Disruption and the matching market for new multi-family housing in Melbourne, Australia

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Abstract

A key area of system impact of the fourth industrial revolution is the radical improvement in the functioning of matching markets. Matching markets are markets in which agents seek to be paired with someone or something with the criteria for matching often highly specific and requiring reciprocity (Abdulkadiroglu and Sönmez, 2013: 1-3; Agarwal, 2017). The cost and difficulty in matching means, in many cases, these markets have traditionally not functioned optimally (Roth, 2015). Uber and Airbnb are examples of new matching market matchmakers that have been 'turbo-charged' by new digital technologies (Evans and Schmalensee, 2016), resulting in what Parker et al. (2016) describe as a 'platform revolution'.

Housing is a matching market and the difficulties in making matches a well-established problem within the field of matching markets (Roth, 2015; Abdulkadiroglu and Sönmez, 2013). In this article we examine the traditional matching market for new multi-family housing development in Melbourne, Australia, outlining how it has functioned to date and the problems this causes. We compare this to a new platform that has emerged in Melbourne, Australia, Nightingale Housing Limited (NHL). NHL has improved matching, facilitating a new market for quality, sustainable and affordable apartments for owner-occupation. We argue this new ability to match could have far-reaching consequences for the industry as a whole. This has implications for the type of multi-family housing built and offers a route to a more sustainable and equitable built environment. Such a systems impact would be consistent with Schwab's (2017) definition of the fourth industrial revolution.

Key words

matching markets; fourth industrial revolution; multifamily housing; Nightingale Housing Limited; platform; Australia; social impact; off-the-plan

1. Introduction

This article examines the impact of technological change on matching markets and in particular that for the development of new multi-family housing[1] in Melbourne, Australia.

[1] Multifamily housing is known as apartments in Australia.

Evans and Schmalensee (2016) argue that matching markets have been 'turbo-charged' by the combined impact of technologies including powerful computer chips; the Internet, the world wide web; broadband and mobile communications; and, programming and operating systems. Such change can be viewed within a wider discourse on 'disruptive technologies', which have disrupted or redefined the performance trajectory of many industries leading firms resulting in their failure (Bower and Christensen, 1995; Christensen, 1997). In some accounts, digital disruption is part of the third industrial revolution (3IR) while the convergence of physical, biological and social worlds enabled by computing, 3-D printing, artificial intelligence, the Internet of things, robotics, nanotechnology and photonics forms the basis of the fourth industrial revolution (4IR) (Groscurt, 2018). Schwab (2017) influential definition of the 4IR, however, does not make this distinction. Rather, he argues it is how these technologies 'build on and amplify each other', drawing attention to the velocity of change; the breadth and depth of change; and, systems impact (Schwab, 2017: 1–3). In Schwab's view digital platforms, such as Uber and Airbnb are part of the megatrends that exemplify the 4IR. Both are examples of matching markets.

Like Christensen and Raynor (2003), however, our focus is not on the technology per se but on 'disruptive innovation'. But we also shift the focus from firms and industries alone to the type of market allowing us to extrapolate the lessons from so-called disruptors, Uber and Airbnb, to the development of new multi-family housing in Australia.

The existing matching market for new multi-family housing in Australia does not function well, in that obtaining off-the-plan sales (or 'presales'), is difficult and costly and that presale contracts are subject to 'settlement risk', being the risk that in certain circumstances buyers have strong incentive to avoid final settlement of the contract if the value of the apartment declines in the time between contracting and settlement of the contract (Derrick and Barker, 2012; Bleby, 2016; Bryant, 2012). It is a risk that is not adequately addressed by the law (Sharam et al., 2015a).

The outcome of this poorly functioning matching market is an oligopolistic industry (Ong et al., 2003; Coiacetto, 2009; Dong et al., 2006), which builds, overwhelmingly, speculative product for rental investors (City of Melbourne, 2013; Birrell and Healy, 2013). This product is typically poorly designed, of low quality and of low sustainability (City of Melbourne, 2013; Government of Victoria, 2015; Buxton et al., 2016; Higgins and Moore, 2015; Moore and Doyon, 2018). Supply also lags well-behind demand. A consequence is that aspiring owner-occupiers on low to middle incomes willing to purchase new higher-density housing only have the option of product built primarily for rental purposes. Apartment prices may be relatively affordable compared to detached housing in the same locations, but the quality and amenity is sufficiently poor that arguably owner-occupation does not represent a good value proposition. The result is that while nearly a third of Australian private renters live in higher-density housing, only six per cent of the 69 per cent of Australian households who own their home, live in higher density housing (ABS, 2016).

This provides the context for a new not-for-profit housing developer, Nightingale Housing Ltd. (NGL) which was established in 2015 to provide quality, well-designed multi-family dwellings for owner-occupation. NHL was established following the experience of the founder, Jeremy McLeod, in developing a precursor multifamily project, *The Commons*. As a recently established entity, there is limited scholarly research but extensive media (Moore and Doyon, 2018). *The Commons* won numerous sustainability and architectural awards, and the publicity generated a list of aspiring purchasers, motivating McLeod to create a development model that combined good design, sustainability, affordability and community. The model has generated substantial interest and the initial list of buyers has grown to around

5,000 people (Lane, 2018). This aggregation of demand resolved the problem of finding presales ordinarily faced by multi-residential property developers. Further, through offering quality product at cost to intending owner-occupiers exclusively, NHL also mitigates the risk of buyers failing to proceed to settlement. This allowed NHL to obtain more advantageous financing arrangements, the financial benefits of which they pass through to the buyers, reinforcing the propensity to settle the contracts (Sharam et al., 2018b). Conceptualized in terms of matching markets, NGL has created a model that reduces the costs associated with finding matches in this matching market, and promotes stable matching, that is matches that are unlikely to later 'unravel'. Our contention here is that the NHL model could pave the way for disruption of the multifamily development industry because it addresses, albeit inadvertently, the problems typically encountered in matching markets that result in their poor functioning. But without the Internet and social media, this would not be possible.

The article proceeds as follows. In the following section we introduce matching markets and locate them in relation to technological disruption and the fourth industrial revolution (4IR). In section 3 we outline the traditional multifamily development model and the problems that the model creates. We turn in section 4 to NHL, describing what it does and how, and how this innovation might translate into disruption. Problems with NHL model are discussed in section 5, and a possible solution canvassed. Conclusions are made in section 5.

2. Matching markets

Matching markets are markets in which agents seek to be paired with someone or something with the criteria for matching often highly specific and requiring reciprocity (Abdulkadiroglu and Sönmez, 2013; Agarwal, 2017). Within the economic field of matching markets housing is considered to be a matching market rather than a commodity market (Roth 2015). In commodity markets the homogenous nature of the goods means price is the mechanism that connects buyers and sellers. Housing, unlike commodities, is highly heterogenous and price is only one factor among many that determines a match. The housing system is moreover, not a single market, but rather is comprised of many matching markets

The need to pair means in many matching markets, including housing, finding a match can be very difficult and/or prohibitively expensive, with high search and transaction costs. Prior to the Internet the cost and difficulty of securing matches means many matching markets traditionally have not functioned well. Commodity markets evolved in response to such difficulties in finding matches (Roth 2015). The key method of overcoming the challenges in securing matches in matching markets has been the use of matchmakers or intermediaries to facilitate matches.

The concept of matching markets emerged in the early 1960s with Gale and Shapley (1962) work on the matching of marriage partners which resulted in their deferred acceptance algorithm proposition. Surveys of the field have been provided by Abdulkadiroglu and Sönmez (2013), Roth and Sotomayor (1990) and Sönmez and Ünver (2011). Sönmez and Ünver (2011: 781) locate matching markets in Matching theory:

> Matching theory is a name referring to several loosely related research areas concerning matching, allocation, and exchange of indivisible resources, such as jobs, school seats, houses, etc., lies at the intersection of game theory, social choice theory, and mechanism design. Matching can involve the *allocation* or *exchange* of indivisible objects, such as dormitory rooms, transplant organs, courses, summer

> houses, etc. Or matching can involve *two-sided matching*, in markets with two sides, such as firms and workers, students and schools, or men and women, that need to be matched with each other. Auctions can be seen as special cases of matching models, in which there is a single seller. Recently, matching theory and its application to market design have emerged as one of the success stories of economic theory and applied mechanism design. (italics in original)

Matchmakers or intermediaries rely on aggregating demand, often using membership as a means of creating pools of demand as this narrows the search field. Nevertheless, many traditional matching markets provided sub-optimal outcomes. The Internet and associated technologies, and resulting societal paradigm shift in how we communicate, express, inform and entertain (Schwab, 2017), has given rise to new intermediaries or platforms who have been able to overcome search and matching problems. The contribution of the Internet has been to radically improve the ability to find matches; this new 'service discoverability' permits services (or individuals) to be 'easily located by those who want to potentially interoperate with them' (Erl, 2016: 45). Discoverability enables more effective search strategies reducing the frictions often associated with transactions in matching markets. The new Internet-based digital platforms have moreover, improved the likelihood of matches by updating the strategy used by marriage matchmakers. Platforms such as RVSP, Grindr, Uber, PayPal and Airbnb drive membership not just for extra business but because larger membership pools increase the prospect of matches (termed 'thickness' (Milgrom, 2011), with success in matching in turn driving increased membership, which further improves matching (Parker et al., 2016; Evans and Schmalensee, 2016). Actual matching is assisted by the use of algorithms to sort preferences. Technology aids the search process, radically reducing its costs, but also reduces transaction costs (Schwab, 2017; Productivity Commission, 2016).

In Christensen (1997) thesis of the disruptive impact of technological innovation, new entrants in a market focus on less demanding customer segments as a strategy for gaining a foothold in the market or they create a market where none previously existed. In this understanding, Airbnb is a disruptor, but Uber is not (Christensen et al., 2015). The contention, however, that Airbnb created a new market (letting of spare rooms or beds) is questionable. But seen from the perspective of matching markets, Airbnb replaced numerous, brokerage (i.e. matching) services that preexisted it. So, incumbent matchmakers were replaced by a new entrant matchmaker who could provide more frequent matches that were better, faster and cheaper. Uber, as a new matchmaker for rides, replaced a cozy oligopoly of matchmakers (the taxi companies) whose businesses were dependent on government regulation. Government restrictions on the number of taxi licenses and regulation of fares ensured operators would have the revenue to support a fleet capable of supplying peak demand, without the over-supply of vehicles in off-peak times resulting in price cutting. This meant most users paid for a service they were not using. Uber's solution was to utilize an existing car fleet that had excess capacity during peak periods. For traditional taxi services, regulation served a purpose but the outcome was sub-optimal. Uber is very relevant here because the existing multifamily development industry is an oligopoly (Coiacetto, 2009; Ong et al., 2003; Dong et al., 2006), and we will return to this in section 3.

D'arcy and Keogh (2002: 19) argue speculative developers essentially supply 'a stream of entrepreneurial services'. The key role of the developer-as-middleman is to obtain the finance to undertake the development, organize the actors who do the building, and find the buyers. The developer, importantly, assumes the risk for matches that may not be stable (the

settlement risk). The developer, however, occupies the position in the supply chain, that permits them to capture most of the uplift in property value that occurs when multi-family housing is developed.

Value creation is identified by Parker et al. (2016) as a central element in the success of the new matching market platforms. They argue these businesses are

> based on enabling value-creating interactions between external producers and consumers. The platform provides an open, participative infrastructure for these interactions and sets governance conditions for them. The platform's overarching purpose: to consummate matches among users and facilitate the exchange of goods, services, or social currency, thereby enabling value creation for all participants. (Parker et al., 2016: : 5)

The implication is that the new technology-enabled matching market platforms, in replacing preexisting matchmakers, or in creating a new market facilitate a redistribution of value. A better redistribution of value in the supply of new multifamily housing would not only attract buyers, thus improving matching, but also, attract new supply-side actors, thus thickening the market. This much needed competition, moreover, would see excessive profit reduced.

Matchmaking intermediaries have not been a feature of the multi-family development market. Instead, speculative developers expend in the order of 10 per cent of project funds on campaigns to find buyers for each and every project (Sharam et al., 2015a). These campaigns include extensive advertising, construction of display suites, engagement of sales consultants, and in some case international trade fairs or offices. Financial advisors promote developments to their client lists. Some specialist property advisors, such as Apartment Development Register (ADR) (https://apartmentregister.com.au/) have emerged to link buyers with property developments, describing the service as a dating agency that permits buyers to obtain quality product (Sharam and Bryant, 2017). An actual matching platform, Citiniche was launched in 2013. Its founder, architect Ivan Rijavec, argued the model would lower prices and substantially de-risk the developer, while allowing the buyers to obtain 'good design' (Rijavec, cited in Edgar, 2013). These examples indicate that the idea of a marketplace to match owner-occupier presales and development opportunities is not entirely novel. By 2018, however, Citiniche had filed for voluntary deregistration as a company. No public explanation for the failure of Citiniche has been provided but this was a period in which the property market boomed, with much debate as to whether or not there was a property bubble (Shi et al., 2016). These conditions meant matching was unusually easy. Conditions have since changed and prices have faltered. Projects still in the presale campaign stage or post-presale stage have seen developers offering non-price financial inducements to purchase (see for example Schlesinger, 2017; Hughes, 2018; Bleby, 2018).

Returning to Christensen (1997) thesis that one type of disruption is where a new market is created, the establishment of a matching market for multi-residential development would be an example of disruptive innovation. From the perspective of Parker et al. (2016), this disruption occurs because the matching market permits the actors to interlope in new ways enabling 'value creation'. Theoretically, a matching market for multifamily housing development could see the end of the speculative developer. This would have positive implications for the quality and affordability of new multifamily housing. Shifting the construction of new multifamily from a speculative market to effectively a contract market would permit the orderly matching of supply and demand, and moderate the boom and bust property cycle, which is a feature of Australian housing market. To understand how this may come to pass, we provide, in the next section, an overview of multi-residential property

development in Australia, highlighting why matches are at risk of unravelling (becoming un-stuck) the problems that ensue from this.

3. Multifamily housing provision in Australia

Multifamily housing may be purchased via three means in Australia. Firstly, new multifamily housing can be purchased 'off the plan' from a developer. Presales permit a buyer to pay a deposit (in Australia a maximum of 10 per cent of the sale price) to purchase a dwelling in a proposed development, with the outstanding amount due at settlement when the title is exchanged (Sharam et al., 2015a). A long-standing advantage of off-the-plan sales in Australia is that they did not attract transfer duties thus making this asset class especially attractive to investors, however since 2017, investors no longer have this exemption. Investment property nevertheless attracts a generous capital gains tax concession and negative gearing permits losses on rental property to be offset against personal income for taxation purposes (Blunden, 2015). New multifamily housing may also be purchased from the developer once the building is completed and titles have been issued. Transfer duties at this point are as if for houses. Apartments can also be bought and sold via the secondary market for existing housing. Our concern here is multifamily housing that is sold off the plan.

Investors are traditionally the target of developers' sales strategies. Developers can build investor product cheaply enough to deliver apartments at price point that works for investors, whose interest is predominately capital gains, while delivering the margin required by the developer. They are able to do this, despite high land values, because weak planning and building controls permit high dwelling yields, and allow for a greater number of smaller, and more poorly-designed apartments. The focus on capital gain rather than rental yield results in a lack of commitment to quality on the part of both investors and developers. The result is unattractive to intending owner-occupiers, for whom amenity, design and quality are important.

In addition, Australian Consumer Law means buyers have no recourse if they are dissatisfied with amendments to plans made by the developer after presale contracts are signed. On top of this, the developer can void the contract if the development has not commenced within a specified period (Derrick and Barker 2012). Intending owner-occupiers are more likely to be disappointed by reductions in floor space or quality, and in a rising market are financially disadvantaged if a project does not proceed. Such disincentives further reduce the pool of potential owner-occupiers. These issues reinforce the importance of investors to developers, and highlight how owner-occupiers are edged out of the market, as a result of the search problem. While census data provides picture of who lives in an apartment and their tenure status, the extend of unmet demand for new apartment product is currently unknowable.

Investors may be perceived to be the easier group to match with, but these matches, in the language of matching markets, are susceptible to 'unravelling'; that is, to un-matching at the worst possible moment from the perspective of the developer and their financier (settlement of the contracts). The role of presale contracts, in principle, is to ensure sufficient revenue at completion of the building to retire debt, thus protecting the lender. Financiers of multifamily

housing developments thus require project proponents obtain a specific percentage of presales before they will commit funds for construction. Pre-sale contracts however do not guarantee settlement of the contracts. Market conditions may fluctuate in the time (often years) between pre-sale contacting and project completion (Bryant, 2012). Property values may fall, interest rates and input costs may rise, increased competition may result in over-supply, or credit conditions may tighten. Buyers in certain circumstances have strong incentive to avoid settlement if the value of the housing has declined in the time between contracting and settlement (Derrick and Barker, 2012; Bryant, 2012). Investors concerned with the prospect of making a loss on the transaction are willing to forfeit their deposit (Bryant, 2012). Settlement is the point at which the developer has expended all funds, thus a high rate of settlement failure leaves the developer and their financier highly exposed. While legal remedy is available to the developer, the cost and reputational risk of legal action undermines this option. Legal options may not in practice be feasible at all in the case of foreign buyers. Financiers address settlement risk by imposing restrictions on the number of sales per buyer, on foreign sales or the number of foreign sales, and through requiring due diligence on buyers. Mitigating the risk in this way however, exacerbates the difficulty in finding sufficient matches.

Financiers have a key role in determining not just which buyers are paired with developers, but who the developers are, and what projects proceed. There are very significant barriers to new entrants in the industry, who must marshal substantial capital and expertise. Entry is effectively policed by financiers who subject development proposals and their sponsors to rigorous credit assessment (Bryant, 2012). The result is an oligopolistic industry (Coiacetto, 2009; Dong et al., 2006; Ong et al., 2003). Demand is a key determinate of whether a project will proceed. Inadequate demand or looming over-supply will result in financiers refusing to lend. Adverse market changes subsequent to approval of loans will result in financiers withholding funds for construction, or withdrawing offers of finance (Bryant, 2012).

Over-supply, therefore, is subject to correction although there is a time lag. In the context of property boom and bust cycles, the last one off the boom merry-go-round loses. The norm, in Australia (where there is a strong boom and bust cycle), is chronic under-supply (which upholds the market price of apartments) with a short period of over-supply resulting in firms exiting the market either voluntarily or as a result of bankruptcy. Some degree of price discounting occurs at this point as an attempt to cut losses. This is followed by a longer period of inactivity reflecting lack of demand. This pattern reflects the lack of orderly matching in the market and entrenches the oligopolistic structure of the industry.

This disorder in matching justifies high development profits. Cheap and effective search strategies, and matches that exhibit a high degree of stickiness however, have the potential to the de-risk development projects, permitting lower returns, which would open the way for value-creation in the forms of affordability gains, improved quality, design and sustainability. But for this to occur, the target group would need to be owner-occupiers rather than investors as stickiness is greater. This stickiness may require higher project expenditure to lift quality and design, but this could be funded out of reduced margins. Sharing the value-created with buyers, further increases the stickiness of the match, further de-risking the project.

With risk reduced new suppliers could enter the market, providing development services on a fee for service basis. In the Australian context, there are non-profit companies providing social housing, and aged care providers who have requisite expertise and balance sheets that would ensure access to capital requirements. Further, development consultants who are currently engaged by developers could provide the expertise required so that 'deliberative developers' (do-it-yourself) syndicates of intending owner-occupier developers (Sharam et al., 2015b), could undertake their own multi-residential projects. Property Collectives (http://propertycollectives.com.au/) is an example specializing in small townhouse developments. In Germany, this form of development is known as baugruppen and has consistently delivered savings of 25-30 percent (Ring, 2013).

In the following section, we turn to NHL, which has been able to use aggregated demand to not only de-risk development, but to establish a new market for owner-occupied apartments in Australia through creating value for all the participants.

4. Nightingale Housing Ltd

Nightingale Housing Ltd is an architect-as-not-for-profit-developer model. The NHL project Directors assume full risk for the project despite the housing being delivered at cost. In a Baugruppen the members would assume the risk but have also have control. NHL licenses architects to undertake multifamily housing development on a not-for-profit basis, and in exchange for a modest license fee provides the architect with intellectual property such as legal template agreements, access to financiers and allows them to recruit buyers from the NHL waiting list.

In Christensen's (1997) conception technology's contribution to disruption is to permit a new market emerge, and in Parker et al's (2016), is how matching markets create value for participants on a different basis from pre-existing business models. The Internet's ability to promote discoverability has been important to NHL. Media, largely online specialist news and magazine-type outlets, provide free promotion of the model. These websites put information about NHL into the market place, that negates the need for advertising. NHL uses it website, Twitter and email to communicate with supporters and those on the list. Use of technology in this way is commonplace and denotes the most ordinary of approaches. This serves to underline the power of the Internet. Could NHL have attracted a pool of potential buyers in the same time frame, for free, twenty-five years ago? It could not have. The Internet increases the velocity of change as Schwab (2017) argues with the impacts being greater than simply shortening the period over which something occurs. NHL also utilizes a customer relations management (CRM) software system, but makes the most rudimentary use of it at present. The matching, once a buyer registers, involves the buyer opting-in at various stages of a development. This leaves the scope for a far more sophisticated approach, one that can potentially see the CRM interface with an online-membership portal and the use of algorithms or artificial intelligence to propose matches.

While the NHL model is enabled by technology, its strength as platform, is the value-creation. Delivery of housing at cost, that embodies design excellence, quality and sustainability very clearly creates value for the buyers. Purchase of the apartments however is

contingent on development financing in the first instance and mortgage finance, the second. The development financing is comprised of two parts: senior debt, which takes security over the project assets, and equity investors who have no resource to security. The debt financiers required (for the first project) a 30 per cent equity contribution. As each architect-as developer is unable to bring equity to the project, NHL seeks external equity investment. These investors are offered a sub-market return. This indicates that financial return is only part of the reason they invest. Some other type of value is being realized for them. Sharam et al. (2018b) found the desire for better designed housing and a more sustainable city were key factors, with some also concerned about declining housing affordability. The debt funders were a group of social impact investors and a pension fund who shared these concerns, with housing affordability, environmental sustainability and resilient communities, key objectives. While the debt lenders sought market returns, they changed some of their lending parameters to facilitate the deals (Sharam et al., 2018b). Buyers are able to seek mortgages from any provider, but NHL has developed a special relationship with the cooperative and mutual banking sector, who are keen to respond to members' concerns in regard to housing affordability and sustainability. The individual architects, who are the developers, are able to obtain work that enables them to deliver design excellence (and conversely avoid undertaking work for profit-driven developers that they regard as soul destroying), and contribute to a better city. Notably, the debt financiers take the unusual step of not requiring a personal guarantee from the architect-as-developer, which frees the architect to facilitate the creation of value for each of these participants.

The debt financiers, in particular, are interested in how the model can build sustainable communities. A key design element is the inclusion of common laundries and communal spaces to encourage interaction. Another is bringing buyers into the process at a very early stage. NHL surveys those on the list regarding their preferences, interviews buyers and holds feedback sessions on the design progress and costs. Each project builds a community well before the project is completed. This is also a process that increases the stickiness of the buyers.

Finally, the debt financiers were convinced prior to lending that the model strengthened matching and that the registration list would mitigate settlement risk (Sharam et al., 2018b). This theoretical proposition was tested with the first project when, as a result of a marriage breakdown, a buyer, three weeks prior to settlement, wanted to back out. A call went out to the list and elicited 11 households who were willing to immediately put down a deposit and settle shortly after. (McLeod, 2018b). Risk mitigation of this type delivers another form of value to these social impact investors, who can be confident that their funds will be returned to be made available to future borrower. This is particularly important in Australia as impact investing is a nascent sector with limited capital (Muir et al., 2018).

In recognition that the waiting list mitigates settlement risk, the development financiers provided in principle agreement that this would enable them to provide a higher proportion of the capital required, reducing the need for equity investors, and hence the overall financing costs. On this basis NHL launched UrBau, a baugruppen-style syndicate model. NHL is a small platform and the model has, so far, delivered only a very small number of dwellings. NHL is yet to scale-up and it is too early to say it is, or will disrupt the multi-residential

development industry. In the next section we examine some of the challenges faced by NHL and how some may be resolved utilizing matching market strategies.

5. Discussion

In this article we foreshadow changes to the multi-family property development sector, made possible by technologies associated with the 4IR. Our focus however, is not on a 'tech start-up'. Indeed, we have downplayed the role of technology somewhat so that the impacts are not obscured. The innovation, in question, nevertheless is a start-up, and like all other start-ups, impacts can only be forecast. In the preceding sections, we have argued that NHL promises to have a systems impact, and accordingly, can be considered a part of the 4IR as defined by (Schwab, 2017). It is creating a market, where one did not previously exist (considered to be disruption as defined by (Christensen et al., 2015) through identifying how the existing market could evolve from being high risk/high reward to low risk/low rewards through the more orderly matching of supply and demand. This, in turn, could facilitate a shift to high-quality, sustainable and affordable housing, a desirable change given the twin challenges of declining housing affordability and climate change.

An important caveat is acknowledgement that property development is a lengthy process, with the lag between purchase decision and delivery of the product setting development apart from other markets. This time delay, as noted, is implicated in matches unravelling. Here, we examine why NHL may not result in system change and how the model could change in order to improve the likelihood of surviving and facilitating the shift to better owner-occupied multifamily housing.

NHL faces the difficult problem of scaling up in order to satisfy demand for their product, but this should not be seen as simply a supply-side issue, although supply is a critical problem. In traditional economics excessive demand is a problem firms love to have as it provides the opportunity to raise prices. In matching markets, it denotes the inability to make matches and in NHL's case it means the registrants list and the de-risking benefits this has for the model are likely to be undermined by registrants giving up on them. In short, unless a reasonable number of registrants can be satisfied, registration only provides an illusion of demand. One part of the solution is to encourage competitors. Another is to fully understand the preferences of the demand-side. We will now expand on both of these points.

The NHL model involves licensing architects-as-developers to undertake developments. In theory, many developments could be initiated. However, to date, only a modest number of architects have been licensed and many are yet to launch projects, with the cost of land in desirable localities a barrier to delivering on affordability aims. The choice of localities is subject to three factors. Firstly, town planning regulation nominates the areas for intensification, which are regarded as suitable for multifamily development. This has the effect of inflating land values, undermining affordability objectives. Secondly, financing is critical, with the loan to value ratio (reflecting the relationship between build cost and market value) restricting projects to high, but not too high, land value localities. Thirdly, are the preferences of the aspiring owner-occupiers. NHL are concerned that registrants are nominating their preference localities based on where they believe there is a greater

likelihood of projects occurring rather than where they would like to live (McLeod, 2018a). In effect, registrants are engaging in strategic gaming. It is this factor, that matching markets theory can provide insight into.

Strategic behaviour is a central concern of designers of matching markets. The designer will seek to ensure participants can do no better other than state their actual preferences (Sönmez and Ünver, 2011). For this to occur, participants must be able to trust that their disclosure will bring them the best outcome possible. NHL currently has around 5,000 registrants (Lane, 2018), the majority of whom have stated a preference for the suburb of Brunswick, which happens to be where the first project was built, where the second is underway and where land for seven new development have been announced. The only other project underway is in Fairfield, six kilometers away. The majority therefore are competing for around 200 proposed dwellings. In theory, however, a small development of twenty apartments but with only one hundred interested buyers in a neighboring suburb a little more distant from the city center, where land is cheaper would have better odds of obtaining an apartment. The resolution for NHL is in fact quite simple. HNL needs to communicate to potential and actual registrants that localities are driven by their preferences, and the impact underlying land values have on project viability and what it means for affordability. To date, they have not done this.

The NHL model as it stands runs the risk that its registrants list could prove illusionary. In the first instance, supply-side constraints mean too few opportunities to purchase are created. The registrants can opt in to ballots for apartments as these opportunities occur, but ballots as an allocation mechanism means obtaining an apartment is a matter of chance. The combination of too little development and balloting (instead of a waiting list for example) is likely to result in disengagement and households choosing other housing options. It is not very likely that they will remove themselves from the list so the list will not reflect demand. Matching market theory can also offer a solution to this problem: switching from the current one-sided matching market (one-sided as the buyers have preferences but NHL does not, beyond initial entry criteria) to a multi-sided matching market. Multi-sided facilitate interactions between more than two types of customers (Evans and Schmalensee, 2016; Evans and Unsworth, 2012). A multi-sided platform would provide competitors access to the registrants list, providing a ‘thicker’ supply-side.

Multi-sided platforms exhibit strong network effects. Evans and Schmalensee (2016: 11) argue, these matchmakers are businesses that ‘operate under a different set of economic rules’ as the objective is to sell access to members in the group(s) on the other side(s) of the market. ‘Demand by each group of customers’, therefore, ‘depends on the demand of the other group served’.

NHL has competitors such as Assemble Communities (www.assemble.com.au) and Melbourne Affordable Apartments (MAP) (see (Raynor et al., 2018), which also aim to provide affordable home ownership (via a rent first model in the case of Assemble, and for providing exits into home ownership for social housing tenants who pay market rent in MAP’s case). The overlap between NHL and Assemble is strong, and some of the social tenants targeting by MAP could equally choose NHL or Assemble. Instead of each searching for buyers, recruitment could be conducted by a shared platform. An independent platform

could recruit other developers, which would increase the opportunity for matches by making the market 'thicker' on the supply-side. These participants could be speculative developers, but their projects could be rated (on indicators such energy efficiency, renewable energy, common spaces, design, affordability, density, height, tenure mix etc). A requirement for accessing the buyers would be a requirement to share the savings made through using the platform with purchasers, so that value is created, as Parker et al. (2016) suggest. Platform participation moreover, would require the proponents of speculative projects to brand themselves more strongly, and respond to not just aspiring buyers but to tenants. A platform that registers aspiring buyers is likely to have tenants as members until such time as they buy. Providing the opportunity for tenants to rate the apartments they live in and have those ratings linked to the developer provides market information that is otherwise missing. With tenants rating the previous work of developers, investors, too, would have a stronger understanding about demand for any product they purchase.

There are other non-profit supply-side actors that could use the platform. This includes community housing organizations who provide affordable home ownership opportunities, key worker and other affordable rental options, in addition to social housing. Eligibility rules make matching more difficult so aggregation of housing consumers would assist the search process. Advertising through the platform need not be broad-brush but could target discreet tenure types or cohorts defined in other ways. If the platform had a very broad membership of rental households in addition to households looking to purchase an apartment, it would permit a provider of subsidized key worker, or a market-based build-to rent company the opportunity, for example, to gauge demand in specific locations, prior to making any major commitment. There would be two routes available. The platform would have valuable data that could be used for research purposes. Secondly, the provider could call for expressions of interest.

The *Housing Hub*, is a Melbourne-based nascent matching market established to support the development of specialist disability accommodation (SDA) market. The Housing Hub also accepts rental vacancy and sales advertising for properties that are accessible, thus making these dwellings more discoverable. Finding existing accessible housing is particularly difficult as modifications are regarded as detracting from the value of the property (Imrie, 2005). NHL, Assemble and MAP could join an expanded Housing Hub. There is already some overlap as NHL is a supplier of silver-level accessible housing and will provide gold or platinum level accessibility if a buyer seeks it. The owners of the Housing Hub are open to their platform taking a broader matching role (Sharam et al., 2018a).

The other key group that could use the platform are deliberative developers. Individuals could use the platform to find others with similar aspirations, or by a development services company as outlined in section 3. NHL has moved in this direction with its UrBau model, recruiting syndicate members from the list. Syndicate members can expect a discount to market of 30 per cent (McGregor, 2018). The additional savings and the requirement to contribute equity (rather than pay a deposit) increases the stickiness of the match. While not risk-free for the members it has a very significant key advantage: it guarantees the household will obtain a dwelling. The likelihood of the match unravelling is very low.

A single platform capable of matching tenants, buyers and deliberative developers to various housing opportunities would increase the pool from which matches could be found, to the advantage of all its users. The developers still compete but, in effect, cooperate in order to grow the market and add value for participants. A single platform would also be cheaper than each developer operating their own platform, and have resolve some of the difficulties highly specialized platforms have in driving traffic to their sites. Should such a platform grow, however, it may face the possibility that rival platforms will emerge, or more likely, that an existing large-scale real estate platform will turn their attention to this market. Such a platform would provide for economies of scale. As Eisenmann et al. (2006) outline, platform owners need to consider whether a there is room for more than a single platform, with a key question being the value to users in competing platforms. A case in point is the sale of accessible housing short stay platform, Accomable to Airbnb (Gazda, 2017).

6. Conclusion

Schwab (2017) influential definition of the 4IR concerns how technologies 'build on and amplify each other', and draws attention to the velocity of change; the breadth and depth of change; and, systems impact (Schwab, 2017: : 1–3). He includes the emergence of companies such as Airbnb and Uber within this definition. These companies represent what Parker et al. (2016) describe as a 'platform revolution'. This revolution, Evans and Schmalensee (2016) argue involve the 'new economics' of matching markets that have been turbo-charged by technology. The examples of Airbnb and Uber set a very high bar for disruption.

In this article, we have argued how technology has created the opportunity for improving the matching of presale buyers to new multifamily housing. In doing so, we have applied theoretical understandings of matching markets to observable changes in the new multifamily development market in Melbourne, Australia. The concept of a matching market platform for connecting buyers of apartments with providers is not new with platforms established in Melbourne and Berlin, although both were short-lived. As Evans and Schmalensee (2016) argue matching markets are a very different type of market and platforms need to be cognizant of this if they are to be successful.

We forecast possible transformations taking account of the particularities of multi-residential development. The current innovation occurring can be described as a trickle; it might come to very little. However, it might become a torrent. The support of NHL by institutional investors such as pension funds (a AUD$300m NHL investment fund was announced in early 2018 (Perinotto, 2018)), is indicative that improved matching, associated risk mitigation and the value this can create could be the catalyst for system change. The pre-4IR residential development model is shaped by the demands of its financiers, who are deeply concerned with the return of their funds, and who impose measures on borrowers to reduce risk of default. Other mechanisms that could reduce settlement risk and increase the propensity for funds to be returned are, therefore, likely to be embraced by financiers. This suggests change will ultimately be driven by the banks, who would benefit from the establishment of matching market platform, and have the capacity to create one.

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