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"TAKE CARE OF THIS HOUSE" - AFFECTS MATTER IN CONSTRUCTION INNOVATION

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Discussion of affects and emotions remains notably absent within studies of innovation, not least in construction. Most innovation studies in construction adopt a rationalist approach where innovation implementation is a function of cost-benefit calculations and deliberative management support. Even in those studies that do consider innovation as the result of complex interactions between people, ideas and technologies, such as those inspired by Actor-Network Theory (ANT), it is often presumed that the network builder is a rationally calculative actor. However, a growing body of research across the social sciences, including the margins of ANT, has shown that innovation is shaped by emotions and affects. To examine these themes our research addresses an experimental zero-carbon housing project to show how innovation implementation is influenced by a rich affective tapestry of love, pride, hope, fear, greed and annoyance. Understanding such affects, and their socio-material conditions and power relations, may help us further address the complexities of innovation implementation.

Keywords: innovation, emotion and affect, materiality sustainable construction

I was given a visit, by the site manager - I will call him Bob, of a construction site for a zero-carbon housing (ZCH) development, to investigate the success of innovation implementation on this project. From what I'd been told by the project manager, the development, a complex project using multiple innovations to lower carbon emissions in use, had been considered very successful by the company, as well as by the government. Little did I know how special this site was. The site itself announced it: the site manager's NHBC 'Pride in the Job' award was displayed at the site entrance, next to his picture, for all workers and visitors to see. Entering the site office, I was once again reminded of it through the dozens of similar awards covering the wall from top to bottom - all in his name. Then, as we walked on the tour, I started to get a sense of what 'Pride in the Job' might mean. While Bob was explaining the ways different innovations were integrated in the houses, I witnessed him pick up trash on the ground and dispose of it in the appropriate bin; check that one innovation he was showing us - AirTape™ - was correctly applied to the window frames, without bubbles; inspect a door and phone someone to ask them to come and get it cleaned; interrupt two subcontractors to discuss an issue with wardrobe installations in another unit; spot another worker from afar and ask him for an update on his work; inspect another person's work and ask him to make sure the nails were fitted properly;

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comment with humour on the damp, crumpled state of a professional drawing a worker was holding. While we were visiting a finished house being cleaned before delivery, I saw him wipe dust off a faucet, and re-tick a grey-water label on which the ink had faded. All these small acts, witnessed over a one hour period, made me wonder about the role such a level of care on the construction site, and pride in his job, could have on making innovations work in a complex environment.

INTRODUCTION

Most studies on innovations in the construction industry, and elsewhere, adopt a rationalist approach where the emotional and affective dimensions of innovation implementation are not discussed at all or glossed over (Drejer and Lund Vinding, 2006; Dubois and Gadde, 2002; Hartmann, 2006; Dulaimi, Ling and Bajracharya, 2003; Gambatese and Hallowell, 2011; Gajendran *et al.*, 2014). And yet, the relevance of emotions on the construction industry has been acknowledged, not just in terms of employee wellbeing (Haynes and Love, 2004), but also the role of emotions in achieving project success (Dainty *et al.*, 2005). Beyond construction, emotions have been shown to play a key role in innovation, whether enabling future innovative projects (Shepherd and Kuratko, 2009) or firm creativity (Amabile *et al.*, 2005; Baron and Tank, 2011). Moreover, sociological studies of innovations in construction, while not focusing on emotions, stress the importance of moving beyond seamlessly rationalistic and linear control approaches to innovation implementation to engage with the "messy, complex and dynamic realities of construction activity" (Harty, 2008:1038). Such an approach is crucial if we want to move beyond a sanitized view of innovation as a rational, linear activity, which offers very little purchase for practitioners looking for relatable insights into their practice. While Harty and others (e.g. Linderoth, 2010) advocate Actor-Network Theory (ANT) to apprehend the complexities of construction innovation, classic variants of ANT (e.g. Callon, 1984) struggle to address how innovations travel across more fluid contexts. This said, some ANT studies have shown that technologies can be successful because they can be adapted rather than stabilised in advance of their implementation. Notably, these studies have suggested that this adaptability is accompanied by a 'love' for or 'care' of the innovation (De Laet and Mol, 2000; Latour, 1996).

Our purpose in this paper is to explore the significance of this affective life in innovation through the example of housebuilding, specifically a 'zero carbon' pilot project. This paper is organized into three sections. First, we discuss the predominance and limitations of rationalist approaches to construction innovation. Then we introduce innovation studies that have addressed emotions and affect, before considering the potential for ANT studies of construction in particular to address emotions and affect as part of the messy socio-technical process of innovation implementation. Finally, we empirically elaborate on the potential of our approach through an analysis of the role emotions and affect in construction innovation.

Beyond A Rationalist Approach to Construction Innovation

Innovation studies tend to assume (and produce) a calculative, cognitive, rationalist human subject. These studies attribute the shortcomings or successes of innovations in the construction industry variously to management activities (Drejer and Lund Vinding, 2006), organizational structures (Dubois and Gadde, 2002), and environmental variables (Hartmann, 2006). Studies that do mention less determinate human behaviours, such as motivation, tend to rationalise them into 'expected goals' and 'main objectives' (Dulaimi, Ling and Bajracharya, 2003). Even as innovation

studies have registered socially complex humans as shaping innovation implementation, these accounts focus on the deliberate calculations and rational cognitions, mostly of senior managers (Gajendran *et al.*, 2014; Gambatese and Hallowell, 2011).

In short, the role of emotions and affects remains underplayed in most cited studies on innovation in construction, indeed more widely innovation studies possess a “unidimensional focus on the rational aspects of human behavior” (Choi *et al.*, 2011:108). And yet, studies have shown how understanding and processing strong emotions - such as the grief of a failed project - can improve the outcome of future innovative projects (Shepherd and Kuratko, 2009). Equally, positive affects has been linked with creativity, in turn impacting organizational innovation (Amabile *et al.*, 2005; Baron and Tank, 2011). Paralleling these nascent theories of affect and innovation, sociological studies, especially those mobilizing ANT (e.g. Harty, 2008; Linderoth, 2010) have challenged the idea that the uptake of innovation is a function of their innate viability or efficacy, but rather dependent on complex social-material negotiations.

Consider the installation of an innovative Photovoltaic (PV) panel on a house. ANT suggests that for this technology to produce a predictable amount of electricity given a certain amount of sunlight (to be considered a 'successful' innovation), a network has to be organized, comprised of other actors defined, enrolled and aligned towards this goal. These actors include humans - engineers, contractors, end-users, planners, policymakers - and non-human actors - the sun, planning policies, overhanging trees, the internal electricity circuit, and feed-in tariffs. This process where actors and their interests are defined and aligned constitutes an 'actor-network' - PV - whose predictable agency is the result of its relations. PV thus becomes capable of being implemented on multiple sites, a technology in which the relations between actors that render it mobile and successful are folded inside this predictable 'black boxed' actor (Latour, 1987).

A 'blackboxed' innovation, like PV, can travel across space and time, or be successfully 'implemented'/'used' elsewhere, as long as its network holds firm not because it is rationally judged as useful, - the actor-network is "only as strong as its weakest link" (Latour, 1987:121). ANT is thus suggestive of a significant problem within the context of construction innovation: some of the critical actors involved in implementing innovations remain incredibly difficult to know or enrol in advance, using the sort of calculative, even Machiavellian, network building techniques described by Callon (1984) and Latour (1987). For example, Latour (1987) discusses how one can align the goals of actors by asking them to make a detour through your technology in order to pursue their own goals. However, in the case of construction - sub-contractor fragmentation, the ephemeral nature of projects, and the practical challenge of management monitoring on site - renders attempts to fully know in advance let alone control the panoply of actors (sub-contractors, suppliers) involved in innovation implementation, via mechanisms such as goal alignment, and accompanying surveillance and bureaucratic control, highly problematic (Green, 2006; Thiel, 2013).

And yet innovations, even those that are highly disruptive, clearly do sometimes still travel across building projects and are successfully implemented. Some ANT studies of innovation are suggestive of the idea that emotions and affects may be significant conduits for processes of enrolment in such uncertain domains. De Laet and Mol

(2000) offer the example of a bush pump used in rural Zimbabwe. They show that the long-term success of the innovation to travel through time and space corresponds with the fluidity, rather than stability of its network, such that the handle, for example, can be replaced by a piece of wood. This fluidity is said to mediate the care and love circulating among the actors involved with the pump, which "must seduce people into taking care of it" (De Laet and Mol, 2000: 235). Similarly, the failure of innovations to travel can be attributed to lack of love and care: Latour (1996) uses ANT to explain how ARAMIS, the abandoned personal rapid transport system in Paris in the 1980s, never came to fruition. For him, the key element to ARAMIS' demise was the assumed maturity of the innovation, which for Latour is indicative of a lack of love for innovation research: "you still don't love research. Its uncertainties, its whirlwinds, its mixed character, its setbacks, its negotiations, its compromises" (Latour 1996: 293). Despite these affective ruminations, these ANT studies of innovation fail to develop a conceptualisation of the relationship between affect and innovation. In the next section we will begin to develop the potential for theories of affect, especially those influenced by work within the social sciences (e.g. Anderson, 2014; Hardt and Negri, 2000; Massumi, 2002), which have much in common with ANT to help elaborate the significance of affective life to ANT, and other sociological, studies of construction innovation.

Bodies, Affect and innovation

'Affect' has been defined in philosophy since Baruch Spinoza's 18th century concept of affectus, and later William James and Gilles Deleuze and Felix Guattari writings on affect as 'an ability to affect and be affected' - 'an augmentation or diminution in that body's capacity to act' (Massumi, 1987: xvi), where a body can be anything (Anderson, 2014). Thus affect has a long history of being used to describe a relational, or transpersonal, and future oriented, concept of agency that has much in common with that described by ANT scholars. Indeed, Latour (2004) himself views affect as an vital ingredient of not just agency but life: 'to have a body is to learn to be affected, meaning 'effectuated', moved, put into motion by other entities, humans or non-humans. If you are not engaged in this learning you become insensitive, dumb, you drop dead' (p205). Positive affects can thus be understood as brining about a heightened sensitivity to other bodies which results in a heightened capacity to act over them, while negative affects engender the opposite. While affects have sometimes been associated with the disruption, or radical contingency, of life (Massumi, 2002), affects are also vital to the managed stability of society. Consider contemporary workplaces, where affective labour - such as care, entertainment, motivation and inspiration - is a significance source of economic value and has become the target of management interventions (Hochschild, 1983; Hardt and Negri, 2000). Affects have 'become part of the institutions, practices and other things that make up society ... settling limits or exerting pressure on what is thinkable and doable' (Anderson, 2014: 17).

The organizational significance of affect remains rather nebulous until we consider an example, such as that at the head of this paper. The site manager we observed was not simply controlling the site like a Foucauldian prison guard or Weberian bureaucrat, his agency, and that of his firm, partly stems from him being affected, positively or negatively, by the bodies he encounters: the bubbles in the Air Tape™, the litter on the floor, the unclean door, the worker he spotted from afar, and so on. These bodies affected this site manager and influenced his action over them, but so also did past bodily encounters, including other affects, he brought to these encounters (other

projects, other sites, other bodily interactions with materials, other NHBC 'Pride in Job' awards), as well as the emotional significations he and others gave to these encounters. Sometimes the encounter with a new body on the site would be positive, engendering new future capacities for him to act and think, sometimes they might be negative; either way, to conceptualize these lively encounters is to think with theories of affect (Anderson, 2014; Massumi, 2002).

Affects, and their influence on our future potentials to think and do are partly mediated by: the surprises of a bodily encounter; previous encounters our bodies have experienced; and the signifying systems, such as named emotions, available to register such affects (Anderson, 2014; Massumi, 2002). But affects have been said to extend beyond such proximate encounters too, as they become the target of apparatuses of power (e.g. texts on management motivation), open out into diffusive structures of feeling (e.g. 'age of fear') and atmospheres (e.g. the boredom of a meeting) between wider collectives of bodies (Anderson, 2014). As such, affects are neither objective nor subjective, autonomous nor deliberative, individual nor collective. This holistic approach to affect enables a greater recognition of the various ways affective life can be understood - taking us beyond the simple positive/negative affect binary drawn from Spinoza, and psychological notions of affects as biological, autonomic intensities. Building upon this inevitably brief account, in the remainder of this paper we explore in more detail, via an analysis of the already discussed zero-carbon home development, how an affective life might participate in construction innovation.

The Affective life of construction Innovation: The Zero-Carbon Home (ZCH)

METHODOLOGY

Targeted ethnographic fieldwork (Pink and Morgan 2013) was conducted on a large development involving a substantial number of innovations for sustainable construction. We visited the site twice as it neared completion, which produced 2 memos, 94 pictures and 6 semi-structured interviews – 5 of which were recorded and transcribed. In particular, we spent two hours on a site visit following the site manager and were able to observe his interactions with other workers, as well as following some of the technologies, which had been trialled as part of attempts to reach a zero carbon standard. We compared these observations with those made on a previous site visit to a different construction site. The data was thematically analysed.

The ZCH agenda was long mediated by affect, especially hope in a more sustainable, secure and equitable, future - an openness to a potential that our bodies can affect and be affected radically differently in the future than the present (Anderson, 2014). The hope for the ZCH was defined against other affects including: the fear of climate change, energy security, and fuel poverty; as well as a confidence that it was realistic, practical and flexible solution for the industry (NHBC, 2009). In this sense, ZCH was an apparatus through which affect became an object of power. However on the site we visited, this hope and confidence appeared misplaced:

... the complexities of getting a sustainable water source up there, rainwater harvesting was horrendously expensive. Everything, the discussions and the amount of time and effort, consultancy fees that [we] have paid into just a wall, is horrendous (Project manager).

This project managers' lack of hope and confidence can be better understood as annoyance. Annoyance can be defined as an open-ended displacement of our future

capacities to affect and be affected by another body, or collective of bodies. For this project manager, these displacements were bodily manifest - he was being called to attend to the alignment of objects and people in a way that he felt was diminishing his, and his firm's ability to act, to their previously sought desire. As he then explained:

The apartment block originally, when we first planned it, we had, down the one side of it was a green wall. So that again would have had complete planting down the side of it and, but then the complexities of getting a sustainable water source up there, rainwater harvesting, as you can imagine, to pump up seven floors, was horrendously expensive. Self-irrigating, everything, the discussions and the amount of time and effort, consultancy fees that [our firm] have paid into just a wall.

Annoyance was here interacting with yet more affects, in particular with a specific form of desire:

if Government and local authorities want to steer developers that way, I think they, I think the incentives need to be greater. I don't think they're going to get anywhere by digging their heels in, forcing us through legislation to do it. I think they need to put their money where their mouth is and then we'll, the developers will be happy to work in partnership with them (project manager).

We might codify the project managers' desire as 'greed' - an affect that is strongly correlated with corporate capitalism (Anderson, 2014). Here greed can be understood as a structure of feeling, crystallized in specific instances, that presses and places limits on bodily capacities to affect and be affected (Anderson, 2014: 124). More specifically, greed pre-orientates people, things and ideas towards insatiable desires to accumulate other bodies, whether money, units of time, data, energy etc. Greed is clearly an essential part of construction management, where wealth, time and knowledge are valuable resources to be pursued. After all, bodies on site are compelled to be busy not idle or wasteful, just as material waste is to be minimized and plant equipment kept busy. As this project manager elaborated: 'ultimately you've got to remember, we're here to make a profit. And these elements of build or anything deviating from our standard house type or our standard build costs us more money'. Greed breeds annoyance at the ZCH in a manner that shifts the proclaimed hope for it to address fears of climate change etc., into hope that future innovations will be less profligate.

The crucial issue now is the role annoyance and greed played in the implementation of innovation. It might be suspected that annoyance and greed were actively undermining the implementation of ZCH. However, as per the example at the head of this paper we felt a high degree of care, even love, for the construction of innovations that constituted the ZCH. For example, the assistant site manager described in detail how he gradually learned to seal the air holes around the electrical sockets:

What you'd do is generally, the rule of thumb, a light switch goes up, and sockets run down. So that should be sealed, again, when you do, put your full dab on an external wall, your full dab of plaster should seal that, stop any airflow like that. And what we do on the, on here, on a, when we put the trunking on, on top of the cables, we would then air tape say 150 mil down again, and then that would seal onto that as well, just to stop any.

This level of attention mirrors that of the site manager in our opening vignette. The assistant site manager was not simply following a bureaucratic plan to implement this innovation, he was not subject to surveillance from afar, he was intervening in the uncertain process of innovation - he was not expecting the innovation to do the work itself (technological determinism) but neither was he simply following out management instructions (social determinism). He was allowing his body to affect

and be affected, as he experimented with the technology to try and understand what it, and his body could do together. The assistant manager even described how he felt the air with his hand to discover the holes where cold air could breach the insulating material. In other words, the bodily capacities of this assistant site manager, the sensitivity of his body to the aims and requirements of this technology, were mediated through an open-ended desire to interact with and be affected by another body to transform both (cf. Deleuze, 1994: 324) - resembling the 'love' for innovation described in Latour (1996) and de Laet and Mol (2000). Without this love for the technology it is difficult to imagine how the units being constructed would have archived the required level of performance; in ANT parlance, how could the ZCH ever be 'black boxed'.

Another equally potent positive affect experienced on our case site was pride. Pride was perhaps the most visibly codified emotion on the site we visited, not least because of the wall of NHBC 'Pride in the Job' awards we were initially shown by the site manager. In affective terms, pride can be defined as an intense attachment to a certain body's unknown capacities to affect which augments, rather than displaces (as in love), our sense of ourselves as distinct from others. To coin a slogan: we may lose ourselves in love (Deleuze, 1994: 324), while we are proud of ourselves for having loved and thus possessing the potential to love (Aristotle, book IV). But just as with love, pride requires that we must suspend the limitations of what we think our body or that of another can do (Massumi, 1987). If we assume our body cannot affect or be affected we cannot be proud of it or other bodies. On our case site, pride, as with other affects (e.g. trust), was one outcome of affective encounters to care and love technologies. But unlike love or care, pride is integral to a process of subjectification, wherein an actor's intense love or care for another body (human or nonhuman) is rendered central to enduring ways in which certain bodies, actions and encounters, are valued and viewed as distinctive. The project manager described the site manager thus:

the site manager that's currently on [the site] is a chap called [Bob] and he was involved in [another experimental project]. He does seem to land himself on the more complex renewable solution schemes ... He's an NHBC award winning site manager. So he really does go that extra mile when he delivers his, he's got a, he's a very proud man. That's a good way to describe him.

While the criteria, or in ANT terms calculative device, employed to evaluate NHBC Pride in Job awards are largely related to the achievement of certain technical standards and management competencies (NHBC, 2016), the prominence of 'pride' reinforces the idea that these skills are mediated through the affective life of a building site. What is more, these awards also encompass two distinctly transpersonal affects: (i) 'Leadership - reflected by a high level of morale and motivation on site' and (ii) The 'X factor' - that certain something that sets the site manager apart from his peers' (NHBC, 2016). Management success, including the successful implementation of innovations, is here being rendered actionable by an apparatus of power that targets affects. And moreover this specific affect - pride - is said to be material and socially mediated: it is not to be measured by purely subjective (a feeling about the morale or X-factor on site) or objective means (adherence to a design plan, control of a budget, or the quality of brickwork) but both. The NHBC awards, as an apparatus of power, are suggestive that pride, just as annoyance, love, fear and hope, is transpersonal, objective and subjective, shaping (though not determining) future potentials for how bodies (people, ideas, things) can be affected and affect others, not least ZCH innovations. As one previous award winner explains:

Sometime in everyone's life you get that split second, that rush, and winning a Pride in the Job Award gave me that exact feeling. Winning a Supreme Award gets harder every year as all the other site managers up their game. You've got to keep ahead of the field. The competition is fierce but the rewards are great. I'm always anxious when the judges arrive on site because they turn up unannounced, but in fact I'm happy for them to see my site at any time. It's always run as if a Pride in the Job judge was about to arrive (NHBC, 2016).

CONCLUDING COMMENTS

The purpose of our paper was to consider how affect theory might help us understand construction innovations, especially how they travel and become 'black boxed', when the actors involved are difficult to know and control in advance (Green, 2006; Thiel, 2013). We addressed how theories of affect, and specific affects (annoyance, hope, fear, pride, love), which are always socio-material mediated, set potentials for future action that influence processes of innovation enrolment. Our analysis, while suggestive rather than comprehensive, indicates that the affective life of building sites is rich and intimately connected to construction innovations. While affects are sometimes the objects of apparatus of power (such as the hope/fear around ZCH cultivated by institutions such as the Zero-Carbon Hub, or the 'Pride in the Job Awards' from the NHBC), these affects interact in complex ways with other modalities of affect, such as encounters from which emerges love or annoyance, or the wider structured feeling of greed that infuses corporate capitalism. In our case while the site managers we encountered may feel individually proud of their work, and be awarded as such, it is notable that the project manager was at least partly annoyed by the profligacy of their efforts. More widely, the affects that appeared capable of driving the implementation of the innovation on the development site (love, pride) appeared detached from those targeted by ZCH policy (hope, fear) and so incapable of challenge the affects that mediated the critique of the ZCH (annoyance, greed). We can only speculate how the story of the ZCH may have unfolded differently if the professional pride for loving your work and that of others, was attached to the hope for a more sustainable, secure and equitable, world rather than corporatist greed. Given the potential of these affects to influence how innovations are implemented, we hope that other researchers are stimulated by our arguments and analysis to elaborate in more detail on the variety and significance of the affective life of building work and its influence on significant matters of concern such as the implementation of innovations.

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