

TAKING THE PULSE: DEVELOPING A MODEL OF RESILIENCE CAPITAL FOR ARCHITECTURAL FIRMS

Peter Raisbeck¹

Faculty of Architecture Building and Planning, University of Melbourne, Masson Road, Parkville, Victoria 3010, Australia

In Australia, during 2020, the COVID-19 pandemic led to disruptions in architectural workplaces. These disruptions led to project cancellations and the need for many architects to work from home. This paper aims to trace how architects responded to these disruptions and then utilise their responses to propose a model of resilience suitable for architectural firms. What lessons can architects learn from these changes regarding resilience within their profession and workplaces? In a series of industry surveys, the Architects Consulting Association of Australia (ACA) Tracked the pandemic's impact on firms. Five national surveys were undertaken beginning in March 2020. Detailed selected results from the five surveys are presented, and the surveys' design is critiqued. With over 3000 respondents, the surveys represent a comprehensive snapshot of data gathered from architects in Australia. In examining these membership surveys, what constitutes resilience in architectural firms is explored and developed. From these results, firm resilience is reframed, and an integrated model of resilience is developed. This integrated model of Resilience Capital (RC) extends previous understanding of architecture firms based on limited indicators of psychosocial measures of well-being and professional identity conflicts. The developed model will enable further industry development and further studies of resilience in architectural and other small professional service firms.

Keywords: Australian architects; resilience; well-being; global pandemic

INTRODUCTION

For architects working in small professional service firm's resilience is a critical issue. This concept is vital because many firms are small, operating with low-profit margins in a highly competitive environment. Firm resilience is critical if firms are to recover from external disruptions. Concepts of resilience have been employed across population health, developmental psychology, ecological and climate studies. Evidence of the concepts wide-ranging application can be seen in its integration across the UN Habitat's Sustainable Development Goals (SDG). However, as a concept, resilience is not often applied to studies of the professions. Indeed, architects themselves have long been concerned with applying resilience concepts in wide-ranging studies across community development and urban design (Barton *et al.*, 2018; Roggema 2018). However, few architects have thought about resilience within their firms, nor have they considered how resilience is operationalised.

¹ raisbeck@unimelb.edu.au

The paper traces how Australian architectural firms responded to disruptions resulting from COVID-19 outside of their standard operating context during 2020. This will be done by analysing a series of nationwide surveys. The Architects Consulting Association of Australia (ACA) tracked the impact of COVID-19 lockdowns and project disruptions on firms (ACA, 2020). Five national surveys were undertaken beginning in March 2020 as a national lockdown due to COVID-19 was instituted. The overarching aim is what lessons about resilience can architects learn from pandemic induced disruptions? Moreover, in a post-pandemic profession, how might resilience be reframed in strategic and operational terms so a model of resilience can be developed for architectural firms.

LITERATURE REVIEW

The Focus of Previous Studies

In studies of the architectural profession, ideas of firm resilience have been overlooked in favour of examining the well-being and mental health of employees in architectural firms. For example, Bowen *et al.* (2013), in a study of construction professionals in South Africa, found that "Architects, more than engineers, quantity surveyors, and project and construction managers; and female, more than male professionals feel stressed." In a similar vein, Raidén and Räisänen (2018) cite the architects diminished work-life balance, unpaid or excessive working hours, precarious employment and "low professional worth." They argue that well-being and mental health is critical to knowledge workers like architects who can "simultaneously demonstrate creativity and compliance." Perhaps as a result of these concerns, the UK Architects' Mental Wellbeing Forum tool kit was developed "to tackle the all-pervasive problem of mental health issues within architecture schools and practice." Topics range in the tool kit include "Office Culture and Overtime, Technology, Monitoring Staff Wellbeing and Championing an Active Mindful Approach." In Australia, this tool kit was championed by Parlour, the advocacy group working to improve gender equity. This impetus has led to, more recently, an Australian Research Council (ARC) grant for Australia entitled "Architectural Work Cultures: professional identity, education and well-being" was funded in 2020. According to its proponents, the ARC study will "address the question of how workplace cultures and professional identity affect subjective well-being in architecture." The above imbalances identified in the working lives of architects appear, as some have suggested, to be a global phenomenon (Raisbeck, 2019).

There has also been a focus on well-being in Construction Management—perhaps more so than in architecture. Again, psychosocial notions of well-being have been the focus: Kotera *et al.*, (2020) explore psychological outcomes in construction workers related to work-life balance. Chan, Nwaogu and Naslun (2020), in a literature survey of construction workers and mental health research, identify 16 psychological risk factors. Cheung *et al.*, (2019) develop a psychological "Shortened Stress Evaluation Tool" to highlight project professionals' stress levels. In related research, Clarke *et al.*, (2020) note that construction—and the same could be said for architects—is "a highly competitive market with low-profit margins and tight time frames, all of which is in a sector that is temporary in nature." Consequently, "the mental health and well-being of those within microenterprises may therefore be compromised." All of the above studies point to the need to develop accurate well-being measures such as the PERMA measure—rather than simply asking people how they feel (Butler & Kern, 2016).

The focus on the individual mental health, professional identity and individual resilience of architects in their workplaces is undoubtedly critical. Many researchers, as indicated above, have isolated well-being and mental health concepts, not linking these to industry, firmwide or organisational resilience. Moreover, this assertion is underscored by the fact that notions of individual identity and its professional conflicts in architecture (creative vs. suit) have been extensively examined (Bos-de Vos and Volker 2017). As noted in the field of Social Work 'Well-being' is a "contested issue, for both policy and practice" and one that is primarily "self-defined" by researchers and participants (Lelkes *et al.*, 2021). Self-definition suggests that a broader consideration of firm resilience is needed. In prevailing well-being studies, self-identifying tropes of the architect may have been reinforced: the architect as creative genius; a knowledge worker who must be "kept" or "made" well; a worker as an atomistic commodity. As Fraile-Marcos (2019) asserts, individual resilience is also reliant on "the social and physical" context enveloping an individual "far more" than individual "traits, cognition or talents."

Definitions of Resilience

Many of the normative definitions of resilience have been focused on the engineering capacity to absorb shocks or perturbations and yet still maintain function (Folke, 2016). However, the concept has also evolved since its emergence in ecology studies of the 1970s. As a result, integrated definitions rather than functionalist definitions have prevailed as resilience has been seen to be a socio-ecological construct (Fraile-Marcos, 2019). In contrast to engineering, ecological resilience has been defined as the "ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist." Zampieri (2021). Not surprisingly, this definition aligns with the Intergovernmental Panel on Climate Change (IPCC) definition: "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organisation, and the capacity to adapt to stress and change." Zampieri (2021).

In multi-lateral organisations, ideas of multifarious resilience have also taken on an integrated tone. For example, in research centred on the Sustainable Development Goals, Assarkhaniki *et al.*, (2020) note the many different types of resilience emerging in the SDG literature. In a literature review from 1970 onwards, they identify five dimensions of resilience: "social, economic, institutional, infrastructural, and environmental." As the World Health Organisation (WHO) states, for resilience to be "meaningful in operational terms", three things need to happen: Firstly, "the causes of the vulnerabilities that the strengthening of resilience should tackle." Secondly, the context or level of application of the measures needs to be identified." Thirdly, identifying the positive impact of any measures and processes advocated for resilience. Moreover, WHO argues that overall resilience must have "absorptive, anticipatory and adaptive capacities" (Ziglio, 2020).

Similarly, essential definitions of resilience have also emerged in Disaster and Emergency Studies. For example, after the Canterbury earthquake, the Resilient Organisations Research Group concluded that essential factors in building resilience are: care for staff, effective leadership, employee engagement, wide-ranging stakeholder communication, and "open communication" along supply chains. In two studies after the Christchurch earthquakes, Wilkinson *et al.*, (2016) and Sapeciay *et al.*, (2017) Argued that to help in post-disaster environments, contractors themselves

need to be resilient. They note the difficulty of this given that 'smaller companies struggle to achieve a reasonable level of resilience"—likewise for architectural firms.

There have also been many calls to consider the resilience construct in Construction Management studies as an integrated concept by extending it into design, project and organisational contexts (Anderies, 2014). Banahene *et al.*, (2014) set out the difficulty of maintaining resilience in temporal organisations, finding that the "dispersed, temporary and unique nature of projects: impairs the "communication and knowledge sharing" required for resilience in project organisations. Blay (2017) Examines resilience in both projects and temporary organisations, finding that diversity is critical to organisational resilience, concluding that inclusiveness, "the process of valuing, respecting and supporting members of an entity," is important in maintaining resilience in temporary organisations. Blay *et al.*, (2019) goes on to extend her work and concludes, "resilience in organisations should be seen as both the capability to prepare and respond to disruptions and the capability to respond to, prepare for and reduce the impact of disruption caused by the drifting environment and project complexity."

Despite the above impetus to bring notions of resilience into construction studies, as Kurth *et al.*, (2019) argue, operationalising the concept of resilience across construction is problematic. Firstly, they note the inability of risk management factors to be correlated with resilience measures and the "limitations for mainstreaming resilience into building industry processes and actors." This claim is because the full range of "Climate extremes, emerging human-caused hazards, system vulnerabilities and interdependencies can erode the capability to profile risks and apply risk management techniques." They go on to warn that the barrier to integrating resilience concept in construction is resilience analysis is "immature in terms of predicting or estimating what enhancements will yield greater resilience." To offset this, they suggest that the resilience curve and National Academy of Science (NAS) defined stages are useful analytical tools. The stages of resilience in this model are Plan, Prepare, Absorb, Recovery and Adapt (Kurth *et al.*, 2019; Ayyub 2014).

The above definitions indicate that conceptions of resilience for architects need to shift away from the proxy conceptions of retained—or "snapback"—functionality or a delimited psychosocial focus on individual well-being or professional identity.

RESEARCH METHOD

The Pulse Check (PC) Surveys were membership surveys intended to gather information from ACA members as the pandemic progressed to inform ACA decision-making (ACA, 2020). Before the pandemic, few extensive surveys or analyses of immediate business conditions for Australian architects had been undertaken. The ACA's strategic aim was to position itself as an influential advocacy group by understanding its membership. The survey design was primarily formulated by the executive committees and members of the ACA. This participatory context led to each survey containing different questions as external events unfolded. No two surveys were precisely the same. However, in this study, survey responses were downloaded for each survey. Aggregate statistics related to project cancellations, work pipelines, casual workers and redundancies were collated for each jurisdiction. This aggregation was done in Excel. These results were then ordered chronologically and compared to the corresponding staff well-being indicators (also collated in Excel) as set out in Tables 1 and 2 below. The resultant comparative analysis of the descriptive statistics is discussed below. Through a process of inductive interpretation

of concepts of firm resilience are also discussed below; from this discussion, a general model of firm resilience is developed. Further research would be needed to conduct correlation and regression studies on the data presented below.

The Pulse Check Surveys

Survey Responses and Questions

Table 1 summarises surveys and responses. The surveys covered a range of issues: office culture, changing working arrangements, roles, reduced hours, reduced pay, remote working, carer duties, seconding staff, well-being and stand-downs vs. forced redundancies. Broad financial indicators were also canvassed in the surveys, such as questions concerning work pipelines, revenue declines and the impact of cancellations in different sectors. It can be seen that the first survey gained the most respondents. By the time of PC4, the number of respondents decreased to be about 38% of PC1.

Table 1: Survey Summary

Survey and Date	Responses	% of Small firms (1-5).	% Casual to FTE	Projects cancelled or delayed	Standowns (%): Forced redundancies (%)	No. Rating mental well-being in as Very Good?
PC1:15-17 March	1,341	51%	16%	17%	Not asked	Not asked
PC2: 29-31 March	777	59%	15%	66%	12:12	15%
PC3: May 31 -3 June	453	60%	13.2%	79%	118: 166 (no.)	34%
VPC: Aug 20-27	196	67%	13.2%	75%	15:12	7% (43%)
PC4: 12-19 October	511	52%	12.3%	Not asked	19:12	16%

Survey Results

Pulse Check 1 (PC1). Taken 15-17 March 2020

The 1341 responding firms in survey 1 encompassed 15873 staff and 2542 Casual staff. At this point in 17% of firms had had projects cancelled, and 41% of firms anticipate this would happen. Respondents thought managing both stand-downs (24%), and Redundancies (25%) would be “Very Challenging”. At this time, any offices were shifting to remote working at home, and the most critical challenge appears to be "software and networking file-sharing issues. With 18% of respondents saying this might result in substantial difficulties. However, 23% felt that remote workers' carer duties (working at home) would also be “Very Challenging.” Only 8% felt that there would be a “Very Challenging” impact on office culture.

Pulse Check 2 (PC2). Taken 29-31 March 2020

As the pandemic circumstances unfolded, the second survey came quickly after the first. The 770 responding firms in survey 2 encompassed 7040 staff and 1072 Casual staff. At this time, 33% of firms stated they were changing work arrangements. 65% of firms noted that with the shift to remote working, productivity was down by 30% or more, but 47% expected this to improve quickly.

Pulse Check (PC3). Taken May 31 to June 3 2020

This Pulse Check also reported on the Federal JobKeeper wage subsidy program. Of the 271 respondents, 94% of firms had applied for it, 89% had been approved to receive it, and 10% were still awaiting approval. Overwhelmingly respondents stated JobKeeper had both prevented redundancies (79%) and stand-downs (74%). In response to how mental well-being in the firm had been since the beginning of the

pandemic: 49% of firms said it was the “About the Same”, while 24% said it was “Worse” (20%) Or “Much Worse” (4%).

Victorian Pulse Check (VPC). Taken August 20-27, 2020

Victoria's extended second wave lockdown prompted the VPC survey. In this survey, there were also questions regarding well-being. Notably, this survey also sought information about which sectors of cancelled or on-hold projects had impacted architects. The majority of cancelled or on-hold projects was in the residential sector (66%). More worrying was the response that 26% of office's had only up to 2 month's work.

Pulse Check October 4 (PC4). Taken 12 -19 2020 (refer to Table 2)

By this time, 43% of architects stated some projects had restarted, and 17% felt it would restart but not yet. 36% of office's had put to 2 Months of work whereas 25% had three months of work and 39% had six months or more of work. The ACA used the results of PC4 to call for substantial fiscal stimulus from the state and federal governments in the construction sector.

DISCUSSION

To what degree Australian firms were resilient in the first place is an open question. The above results suggest that Australian architects absorbed and partly recovered from the 2020 lockdowns. PC1, PC2, PC3 and VPC can be seen to undertake in the absorption phase. PC4 suggests the beginning of a recovery phase. Arguably, the decline responses from PC1 to PC4 might increase the surveys' increasing disinterest as business conditions picked up. On the one hand, the surveys appear to indicate an agile profession easily absorbing the pandemic shock and quickly adjusting to remote working, sensitive to carer duties during lockdowns, and able to change and adjust labour arrangements quickly. Throughout the surveys, except VPC, it was reported by employer firms that mental health and well-being were either "Good" or "Very Good"; although respondents, as managers, may have had optimism bias with no actual knowledge of their worker's well-being.

While the above results suggest a resilient profession, a profession with the agility to quickly cope with exogenous shocks, there are also contrary notes. This apparent agility may only reflect flexible labour arrangements and architects' ability to weather boom-bust cycles in neoliberal service markets. The Federal government's wage subsidy JobKeeper program was the primary source of resilience for many architectural firms. Arguably, many more architectural employers and employees would have had drastic changes in their employment and conditions without this support. The work pipeline questions point to the architectural practice's precarious nature, with many firms having less than three months of work. For employees, there were reduced pay, reduced hours, stand-downs and redundancies. As direct measures of resilience, the surveys are limited because the elements of firm resilience read through the surveys are imprecise. In part, this is due to the limited resources of the ACA despite their best efforts. Measures of financial resilience in all the surveys did not account for initial financial reserves in smaller firms. In Australia, this data is not collected at all by membership bodies. It was also difficult to know more precisely how many staff had been stood down from one survey to the next. Or the percentage of people working remotely in each firm, working remotely whilst caring for others and to what degree reduced wages and hours were in play. In addition, anecdotal evidence also suggests that many architects feel they have survey fatigue. Indeed, the ACA's employer architects seemed to "selectively" answer some questions and not

others. For example, in PC4, only 297 out of 511 skipped the decline in revenue questions, and 360 skipped questions regarding changing working arrangements. Arguably, the higher the uncertainty in the external environment at the start of the pandemic, the more likely architects would respond.

Table 2: ACA Pulse Check No. 4 Comparison by States

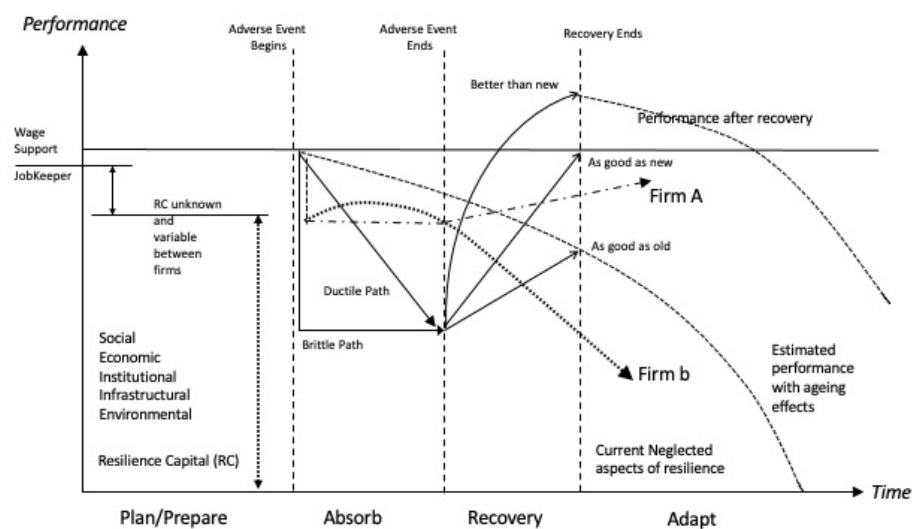
	SA	NSW	QLD	Vic
Cancellations or on Hold				
Yes	71%	70%	77%	77%
No	23%	21%	17%	15%
Pipeline of Work (Average all firms)				
Work needed				
now	12%	23%	0.0%	4%
1-2 Months	7%	13%	20%	24%
3 Months	28%	19%	20%	35%
Decline In Revenue				
Yes	46%	67%	70%	80%
No	42%	27%	28%	18%
Well-being: Current: Very Worrying (1), Neutral (3) Very good is (5). Compared: Much Worse (1), Same (3), Much Better (5)				
Current Mental Well Being				
	3.95	3.79	4.02	3.44
Well Being Now Compared to Start				
	3.37	3.17	3.23	2.59
Job Keeper Prevented Redundancies				
Yes	41.7%	48.1%	42.7%	50.0%
No	10.4%	10.1%	5.3%	14.6%

In Fig 1, Resilience Capital (RC) is that capital available to firms to enable their performance over time as a result of disruptive events. Reserves of RC allow a firm to absorb and adapt after an external shock. This diagram has been adapted to indicate how the ACA member surveys' information might be interpreted and future surveys improved (Kurth *et al.*, 2019, Ayyub 2014). The RC framework is divided into four stages: Plan/Prepare, Absorb, Recovery and Adapt. Some firms will enter the absorb stage with more RC than others. This RC is built on an integrated mix of the firm's culture, finances, infrastructure, institutional support (e.g., industry and govt policy) And spatial and environmental factors in workplace settings.

The surveys were taken in the Absorption stage; many firms reported a sudden drop in projects between PC1 and PC2, suggesting a more brittle path than a ductile one. The financial support of JobKeeper helped all firms with different degrees of RC at the outset of the disruption. But arguably, how firms employed this support determines how well they do in the recovery phase. For example, in Fig 1, two model firms are contrasted. Firm A uses the wage support and other measures to maintain reduced operations in a competitive environment.

In contrast, Firm B uses wage support to extend operations, for example, using the support to price its fees to win work aggressively. In the Absorb stage, both firms look very much alike; firm B, because of increased activity and the quick expenditure of the wage support, may appear to have more outstanding performance. However, Firm B's strategy fails in the Recovery stage because it has expended too many of its resources on unsustainable and low fee bids in the previous stage. Appearing to do well in the Absorb stage may not be a predictor of success in the following stages. The model thus points to why it is essential for firms to accurately consider RC in the Plan/Prepare stage, especially given the cyclical nature of the construction sector. The model also suggests what might happen if the Absorb and Recovery cycles were repeated due to sequential pandemic waves.

Fig 1: Diagram of Resilience Capital (adapted from Kurth et al., 2019, Ayyub 2014).



The above results suggest the need for architects to better index and measure RC in future surveys. Assarkhaniki *et al.*, (2020) Suggested that an integrated and strategic resilience model needs to address social, economic, institutional, infrastructural, and environmental contexts. However, they also suggest that this should account for the broader context of firms and their circumstances. In other words, RC should be measured to account for different scalar contexts. To this end, RC in the Plan/Prepare stage should account for both internal micro and external macro factors. Hence, firm resilience relies on a range of multi-scaled elements. These elements need to encompass "the interconnection and interdependence of social and ecological systems, their interplay between conservation and transformation, and the capacity of a given system for self-organisation" (Fraile-Marcos, 2019). As Casco-Solís, S. (2019) states, resilience must be seen as a "social process" that binds together individual actors and entities and broader social-ecological systems. The RC model developed here suggests further research is needed to determine how integrated Psycho-Social-Ecological conceptions of resilience can shape and be enacted in professional service firms. (Stroink, 2020).

CONCLUSIONS

The above discussion contributes to our knowledge regarding architects by establishing how Resilience Capital might begin to be conceptualised as a dynamic

concept for their firms (Fig 1). As suggested by the preliminary framework, the concept of Resilience Capital should be defined, measured and developed across micro and macro different scales. All too often, people and organisations imagine they can quickly return to their "pre-earthquake" or "pre-pandemic" state. For architects working in a knowledge sector, there is a need to develop industry-wide resilience data and actions across social, economic, institutional, infrastructural environmental contexts. For architects, measuring, building and modelling Resilience Capital will prepare the profession for the exogenous and environmental shocks that will surely come in the future.

REFERENCES

- ACA (May 25, 2020) ACA delighted to support Monash Mental Wellbeing Research project, Available from: <https://aca.org.au/aca-delighted-to-support-monash-mental-wellbeing-research-project/> [Accessed 13 July].
- ACA (2020) Pulse Checks, Available from: <https://aca.org.au/research-advocacy/research/pulse-checks/> [Accessed 13 July].
- Anderies, J M (2014) Embedding built environments in social-ecological systems: Resilience-based design principles, *Building Research and Information*, **42**(2), 130-142.
- Assarkhaniki, Z, Rajabifard, A and Sabri, S (2020) The conceptualisation of resilience dimensions and comprehensive quantification of the associated indicators: A systematic approach, *International Journal of Disaster Risk Reduction*, **50**, 101840.
- Ayyub, B M (2014) Systems resilience for multi-hazard environments: Definition, metrics and valuation for decision making, *Risk Analysis*, **34**(2), 340-355.
- Banahene, K O, Anvuur, A and Dainty, A (2014) Conceptualising organisational resilience: An investigation into project organising. In: Raiden, A and Aboagye-Nimo, E (Eds.), *Proceedings 30th Annual ARCOM Conference*, 1-3 September 2014, Portsmouth, UK, Association of Researchers in Construction Management, 795-804
- Barton, C, Gans, D and Palmer, R (2018) Beyond temporary: Prototypes for resilient communities, *Architectural Design*, **88**(4), 78-85.
- Blay, K B (2017) *Resilience in Projects: Definition, Dimensions, Antecedents and Consequences*, Doctoral Thesis, Loughborough University).
- Bos-de Vos, M and Volker, L (2017) Constructing Business Models Around Identity: Tensions in Architectural Firms. In: Chan, P W and Neilson, C J (Eds.), *Proceedings 33rd Annual ARCOM Conference*, 4-6 September 2017, Fitzwilliam College, Cambridge, UK. Association of Researchers in Construction Management, 491-500.
- Blay, K B (2017) *Resilience in Projects: Definition, Dimensions, Antecedents and Consequences*, Doctoral Thesis, Loughborough University.
- Blay, K, Anvuur, A and Dainty, A (2019) *Comparing Resilience in Organisations and Projects*, ARCOM Working Papers Compendium, Available from <https://www.arcom.ac.uk> [Free registration required].
- Bowen, P, Edwards, P and Lingard, H (2013) Workplace stress experienced by construction professionals in South Africa, *Journal of Construction Engineering and Management*, **139**(4), 393-403.
- Butler, J and Kern, M L (2016) The PERMA-Profil: A brief multidimensional measure of flourishing, *International Journal of Well-Being*, **6**(3), 1-48.
- Casco-Solis, S (2019) Resisting resilience in neoliberal times: Rawi Hage's cockroach 1, In: *Glocal Narratives of Resilience* Abingdon, UK: Routledge, 181-191.

- Chan, A P, Nwaogu, J M and Naslund, J A (2020) Mental ill-health risk factors in the construction industry: Systematic review, *Journal of Construction Engineering and Management*, **146**(3), 04020004.
- Cheung, C M, Bowen, P, Cattell, K and Davis, J (2019) Measuring What Counts: Workplace Well-Being of Project Professionals. In: Gorse, C and Neilson, C J (Eds.), *Proceedings 35th Annual ARCOM Conference*, 2-4 September 2019, Leeds Beckett University, Leeds, UK Association of Researchers in Construction Management, 874-883.
- Clarke, N, Bradley, J G and Spillane, J P (2020) Mental Health and Well-Being in Micro-Enterprises in the Construction Industry: An Irish Perspective. In: Scott, L and Neilson, C J (Eds.), *Proceedings 36th Annual ARCOM Conference*, 7-8 September 2020, UK, Association of Researchers in Construction Management, 746-754.
- Fraile-Marcos, A M (Ed.) (2019) *Glocal Narratives of Resilience*, Abingdon, UK: Routledge.
- Kotera, Y, Green, P and Sheffield, D (2020) Work-life balance of UK construction workers: Relationship with mental health, *Construction Management and Economics*, **38**(3), 291-303.
- Kurth, M H, Keenan, J M, Sasani, M and Linkov, I (2019) Defining resilience for the US building industry, *Building Research and Information*, **47**(4), 480-492.
- Lelkes, J, Bouch, A and Holmstrom, C (2021) Well-being: From concept to practice? *Practice*, [Ahead of Print].
- Parlour (July 19, 2019) *Toolkit for Mental Health*, Available from: <https://archiparlour.org/toolkit-for-mental-health/> [Accessed 13 July].
- Raidén, A and Räisänen, C (2018) Conceptualising Behavioural Ambidexterity and the Effects on Individual Well-Being. In: Gorse, C and Neilson, C J (Eds.), *Proceedings 34th Annual ARCOM Conference*, 3-5 September 2018, Queen's University, Belfast, UK. Association of Researchers in Construction Management, 736-745
- Raisbeck, P (2019) *Architecture as a Global System: Scavengers, Tribes, Warlords and Megafirms*, Bingley, UK: Emerald Publishing Limited.
- Roggema, R (2018) Design with voids: How inverted urbanism can increase urban resilience, *Architectural Science Review*, **61**(5), 349-357.
- Sapeciay, Z, Wilkinson, S and Costello, S B (2017) Building organisational resilience for the construction industry, *International Journal of Disaster Resilience in the Built Environment*, **8**(1), 98-108
- Stroink, M L (2020) The dynamics of psycho-social-ecological resilience in the urban environment: A complex adaptive systems theory perspective, *Frontiers in Sustainable Cities*, **2**, 31.
- Wilkinson, S, Chang-Richards, A Y, Sapeciay, Z and Costello, S B (2016) Improving construction sector resilience, *International Journal of Disaster Resilience in the Built Environment*, **7**(2), 173-185.
- Zampieri, M (2021) Reconciling the ecological and engineering definitions of resilience, *Ecosphere*, **12**(2), e03375.
- Ziglio, E (2017) *Strengthening Resilience: A Priority Shared by Health 2020 and the Sustainable Development Goals*, Copenhagen: WHO Regional Office for Europe, 17.