agendas for change. It is noteworthy that the CfD's preference for an educative rather than mandatory tool is indicative of path dependency on their part; located within a university, one expects a commitment to education rather than compulsion.

Thus, there is evidence of a struggle to innovate that takes place within a particular context that was enabling but that also engendered particular resistances. But, the question of how are we to theorise this struggle for innovation remains. Clearly the struggle was political - competing interests sought to affect the outcome. The VAFI was convinced that the process for developing the EcoSelector had been captured by the Wilderness Society seeing evidence for this in a 'lack of methodological rigor' on the part of the CfD.[15] However, the lack of rigor has another, more plausible explanation. The CfD intended to educate the builders. As such, they provided them with information rather than a definitive best product based on a full life cycle assessment. While the initial scope of the project to deliver the EcoSelector specified doing an LCA, this was never funded nor attempted. The CfD was left flat-footed on this issue and cobbled together a response to this issue by claiming that they used a Delphi methodology.[16] This claim seems retrospective, having never been mentioned in the initial conceptualization of the project and, plausibly, a defensive response to an attack on the EcoSelector by VAFI. Hence, see here there are elements of a battle, rather than a simple resistance to innovation on the part of a body or person. Resistance is a shifting phenomenon; a response to a perceived or actual threat. In some ways this particular aspect of the struggle around the EcoSelector is obvious given the historical antipathy of the timber industry to the environmental movement. But in some ways this fight regarding timber certification, which continues to this day, is peripheral to the stated target of this innovation - the behavior of the builders. In addition, there were other peripheral effects of the EcoSelector.

The EcoSelector was specifically designed for a particular project, the Aurora Estate. Yet, it was adopted by architects who had no role in Aurora or VicUrban. Other less targeted effects included changes to some manufactured products and the supply of others, previously unavailable on the local market.

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[15] The Wilderness Society has waged a long-standing campaign against the harvesting of native forests in Australia.
[16] Delphi methodology is designed to facilitate discussions between remote or estranged people and is a facilitated round-robin process.

Changing the behavior of the builders at Aurora was the overt function of the EcoSelector. Although there were some teething problems, the builders did not resist and complied. However, this is not to say that the builders were converts to environmentalism and adopted the most sustainable options at their disposal. While the builders interviewed thought it was a good idea to pursue sustainability, none of the more sustainable products or processes included in the EcoSelector that required a change to pre-existing building practice were adopted. However, there is no evidence to say that the builders were reluctant participants. One of the builders who pulled out of the project after two years of work with no return, did so for financial reasons, yet still believed in the sustainability goals of Aurora. To understand this anomaly in the level of adoption of best products, a more explicit elaboration of the proposed theoretical model follows.

An innovative model

The model proposes that innovation is best understood as learning/adaptation, which is a socio-cultural process. Vygotsky's (1978) model of development proposes that humans develop through a dialectic relationship with superior others. Importantly, Vygotsky described the nature of the relationship necessary for development to occur. This he called this the zone of proximal development which arises when a child, who has previously acquired the appropriate foundational skills, is presented with a new lesson. Language and meaning are acquired through reciprocal interaction and are built upon by developing (adapting) individuals in an additive manner.

The process of social adaptation habituates the individual. These habituated 'lessons' are socially-determined forms of activity, meaning, and language of a given group.[17] Bourdieu's (1977) concept of habitus alerts us to the fact that our class, gender, and other identifying attributes, once habituated, establish our tastes, values, practices, and predispositions However, there is a tendency for habitus to be considered overly deterministic; conceiving of humans as enculturated automata. Nevertheless, this can be resolved if we consider the function of habit.

As Schumpeter (1934) noted, habit has an energy saving function; we don't have to think about every-day activity, we don't have to ask ourselves what our values are before deciding on how we should respond to an issue, we don't have to ask our family what we like to eat when we want 'soul food'. We don't have to think about the bio-mechanics of walking prior to taking a step, nor, if I am a carpenter, do I need to consider or test the force of the blow of my hammer to drive the nail home. We are all masters of a myriad of activities that we deploy without thought every moment of the day. The pay off of not having to think-to-act is attentiveness - being able to respond to and to seek extra-ordinary changes in our social relationships. Not having to attend to the complexities of every-day existence frees us twofold: it enables attendance to unexpected changes in our material, cultural and social surroundings and it allows us to engage in activities that extend our abilities. These activities include, but are not limited to, being creative and innovative.

Another aspect of habit is that it engenders faith. To be able to act habitually requires faith that the activity that we are doing is not risky. If we could not rely on habit to be safe, it would be maladaptive. Wittgenstein (1958) framed this problem in the context of rules, and while it is clear that we have rules that we follow blindly, we are not subservient to them (Sharrock and Dennis 2008). Wittgenstein in considering the role of rules and doubt said:

> But that is not to say that we are in doubt because it is possible for us to *imagine* a doubt. I can easily imagine someone always doubting before he opened his front door whether an abyss did not yawn behind it, and make sure about it before he went through the door, … but that does not make me doubt in the same case. (Wittgenstein 1958: Remark 84) Italics in original.

Wittgenstein demonstrated that while we *may* doubt, there are certain things that we tend not to. Doubting is almost the opposite of what humans do - our default state is faith. To have faith is not to question whether there is an abyss awaiting us every time we open the front door. From the perspective of Vygotskyian development, this faith is neither blind nor ignorant, but the effect of trusting what has already been learned. Faith is the not-having-to-think that comes from mastery.

In conclusion, we are culturally inscribed so that we might act in culturally appropriate ways. However, our habituation does not induce stagnation, but frees us to attend to and create change. The changes that we create are not akin to random mutations but are bounded by the possibilities of our habitus. The habitus not only provides us with our practices and values but is a repository of all existing

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[17] Group membership is multitudinous. We belong to different classes, genders, ethnicities, professions, churches, etc. As such, we have a repertoire of behaviours that we can deploy at appropriate socially determined events.

practices and values. A powerful source of adaptation is introducing a practice or value from one habitus to another. This is innovation.

Schumpeter (1934) rightly puts innovation centre-stage when considering economic growth. However, he errs in limiting innovation to the field of economics and in how he attempts to deal with the difficulties of doing innovation. Schumpeter's problematic defines these difficulties in terms of individual differences rather than relationally. This leads to the construction of villains and heroes in the Schumpeterarian world; those that strive for change and those that resist it. The model, elaborated herein, offers a more subtle analysis of innovation, based on a problematic that is dialectical. This model socially constructs actors, habits, and the process of change. However, there is a final piece in the puzzle, that of the social construction of context.

Staying with ecological metaphors, the contexts that we find ourselves habituated to, which can also change, can be considered niches. Niches are the necessary relationships that sustain, define, and challenge life physically and culturally. These are socially defined activity systems that we habituate. The particular activity systems that we are exposed to depend on the social and cultural positions that we are born into and or adapt to. Niches are not merely theatre-like stages on which to act. They are resistive, facilitative, and agentive.

Resistance is universal; it is an inescapable aspect of reality. At its most basic, resistance is relational; it is defined by the force required to change a relationship; to tip the balance. Resistive relationships include those between us and the ground upon which we walk and social structures; the determining forces that define activities, like, work and reproduction. All of these resistances are mediated by the habitus. However the habitus, while resistive, is also facilitative.

The facilitative function of our niches contradicts the Schumpeterarian rail embankment. While the rail embankment causes the train to travel a particular route, it nevertheless could be used in an innovative way; as a ramp for a motor cyclist to jump over the track. Thus, our niches can be seen as providing particular affordances that we may or may not utilize. They engender both habit and innovation but how we respond to a particular affordance, while fundamentally open ended, nevertheless, is likely to be dealt with as we have dealt with it previously. Furthermore, how we respond to the rail embankment is a function of our relationship to it – either as a train passenger, or as a dare-devil.

Our niches are also agentive in as much as we may need to respond in a non habitual way to a changed relationship. Such changes may be brought about by acts that are intentional and purposeful, or unintentional but still purposeful, or unintentional and un-purposeful. The intent or purpose of the actor is unimportant, what is important is that the change in the relationship demands a response beyond that which is already habit. As such, while a tsunami cannot be said to have intent, it nevertheless has power and effect. A tsunami has agency in as much as it engenders particular behaviors and or adaptations to survive. The point here is that agency, while traditionally assuming intentionality, is, in its basic form, simply responding to change in an already habituated relationship. Latour (1987) shows that it is through resistance that we construct the nature of things, and once known, these things are actants. Actants can be said to have agency in as much as the offer resistance, an in their resistance they must be agentively dealt with, up until such time as they become normative, sinking into the habitus, no longer requiring attention.

Because niches are relational, they are not bounded; they are multi-dimensional and overlapping. A person's habits can be said to be made up of numerous activities, all of which are a function of relationships with others, that set up the conditions of the habitus.

In conclusion, agency is a response to a change in a relationship, which is defined by our habitus. However, while our niches are dynamic, our responses to them are fundamentally stable and habituated. Every day we operate in a 'business as usual' state - doing the acts that we can do without requiring attentiveness. These activities have the status of faith; 'knowing' they are true and correct, without having to think about them. Figure 1 illustrates that when a change in a relationship is encountered, there is a potential for change in the habitus. This challenge to the already habituated/learned engenders a Vygotskyian zone of proximal development (ZPD), a particular relational space defined by agency rather than habit.

Figure 1   The potentially adaptive role of agency
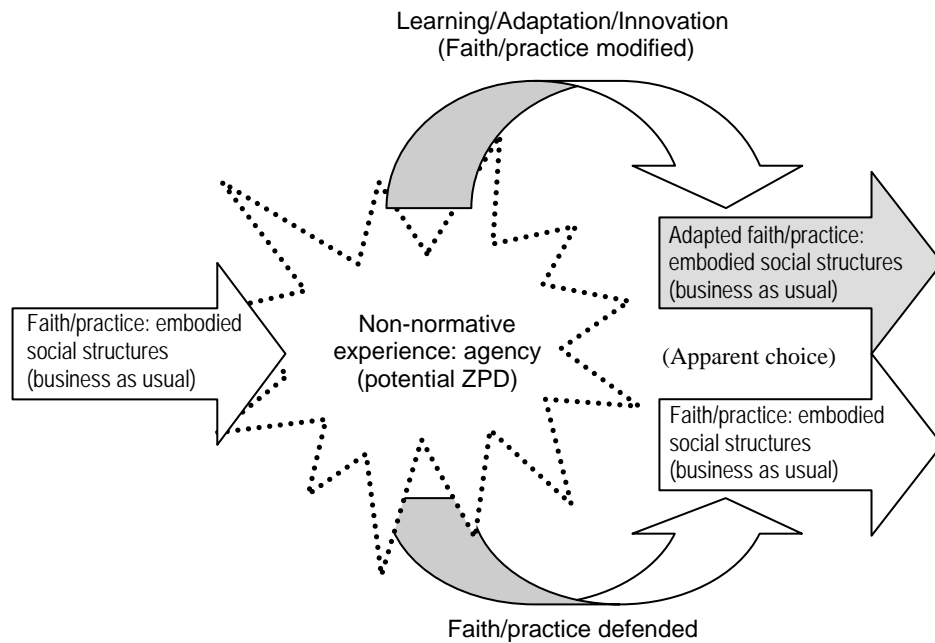
When we are in a ZPD we can respond to the challenge of the changed relationship in one of two ways. If the change required is in keeping with already habituated activities, then there is a high likelihood of learning/change. However, if the change is not in keeping with what we already can do, we are likely to defend what we have faith in and reject to proposed change.

CONCLUSION
When reviewing the literature, innovation seems both ubiquitous and difficult, but paradoxically, elusive. Schumpeter built his economic theory around innovation, and while identifying habit as a significant brake on innovation, his analysis floundered on the idea that individual differences account for the dialectical nature of innovation. The social learning model, developed herein, proposes that we are all habituated to particular social niches that define our likely responses to particular challenges, either defending what we can already do or seeking to build on what we 'know' to be right. From the perspective of this model, innovation is the agentive pursuit of a further adaptation to a particular habitus. As such, innovation is a socio-political phenomenon, pursued and resisted by groups defined by their differential habitus.

Evidence for this model is found in the development of EcoSelector. There was a clear agenda for change being pursued, not by an Entrepreneur, but by people whose habitus included an awareness of, and professional commitment to sustainability.   This habitus underpins the activities of organizations like RMIT's CfD, but can be seen in other places too. VicUrban, and their predecessor, the URLC provided a space for this habitus, which allowed for the conceptual framework for Aurora. Other professionals, with similar beliefs came on board, demonstrating the fit between their habitus and the proposed project by attending meetings that, for a more run-of-the-mill project, they would not have gone to.   Hence, we have an alliance of different organisations that pursued innovation for sustainability.

The EcoSelector was perceived as a threat to forest industries' activities, who then fought to preserve their habitus. Interestingly, the builders themselves did not perceive the EcoSelector as a threat and complied with its requirements. However, they did not pursue the most innovative options. This can be explained by a willingness on the part of the builders to make changes that did not cause a significant shift in their practice. The builders were able to comply with the EcoSelector by replacing a less sustainable product with a more sustainable one. This meant that, with the exception of the supply chain needing to change, the actual practices of the builders did not. A more sustainable brick replaces a less sustainable one, less toxic paints are used, but they do not require, for example different techniques.

While the EcoSelector did suggest superior products and systems, like a compressed strawboard interior wall system, these were not adopted. To do so would have required a significant change in a

range of existing practices, from design, to sepcification, and installation. Because this product requires changes to the habitus, rather than complying with it, they were not adopted. Similar 'small wins' occurred with some suppliers. A door manufacturer started making a rainforest timber free door range, where none had previously been available. Changing a type of timber within the frame of a door is also an easy change as it does not require activities that go beyond those already a part of the manufacturer's habitus. Another manufacturer making a less toxic craft board also made a change in keeping with their habitus. They were making the craft board in Australia, but not selling locally; exporting all that they produced to Japan. As a result of the craft board being specified in the EcoSelector, it came onto the local market.

This model also accounts for the unforeseen take up of the EcoSelector. The architects that found out about the EcoSelector who asked to use it, while having nothing to do with VicUrban or the Aurora project, have a habitus concerned with sustainability and the built environment. This orientation made them eager for tools like the EcoSelector, even if the tool is not specifically designed to meet their needs. This sort of adoption is indicative of our agentive pursuance of innovations that extend our abilities.

Where change for sustainability fits with existing habitus, this will be pursued or, at least, accepted. However, changes that are not in keeping with the habitus will be resisted. For those targeted by the EcoSelector, that is, the builders, there is evidence of some change. However, the boundary conditions of their habitus, in particular, minimising financial risk, meant that they have not made the jump to sustainability for sustainability's sake.

The model sheds light on some of the issues raised in the literature regarding innovation. The form or scope of innovation is not limited by an arbitrary boundary, like a market or economics, but is a function of the perceived adaptiveness of the particular innovation by a particular habitus. The limits of a particular innovation are not set by the innovators but by the habitus of others. The intent of the EcoSelector was to affect activities of the builders and, from this perspective, it is a bounded phenomenon. However, without a crystal ball one cannot predict who else might find the innovation useful. The issue of boundaries, when considered from a relational perspective, makes little sense as the idea of a boundary presupposes an edge condition of a thing. Innovation is not a thing; it is the process of adaptation. It was the agency of the Architects that had nothing to do with the project that saw them seek out and use the EcoSelector.

The literature identifies a multiplicity of factors involved in innovation. These can be accounted for if one considers that they are a function of the resistances and pursuance of countervailing habitus. The initial development of the EcoSelector was smooth. There was agreement as to the form and purpose of the tool. This changed when the educative focus of the EcoSelector was broad-sided by the change in management style at VicUrban. This unexpectedly engendered significant resistance from industry bodies that saw the EcoSelector as a threat. In this case study there is evidence of tacit knowledge[18], cooperation, risk taking, necessity, the importance of self definition, collaboration, performance based regulation, a readiness of the organisations involved, strong leadership, and 'good' timing. But are these ingredients that can be added to the recipe of innovation? No, they are, again, relational phenomenon that are elicited by the innovation process. They are not things but the responses of actors drawing on the tools that the have at their disposal (habituated) that are deployed in a bid to extend or protect their habitus.

Innovation is a universal phenomenon, driven by the dialectics of life. These relationships are in flux and change over time. Timing is important and certainly in the case of innovating for sustainability, the current worldwide engagement with this issue sets the stage for significant change. There has been a marked increase in public, professional, and governmental awareness of the need for significant change. These changes while, at first glance, may seem to be 'just' rhetoric, they nevertheless are legitimate processes like the development of the EcoSelector that start to shift practice; that is objective change. It is yet to be seen whether the continuous innovation demonstrated by the builders is quick enough to address the impending environmental crisis, or whether more radical change is required. It is noteworthy that developers are now calling for regulation to force the industry to become more sustainable (Brockie 2008). In a highly stratified industry, this represents one, albeit important, shift in practice. If actions speak louder than words, then the question of habit must be given at least equal consideration to that of rational ideas.

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[18] According to the model, tacit knowledge is part of the habitus.

Innovation does not happen randomly, nor does it happen because it's a good idea. Innovation happens when people pursue advancement of their habitus, and when the context supports the activities of those people. Furthermore, the innovators must be able to overcome the inevitable forces that will resist change.

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