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EMPOWERING ARCHITECTS: BRIDGING DESIGN AND ENTERPRISE IN SOUTH AFRICA

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ABSTRACT: Internationally, the architectural profession is doing introspection and debating its future role and relevance. In South Africa, the profession, like others in the built-environment sector, is under pressure, due to political and economic uncertainties and a low growth rate. While many voices call for a greater emphasis on the business aspect of architectural practice, this review article suggests that, in addition, if architects were to adopt a more entrepreneurial approach – as many have already done – the profession could gain new ground and fresh relevance. In support of this suggestion, the article proposes how the inclusion of entrepreneurship education into architectural education can inculcate an entrepreneurial attitude. Based on a literature study, the article provides examples of entrepreneurial endeavors by architects in practice. The study found that entrepreneurial architects have created opportunities not only for themselves, but also for others, including persons who previously enjoyed hardly any benefit from architects; that entrepreneurial architects can practice away from mainstream locations; that the advent of the Fourth Industrial Revolution might bring a host of entrepreneurial opportunities to those who are ready and have an entrepreneurial mindset; that entrepreneurial architects seem willing to share and help others who wish to follow, and that entrepreneurship and good design are not incompatible. A further finding was that the profession in general benefits, and will continue to do so, from the entrepreneurial endeavors of its members. A change of mindset was found to be the main factor prohibiting support for the notion that architectural education should include entrepreneurial outcomes into current and new programmers. Finally, it emerged that there is a need for support in the form of mentorship, incubators, and support groups from professional organizations such as the South African Institute of Architects.

KEYWORDS: Architectural practice, entrepreneurship, entrepreneurship education, complementary practice

INTRODUCTION

A characteristic of recent annual reports from the South African Institute of Architects (SAIA) is alarm about the deteriorating situation of architects in South

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Africa. SAIA's State of the Profession 2020: Business Benchmarking Survey (SAIA, 2020: 31) found that "[p]ractice profits, as a percentage of income, have declined compared to a year ago, with the average declining from 21% to 13%, and the median profit showing a similar trend from 20% to 11%. The decline is evident across all practice sizes." This confirms that the profession is under severe strain. This situation can be blamed on various aspects, including the dismal performance of the South African economy (Trading Economics, 2020) and, more recently, the lockdown following the COVID-19 crisis (SACAP, 2020). A recent (2021) survey conducted on behalf of the South African Council for the Architectural Profession (SACAP) found that "a substantial proportion of practices [are] sic clearly struggling financially, while others have enjoyed quite good turnovers and profits" (Leading Edge Research, 2021: 53). The survey results show that "the median turnover for large practices (approximately R11M) and macro practices (approximately R34M) has held up well during the Covid pandemic, showing no decline compared to the previous year". However, according to this survey, on the whole, the median profit percentage for architectural practices was a low 10%, while 10% reported zero profits, and 25% of architects indicated a loss. It should be noted that these findings somewhat contradict the findings reported in SAIA's 2020 report, which indicated that large practices reported similar levels to the previous year, while macro practices reported a lower income (14% compared to 24% in 2019) (SAIA, 2020: 29). However, the reason could be that the sample sizes of large and macro practices for the SAIA studies were small (SAIA, 2020: 8). Nevertheless, this shows that many practices are financially distressed. It is particularly perturbing that the situation described in this instance has been going on for some time. It cannot be allowed to continue because, if it does, many expensively educated and talented persons will continue to leave the profession.

Add to this the dawning of the Fourth Industrial Revolution (4IR) (World Economic Forum, [n.d.]) and changes required or forced onto society by the environmental or climate crisis (NASA, 2021), which will require responses from the profession, it becomes clear that the post-COVID-19 period could have major implications for the profession and the way we practise. The profession cannot continue as it used to. South African architects are not the only ones under pressure and the decline has been underway for some time. With the opening of the 2018 Venice Architecture Biennale, Dezeen published a provocative article by Sean Griffiths, titled "Architects are not really required for the nitty gritty of actual building any more" (Griffiths, 2018). While many would disagree, the curators of the biennale concur that the profession is under siege (Dezeen, 2018). Concerns about the future of the architectural profession are not new. Other architectural professional bodies such as the Royal Institute of British Architects (RIBA) think tank, Building Futures, have reacted to concerns regarding the future of the profession with a study focusing on the questions: "Who will design our built environment in 2025; what roles might those trained in architecture have then and how might architectural practice have changed as a result?" (Jamieson, 2010: 6). Change is a constant. It can be unpleasant, and many will yearn for the position held two or three decades ago. However, some of the participants in the RIBA study viewed the changes in a positive light. One respondent stated that the "invasion of the architect's role shouldn't be seen as a threat but as a natural change that can be exploited – we must find our own new opportunities and education should shift to accommodate that" (Jamieson, 2010: 28). Martha Thorne, executive director of the Pritzker Prize and dean of the IE School of Architecture and Design, believes that "we're at a frontier in architecture, where the profession is changing or must change" (Archipreneur, 2019a). Many, including the International Union of Architects (UIA), have suggested that architects must "expand the boundaries of architectural practice" (UIA, 2014: 14). The current

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economic situation could also force many to seek new opportunities. While there is no single accepted definition for entrepreneurship, finding new opportunities and moving into new fields of operation are central themes in most people's understanding of entrepreneurship (Global Entrepreneurship Research Association, 2018: 28). Furthermore, it is interesting to note that, in the 2021 SACAP benchmarking survey reported on earlier, the macro and large practices are not struggling. This is not new. As far back as 2001, SAIA found in a survey that the composition of firms changed during the period covered by their survey: large firms became bigger and employed more support staff, while firms in the smaller firm categories shrunk and employed less staff (Vosloo, 2004: 32). While there could be many reasons for this situation, it does indicate that the smaller firms are affected most by the difficult conditions and, while entrepreneurship cannot be equated to firm size, larger firms would not exist without an entrepreneurial orientation among their principals. It also indicates that there are opportunities and that a more growth-oriented mindset might be advantageous. However, at the moment, in South Africa, entrepreneurship and any form of entrepreneurial education are sadly lacking as part of formal architectural education and training at any level, Continuing Professional Development (CPD) included (Vosloo, Vosloo & Antonites, and 2018: 3). Perkins (2021: 4) comments as follows: "Today we are highly dependent on sophisticated technology platforms. More and more firms are competing beyond their local markets; many are working nationally and internationally. There is more competition, and it is far more sophisticated. The size and sophistication of the administrative and technology support personnel at most mid-size to large firms has grown to respond to an increasingly challenging business and technical environment. And the design assignments, project team structures, project delivery methods, and client expectations have become increasingly demanding and complex, requiring much more specialization, larger teams, and a vastly broader array of services."The economy is currently entering the post-COVID-19 phase. The COVID19 pandemic led to a number of changes, particularly the faster than expected advent of the 4IR. Bernstein (2020: 1) predicts the following for the near future:

- Fierce fee competition, as the firms that survive compete for contracts.
- If the downturn persists, more and more newly qualified architects and students will leave the profession.
- Practices will be forced to adopt a lean structure, resulting in many losing their jobs. Many of these will look at starting their own practices. This will also result in staff shortages as soon as the economy blooms again.
- Practices will resort to technology, in order to overcome the challenges of the current period.
- Practices will utilise their newly acquired ability to work digitally and remotely, in order to create talent networks that will expand globally. Reliance on data will increase, thus creating opportunities to generate and offer new value through offering services such as analytics, digital fabrication, etc.
- A new generation of digitally facile practices with workforces distributed globally will emerge.
- Even building contractors will be forced to increasingly turn to technology (automation and prefabrication) as a response to pressures such as increasing health regulation, health concerns, and costing. They will demand different forms of communication from those who previously issued drawings as a means of communication.
- As a new breed of architectural practice emerges, students will demand that their education must change, in order to prepare them for the new practice environment.
- The new firms will define the new talent agenda and will probably seek technological prowess, being able to collaborate widely with role-players across the world, and greater flexibility.

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One such example is the development by Architecture studio Wallgren Arkitekter and Swedish construction company Box Bygg of a parametric design tool called Finch. Finch can generate floor plans adapted to the constraints of a site. Finch was designed to help architects identify and incorporate the constraints and potential of a site during the initial stages of the design process (Ravenscroft, 2019). Other examples are Foster and Partners (see 5.3), Aectual (see 5.9), and Morpholio (see 5.10). Some of the new technologies will be introduced during the 4IR (Rashid, 2018: 14-15):

- 3 D printing: 3D-printed buildings and rapid assembly components.
- Advanced materials (including nanomaterials): Smart, low carbon and no or low cement concrete, heat-reducing, and super-insulating materials.
- Artificial intelligence: Machine-automated land-use change detection, auditory-cue lighting/heating, and optimised sustainable building design.
- Robots: Robots for efficient construction and assisted assembly of prefabricated buildings.
- Drones and autonomous vehicles: Drone imagery for landuse planning, and monitoring of human behaviour in the urban environment.
- Biotechnologies: Living building facades and films, biomimicry in urban design, as well as construction biomaterials and processes.
- Energy capture, storage and transmission: Decentralised energy storage for building efficiency.
- Blockchain (and distributed ledger): Smart construction contracts, automated planning assessments, as well as approvals and land registry.
- Internet of things: Sensors in and on buildings to optimise construction pollution and operating performance for energy, water, waste, and air quality.
- New computing technologies: Super high fidelity Building Information Modelling (BIM).
- Advanced sensor platforms: Chemical sensors for building materials.
- Virtual, Augmented, and Mixed Realities: Virtual Realities (VR) and Augmented Realities (AR) for urban planning, citizen engagement, and BIM user experiences.

Clearly, the architectural playing field, like that of many other professions, is changing and has already changed a great deal. Susskind and Susskind (2015: 9) argue that digital technology is (and has been) increasingly dismantling all the traditional professions. As far as architecture is concerned, they provide the following examples of this process at the time of writing (2015): Online Computer Aided Draughting (CAD) systems such as "SketchUp" and "Chief Architect" allow the public to build virtual models and designs, including those of entire homes, and to turn these into formal plans. Other CAD systems assist in resolving particular design problems. Examples are Ply Gem's "Design Exterior" and Timber Tech's "Deck Designer". Other online platforms are changing the ways in which architects are engaged and appointed. Examples of this development can be found on the "WeBuildHomes" website, where architects can, in response, submit their design proposals. The prospective clients can then evaluate the submissions at leisure and select their preferred design (Susskind & Susskind, 2015: 96). Davis (2019: 3-14) points out that the Susskinds foresee that architectural design will move from the bespoke to the systematized. They also anticipate that smaller firms will be worst affected, since large firms will be able to buy technology that will enable them to reduce production costs. This will enable large firms to provide the digital support clients will insist on in an effort to create efficient buildings. It is evident that the

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profession will continue to change. Consequently, the increased reliance on the technology required to compete, together with the ensuing cost thereof, will mean that the already suffering small practices will suffer even more and will have to explore new opportunities in order to survive. Simply put: Architects, particularly those who prefer to practise on a small scale, will have to become entrepreneurs. Odile Decq, award-winning French architect and architectural educator, believes that, since we are in the 21st century, architects cannot continue to practise in the way they used to in the 20th century: we have to explore new directions and new ways of thinking and doing. Architecture will not be left unchanged by the socio-economic changes currently underway. We cannot continue as architects and developers only. Architects must decide which life they would like to have (Archipreneur, 2017: 8). She emphasises that "we need to reinstate the pride of being educated in architecture and the role of the architect for the world. Due to all that, students need to be prepared and trained to decide how to apply their uniqueness and this is not only by designing and building buildings. Training as entrepreneurs, they will be able to act and help the world" (Archipreneur, 2017: 7).

1.   METHODS AND REVIEW APPROACH

Using qualitative desktop research (literature review) and secondary data analysis, this study highlights the need for a more entrepreneurial stance among architects, to show that entrepreneurship and architectural practice have much in common, and how architects can become more entrepreneurial. Snyder (2019: 339) states that literature reviews can act as a basis for knowledge development, engender new ideas, and provide new directions for a particular field (or profession). This literature review follows an integrative approach (Snyder, 2019: 235), since the aim is "to assess, critique and synthesise literature on a research topic" (Toracco, 2005, as cited in Snyder, 2019). Relevant materials used in this review consisted of books, articles, and internet sources. The review starts by showing that the architectural profession is at a point where change is in the offing. It then explores the relationship between architecture and entrepreneurship before considering what might be required to inculcate a more entrepreneurial stance among architects. The review includes 12 examples of entrepreneurial architectural practices in support of the argument that entrepreneurship and architecture are compatible, to show that an entrepreneurial mindset can unlock opportunities for architects, and help architects move into new areas of practice; to identify possible entrepreneurial role models for start-up architects, and to identify additional advantages that entrepreneurial endeavour could have for the architectural profession as a whole. Twelve examples are used because of the inherent advantages of a larger sample size, particularly insofar as the creation of role models is concerned. In addition, as qualitative research, the findings are not intended for universalisation. Thus, the number of examples was determined by pragmatic reasons, namely by what is "Available at:" in the literature, provided that the examples should be from a variety of countries and represent a variety of practice sizes. It should also indicate that entrepreneurial actions among architects are not uncommon or restricted to a few mavericks. Some of the examples used are highly regarded and awarded practices. The discussion and analysis compare the examples used to highlight the differences between the routes adopted, and the advantages of each, both for the firm involved and for the profession as a whole. The results indicate how the profession might benefit from a more entrepreneurial approach.

2.   ENTREPRENEURSHIP AND ARCHITECTURE

As mentioned earlier, during 2009, the RIBA initiated a study, titled "The future for architects?" (Jamieson, 2010). The report concludes as follows: "It can sometimes seem that the long shadow of the gentleman architect still

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hangs over the profession, obscuring the fainter, earlier memory of the master builder. Contemporary society has more interest in the latter than the former. While the future for the practice of architecture as a discrete business is uncertain, the opportunities for architects have never been greater, notwithstanding the current recession. However, to grasp those opportunities architects will need to develop greater financial nous and commercial acumen, to welcome the integration of their work with others in the wider industry and continue to work hard to promote the extraordinary benefits which society gains from the design process" (Jamieson, 2010: 39). In 2011, Nathan Richardson (2011: 310) wrote that, if the architectural profession continues to follow an understanding of practice that is steeped in the past, it is bound to face "diminishing relevance". At the 2014 UIA Congress in Durban, South Africa (3-7 August), the union committed itself to "the continuing extension of the boundaries of architectural practice, limited only by the provisions of codes of ethics and conduct and to strive to ensure the corresponding extension of the knowledge and skills necessary to deal with any extension of boundaries" (UIA, 2014: 14). In essence, this is an acknowledgement that architects should enter related fields where their knowledge and skills can be of benefit. An entry on the Archipreneur (2015a: 1) website holds that "[t]he unique skillset that is acquired with an architectural education is particularly beneficial when it comes to developing creative solutions to real problems". In the South African context, the importance of confronting the matter of economic inclusion (Low, 2019: 11-13) and improving the built environmental situation in township settings cannot be ignored and architects can contribute towards solving these problems. Architects have, by the nature of their education, a wide skill set that enables them to develop and implement a wide range of business models. However, the idea of automating or productising architectural design services remains controversial, since many will argue that it boils down to the very essence of architecture-bespoke design. Regardless, as will be shown, many of the most revered architects nowadays used the strategy of productising of services as part of their success. Rather than customising their offering with every new client and repeating the same processes, these architects have reinvented their businesses' offering, or part thereof, towards creating products. Both the documents referred to earlier indicate that architectural education should also change in line with changes in practice. Previously, design education paid scant attention to anything beyond the creation of physical spaces, whereas in the current situation, our influence and survival depend on us "widening our vision, identifying new business opportunities, fresh approaches to problem solving and renewed ways to create value through design" (Van Schendel, 2019: 4). Ray Brown and Bec Kempster, founders of Archibiz, point out that, contrary to popular belief among many architects, "doing good architecture does not automatically translate into doing good business" (Archipreneur, 2019b: online). They believe that architects must understand the difference between being a technician (or designer) and being a leader. Being a leader requires different and specific abilities. At the same time, it must be understood that planning or designing a clearly defined practice structure is one of the first steps towards having "a stable and sustainable architectural business foundation, primed for growth" (Archipreneur, 2019b: online). Some universities' schools of architecture have responded to this call to action. One such response came from the IE School of Architecture and Design in Spain that introduced a master's degree in Business for Architecture and Design, while the Graduate School of Architecture at the University of Johannesburg is working to introduce a Postgraduate Diploma in Architectural Management and a Post-Professional master's degree in Architectural Entrepreneurship and Leadership. Entrepreneurship theorists such as Heidi Neck, Patricia Greene and Ana Daniel (in Neck & Greene, 2011) also highlight the importance of design thinking in entrepreneurship. Architecture and entrepreneurship are

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not such strange bedfellows after all! Julia Gamolina, founder and editor-inchief of the online magazine Madame Architect (about, for, and by the extraordinary women in architecture) holds that "the more architects can accumulate skills that are about [starting and] running a business and telling a compelling story about who they are, what their work stands for, and who they choose to partner with, the better the work will be as well" (Harrouk, 2021: online). She continues that the most common theme in the advice offered to those starting their careers by the 240 people interviewed is to "be open to interesting opportunities and to not be afraid not to follow the 'traditional' architect-designer path that has been modelled to us all for so long" (Harrouk, 2021: online). Research by the author identified a number of architects who have ventured outside the realm of conventional practice (Vosloo, 2019: 169). It was found that these practices have expanded their operations by:

- the design and manufacture of building components;
- the design of prefabricated housing;
- furniture design;
- interior design;
- acting as estate agents;
- selling furniture;
- creating and hosting a website selling house plans;
- property development;
- property and facility management;
- building contract coordination;
- landscape design;
- space planning;
- building contracting, and
- Construction contract dispute resolution.

Lumpkin and Dess (1996: 136) describe 'new entry' as the central idea of entrepreneurship. To them, 'new entry' could imply the start of a new operation, the entry of a new owner or manager into an established enterprise, an enterprise entering new or established markets, or even introducing a new product or service into an existing market. However, making the above changes will require architects to adopt a more entrepreneurial mindset (Valerio, Parton & Robb, and 2014: 3), if we understand mindset as being the precursor to action (Neck, Neck & Murray, 2018: xvii). Despite the questions many architects might have about the global fascination with entrepreneurship, the association between neoliberalism and entrepreneurship, and the criticism of the former by many such as George Monbiot (2016), this article holds that entrepreneurship, as a construct, is not dependent on the neoliberal system and existed long before the advent of neoliberalism. It proposes that entrepreneurship's focus on freedom and independent action provides inherent potential to generate solutions in areas that centrally planned economies might overlook. That is, it can assist architects in identifying new areas in which to practise. Therefore, enabling and promoting entrepreneurship and entrepreneurial thinking do not imply social engineering in support of the current neoliberal macroeconomic system. It specifically includes what some refer to as "social entrepreneurship" or "the process of sourcing innovative solutions to social and environmental problems" (Neck et al., 2018: 19). Enabling entrepreneurship could provide architects with the ability and skills to identify needs

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and opportunities in society and allow for these opportunities to be explored for the benefit of the individuals themselves and/or for society at large (Vosloo, 2019).

It is also worth noting the following "truths about entrepreneurship" (Drucker, 2021: 6):

- Entrepreneurship is not reserved for start-ups.
- Entrepreneurs do not have a special set of personality traits.
- Entrepreneurship can be taught (the method requires practice).
- Entrepreneurs are not extreme risk-takers.
- Entrepreneurs collaborate more than they compete.
- Entrepreneurs act more than they plan.
- Entrepreneurship is a life skill.

3.   ENABLING ENTREPRENEURSHIP

Entrepreneurship is a way of reasoning and doing (Timmons & Spinelli, 2007: 79) and, as such, it requires specific mindsets. Mindset changes seldom happen overnight. Therefore, if entrepreneurial pursuit is to be stimulated, it is essential to have a wide-ranging and sequential strategy. Actions focused on modifying aspects other than the obvious attitudes or skills that individuals might have or need are required. At the same time, particular actions are necessary to create the appropriate environmental and societal conditions that will ensure lasting attitudinal changes. Noted entrepreneurship specialists Maasdorp and Van Vuuren (1998: 721), Turton and Herrington (2012: 23), and Hill (2003: 39) suggest that many of the required mindset changes involve changes and actions at the societal level and are shaped by aspects such as societal attitudes, culture, work experience, education systems, and family role models, in addition to the individual's own personality and mindset. It is widely believed that entrepreneurship can be taught (as a method or practice, rather than as a process) (Neck et al., 2018: 10). Cooke (2021: 7) relays the findings of McKenzie and Woodruff whose review of a number of earlier studies concludes that training can be associated with better outcomes and an increase in profits of as much as 12.1%. Maasdorp and Van Vuuren (1998: 721) developed a model to illustrate the external factors that promote entrepreneurship in nations. This model, expanded to include Entrepreneurship Education, is shown in Figure 1. This model indicates that, to start with, a society or group with an entrepreneurial disposition is recommended, because an entrepreneurial disposition has been found to be essential for the starting, survival, and growth of enterprises. Furthermore, macro- and microeconomic conditions and cycles, in turn, influence the type of entrepreneur who steps up (necessity- or opportunity-based) (Maas & Herrington, 2006: 9; Ellis & Williams, 2011: 6; Kelly, Bosma & Amoros, 2010: 26). (It is not clear how this aspect might relate to the architectural profession. If the current monodimensional understanding of architectural practice presented by the vast majority of university programmes, as well as the results of research by Th'ng [2005: ii-iv][1] and Vosloo [2017: 292] are considered, it appears that, in general, architects often lack entrepreneurial mindsets, even though the current economic conditions could be forcing some to become necessitybased entrepreneurs as they are retrenched by existing firms). This implies that developing an entrepreneurial mindset would be the appropriate starting point. However, it would take a long time to change attitudes and values, but because many firms start new initiatives, due to

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[1] The author found that relatively few architects regard themselves as entrepreneurs.

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financial need (Botha, 2014: 34),[2] changes to the current professional and economic environment might well induce such a change in a shorter period. A cooperative and supportive environment that helps and stimulates entrepreneurial activity is also required (Maasdorp & Van Vuuren, 1998:
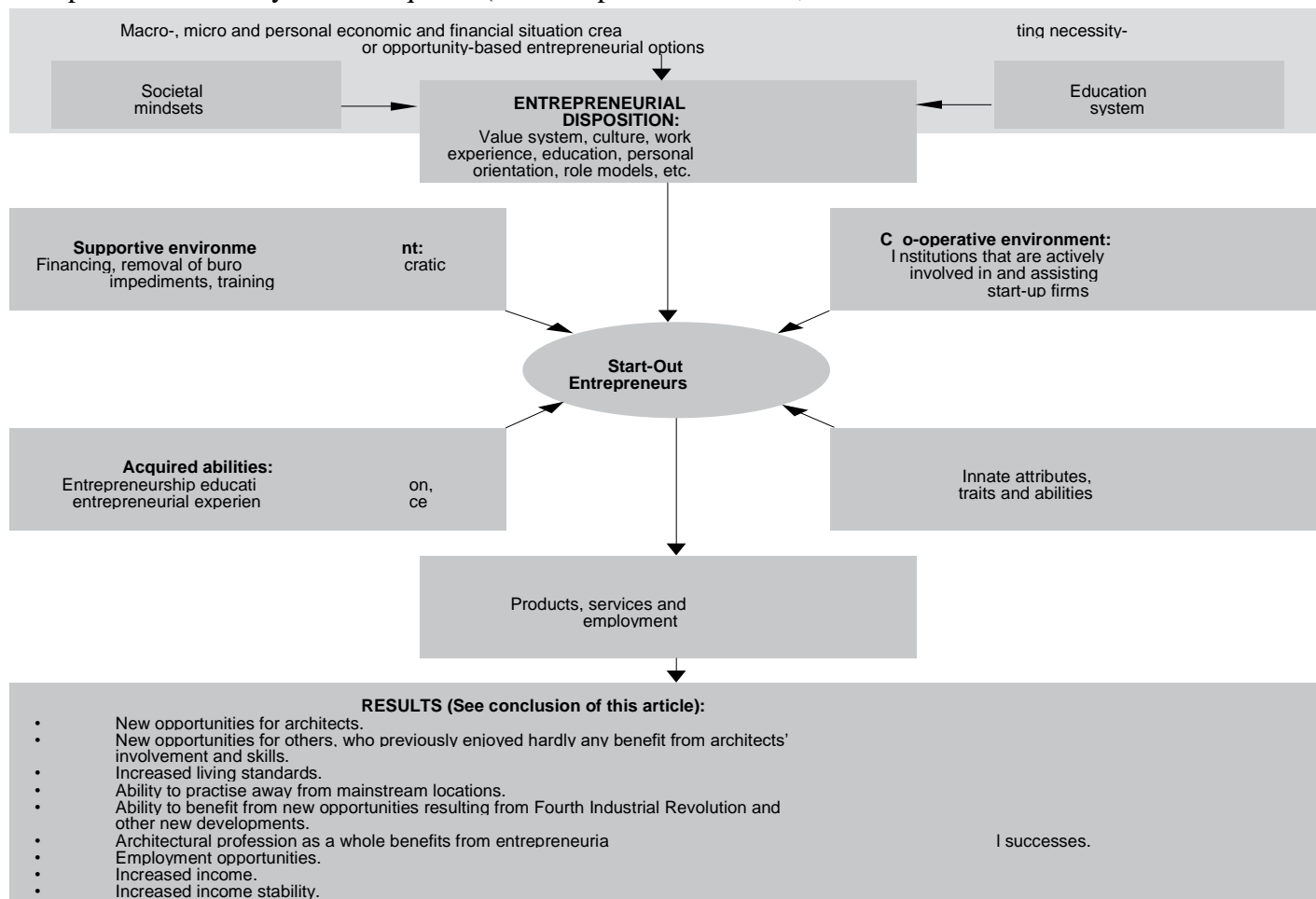

Figure 1: An expanded model for entrepreneurship development in architecture

Source: Author, adapted from Maasdorp & Van Vuuren, 1998: 721

721; Nieuwenhuizen, 2014: 13; Valerio et al., 2014: 11; Turton & Herrington, 2012: 22; Timmons & Spinelli, 2007: 18). To this end, we need organisations that can offer support such as financing, mentoring, counselling, and/ or incubators. In South Africa, some of the required support is available from various organisations, including government departments, banks, and universities (Vosloo, 2017: 107). However, in the South African architectural situation, the pressing need is for additional entrepreneurship education and training, where attitudes can be cultivated and the innate abilities and traits, which most architects have (Th'ng, 2005: ii-iv), can be developed and honed. To this end, the education offered must first compensate for the inadequate primary and secondary education system. Training should then be offered to inculcate the attitudes required for entrepreneurship. This should be followed by modules that include theory and skills development (Vosloo, 2017: 107). The use of case studies and the involvement of established and recognised architectural and general

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[2] Botha indicates that, in general, entrepreneurs start their own businesses for reasons that can be grouped as either 'push' or 'pull' factors. 'Push' factors cause individuals to start a new business because their current jobs have become unattractive or because of financial need.

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entrepreneurs acting as role models can be useful, but developing a style of thinking and acting using a portfolio of techniques such as serious games, simulations, as well as design-based learning and thinking, coupled with reflective practice, has been found to also yield positive results (Neck & Greene, 2011: 63-66; Daniel, 2016: 215-223). Post-professional educational programmes such as those mentioned earlier can fill this need. However, such programmes must also include aspects of business management because the shortcomings identified by Peerutin (2019: 5) cannot be left unattended.

Because of the high failure rate of start-up businesses (EVA Financial Solutions, 2019), start-up architects will need support in the form of role models, mentorships, and peer support groups. They would also benefit from meeting spaces, access to funding, as well as technical and administrative support. Professional bodies such as SAIA are best placed to provide for this need. Many if not the vast majority of architects already have most of the attributes generally associated with entrepreneurial action. These include a 'growth mindset', creative minds, and design thinking (Neck et al., 2018: 66-175). What is needed is for many architects to put into practice the advice of John Keating, lead character in the film Dead Poets Society (1989): "I stand upon my desk to remind myself that we must constantly look at things in a different way" (from Neck et al., 2018: 66).

4. ENTREPRENEURIAL ARCHITECTS

The initial literature review identified 12 examples of entrepreneurial architects and the ways in which they have

used their architectural skills to diversify their offering (see subsections 5.1-5.12 below).[3] The practices were selected with a view to present a representative range of firms that have ventured outside the confines of conventional practice by introducing a 'new' endeavour. They were selected from interviews published on the Archipreneur website (Archipreneur, 2022); practices featured in the article "Branching out: 9 Architects who created innovative products" (Archipreneur, 2015a); "Spatial Agency: Other ways of doing architecture" (Awan, Schneider & Till, 2011) and, to include a South African example, from the author's research on "Adapting to a changing professional context" (Vosloo, 2019).

4.1 Frank O. Gehry (now The Gehry Partnership, Gehry Partners, LLP)

Frank Gehry established his practice in Los Angeles, California, in 1962 (Gehry Partners LLP, [n.d.]). Gehry's work is renowned for his incorporation of complex shapes such as those used in his Walt Disney Concert Hall

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[3] The list is merely a sample and is not meant to be comprehensive. The examples were chosen to portray a wide spectrum of the range of entrepreneurial ventures by architects.

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(see Figure 2). The firm is regarded as one of the most influential practices of our day and Gehry is viewed by some as the world's most famous living architect (Architect, 2014).

Figure 2: Walt Disney Concert Hall in Los Angeles (2003)

Source: Wikipedia, [n.d.]: online

In 2002, the architect started an information technology company, Gehry Technologies. It offers internet-based three-dimensional project collaboration, building information modelling, and advanced project delivery support. Its client base includes international architectural and engineering firms, building contractors, and owners (Crunchbase, [n.d.]). Gehry Technologies grew out of a need to develop bespoke threedimensional design solutions needed to deliver Gehry's complicated designs. This was done by using and adapting software and techniques used in the aerospace and automotive industries. It was separated from the architectural practice in 2002. The firm supplies a consultancy service, a collaborative design platform, and building information modelling solutions to the architecture, engineering, and construction industries. It has since been sold to Trimble, owner of the popular 3D drawing software 'SketchUp' (Winston, 2014). Gehry also ventured into stage, exhibition, furniture, and jewellery design (Wikipedia, [n.d.]).

4.2   Foster and Partners

The firm Foster and Partners ([n.d]) was started in 1967 and has become one of the most revered and respected architectural and built-environment firms responsible for a very impressive portfolio of work across the world. This entrepreneurial practice has simultaneously embraced technology and has adopted many of the technologies listed earlier (see Introduction) (Foster & Partners, [n.d.]). This erstwhile architectural practice has expanded its range of services to include Environmental Engineering, Structural Engineering, Urban Design and Landscape Design, Industrial Design, and Interior Design sections, while offering Workplace Consultancy and Retrofit services. In pursuit of cutting-edge technological development and application, the firm has developed an in-house Applied Research and Development section as well as what it refers to as a Specialist Modeling Group (Foster & Partners, [n.d.]) (see Figure 3). In addition, the firm has established an online bookstore selling a range of books by Foster and many of his partners. Some books such as towards artificial intelligence in architecture: How machine learning can change the way we approach design by partners Martha Tsigkari, Sherif Tarabishy and Marcin Kosicki, who are architects and members of the Applied Research and Development Group at Foster & Partners, extol the benefits of Artificial Intelligence (AI) in architectural practice. Lord Norman Foster founded the practice in 1967 (Shi, 2020: [s.p.]). It currently has 63 senior partners and 101 partners working in fourteen offices in London, Abu Dhabi, Bangkok, Beijing, Buenos Aires, Dubai, Hong Kong, Madrid, New York, San Francisco, Shanghai, Shenzhen, Singapore, and Sydney (Foster & Partners, [n.d.]). Like Gehry and some of the other practices included in this article, the firm has developed software applications, in this case Hermes, an interoperability platform that facilitates the sharing of design data over a range of different applications and devices, and Sandbox, an interactive design tool. Other 4IR developments used by the firm include Machine Learning, Robotics, an Embodied Carbon viewer, 3D printing, and using algorithms in generative design (Shi, 2020: [s.p.]). In addition, the firm employs AI, Digital twining, smart buildings, the internet of things, and collaborative design tools, including technologies such as virtual and augmented reality as part of the design process (Foster & Partners, [n.d.]).

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Figure 3: Analysis of light, heat, air, and sound movement through a building

Source: **Foster and Partners, 2022: online**

4.3   Bjarke Ingels Group (BIG)

Another highly regarded architectural practice, Bjarke Ingels, has expanded its expertise to include product design and creation (Archipreneur, 2015a: 2). In 2014, the group started the BIG Ideas unit with the intention of broadening the scope of work undertaken by the practice (Archipreneur, 2015b: 1). Its website claims that "we have explored personal technology, urban mobility and furniture. With BIG Ideas we feel we can close the gap and really make our interest in product design a literal extension of our efforts in architecture. The Friday Smart Lock is the latest product developed in partnership with Friday Home" (BIG ideas, [n.d.]) (see Figure 4).

Figure 4: Friday Smart Lock

Source: BIG ideas, [n.d.]: online

Other products include light fittings, furniture, accessories, porcelain ware, bathroom ware, cycling accessories, and vases (BIG ideas, [n.d.]). These items can be ordered online from its website.

4.4   MIMA House

Situated in a rural area (Viana do Castelo, in the northern part of Portugal), MIMA House is an example of a small practice that combined design skills with ingenuity and entrepreneurship. MIMA House was started by Marta Brandão and Mario Sousa, who developed MIMA House (see Figure 5), a prefabricated modular housing system in 2011 (Archipreneur, 2015c: 1). The original system has evolved into the MIMA System (MIMA Housing, [n.d.]). In entrepreneurial fashion, they have turned their output into a product with unique fee scale and an

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expanded range of services that include site selection and interior design: "As the project of a house is a whole, which does not end in the house's envelope but requires a conducive design of the exterior and interior space, the Mima Housing team ensures a carefully designed solution for the whole project" (Mima Housing, [n.d.]: online). The system is "Available at:" internationally on a franchise basis and 'distributors' are invited to contact the firm.

Figure 5: MIMA House (Vienna)

Source: Mima Housing, [n.d.]: online

4.5   Al Stratford

Al Stratford is another example of a small architectural practice, located in a small city at the perimeter of the mainstream economy, which has used 'outof-the-box' thinking and entrepreneurship to expand the operations of his practice. Located in East London in South Africa's Eastern Cape Province, he has, in over 40 years, patented many products for which he received numerous awards in industrial design and architecture (Al Stratford, [n.d.]). Stratford developed the 'Winblok' window system (using the 'Winvent' for ventilation) (see Figure 6); the 'Winstep' stair ramp and walkway system; the 'Windeck' lightweight precast suspended concrete system, and the 'Winslot' horizontal sun-screening system. In addition, he has designed a range of wooden occasional furniture (Cooke, 2012: 41-44). While establishing a commercial enterprise to manufacture and sell his precast concrete elements, he also incorporated many of these into his innovatively designed buildings such as the University of Fort Hare (now part of Walter Sisulu University) New Complex in East London (Steele, 2016: 31-32).

Figure 6: Winblok windows and screen

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Source: Wintec, [n.d.]: online
4.6

As stated earlier, entrepreneurship, as understood and promoted in this article, includes what is referred to as 'social entrepreneurship'. Architecture 00 (00:/) describe themselves as "a London-based multi-disciplinary design studio with particular specialisation in designing and delivering innovative solutions, with robust social, economic and environmental sustainability" (00, [n.d.]: online). They form part of what they refer to as 'The Project 00 family', which includes entities such as Open Systems Lab and Wikihouse. Open Systems are regarded as the common platforms that make it possible for any citizen or business to participate in society and/or the economy, usually without needing permission and normally for free (Open Systems Lab, [n.d.]). Wikihouse use plywood components that are digitally fabricated to millimetre precision, thus fitting together perfectly to build a straight, accurate building (refer to Figure 7) (Wikihouse, [n.d.]). Through these and other entities, they give effect to their aims as stated earlier. The multiaward-winning practice was started by Inderpaul Johar and David Saxby in 2005 (Awan et al., 2011: 85). According to Archipreneur (2015a: 8), the firm undertakes action-led research and develops urban design strategy in an effort to propose and implement innovative and collaborative processes that can ultimately change the built environment.

Figure 7: De Stripmaker, Almere, built using Wikihouse panels
Source: Wikihouse, [n.d.]: online

4.7   Jonathan Segal

Jonathan Segal has managed to develop a practice with a vertically integrated business model, in which he eliminates the client and the general or main contractor from the design and building process (Archipreneur, 2015a: 4). Over two decades, he has created and fashioned his unique practice as 'Architect as Developer', a model in which the architect becomes the owner (Jonathan Segal, FAIA, [n.d.]). He has completed the design and development of over 300 medium- to high-density residential, mixed-use units, including live/work units such as the project called 'Park and Polk' (see Figure 8). He has packaged his knowledge and experience in an online video course for architects (Jonathan Segal, FAIA, [n.d.]).

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Figure 8: Park and Polk, San Diego (2018). Photograph by Matthew Segal and Jeff Durkin
Source: ArchDaily, [n.d.]: online

4.8   Francis Kéré (KéréArchitecture)

This practice was founded by Francis Kéré in 2005 and was awarded the Pritzker Prize in 2022. It has adopted two focus areas, namely design and social commitment, and its work incorporates design, building, and knowledge sharing (KéréArchitecture, [n.d.]). As far as design is concerned, the firm purposely crosses the boundaries between architecture and other disciplines to include temporary structures, installations of various kinds, as well as interior and product design (see Figure 9). The firm is committed to an understanding of the particular needs of a given context, thereby adapting the way of building for each project by incorporating local knowledge and resources, in order to share knowledge, create local opportunities, and strengthen local identity, as articulated in its statement: "Working beyond the realm of most established contemporary architecture practices, we have gathered expert knowledge in a number of areas through our diverse portfolio of projects. Our approach is local and participatory, learning from and responding to each project's context and placing a project's users at the centre of the design process, in order to ask the right questions" (KéréArchitecture, [n.d.]: online). An example of Kéré's commitment to community development is his founding of a non-profit organisation whose first project was the collection of funds needed for the construction of a primary school in Gando, Burkina Faso (see Figure 10) (Awan et al., 2011: 161).

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Figure 9: Ziba Stools at the Serpentine Pavilion. Photo by Andrea Maretto

Source: KéréArchitecture, [n.d.]: online

Figure 10: Gando Primary School. Photo by Simeon Duchoud

Source: KéréArchitecture, [n.d.]: online

4.9   Eric Reinholdt

Eric Reinholdt is an award-winning architect and founder of 30X40 Design Workshop. In addition to conventional architectural design work, Eric has authored two books, the most prominent being Architect and entrepreneur: A field guide to building, branding, and marketing your start-up design business (published by Createspace Independent Publishing Platform). He has developed the book into a digital course (30x40 Design Workshop) and created an architecture channel on YouTube, where he releases new videos each week (30x40 Design Workshop, [n.d.]. Eric has developed a number of products that can be bought online from the 30x40 Design Workshop website. These include templates for use with various computeraided draughting and design software packages, productised floor plans such as the Longhouse Series (see Figure 12), and resources to help architects establish and manage practices (30x40 Design Workshop, [n.d.]; Archipreneur, 2015a: 6).

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Figure 12: Productised Longhouse plan and elevation by Eric Reinholdt
Source: **Archdaily, 2015: online**

4.10 Aectual

Architectural graduates Hans Vermeulen, Hedwig Heinsman, and Martine de Wit wanted to bring architecture to the general population by digitising the processes between developers and users. To this end, they built a large three-dimensional printer. Based on their understanding that buildings consist of components and products, they decided to bring threedimensional printing to architecture under a separate business entity called Aectual (Archipreneur, 2019c: 1). Aectual allows designers to produce bespoke designs at any scale for any building. The firm produces personal and architectural products with their large-scale, three-dimensional printing facility. Furthermore, they sell design and architectural products such as the 3D-printed planters (see Figure 13 – via their website (Aectual, [n.d.]).

Figure 13: 3D-printed planters designed by House of DUS
Source: **Aectual, [n.d.]: online**

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4.11 Morpholio

Morpholio provides software that supports the creative processes used by architects, designers, artists, engineers, photographers, or any imaginative individual (Morpholio, [n.d.]). The firm was started by architect Anna Kennof and three other architects. The aim of their mobile tools is to enhance the creative design process. Being of the opinion that 'thinking with your hands' is a critical component of the design process, they developed applications (apps) that aid the design process, particularly for use on tablets. Users pay a subscription fee to use their products (Archipreneur, 2018: 2-3). Their flagship app is called Trace (see Figure 14). Morpholio Trace was developed for use with Apple's iPad Pro and the Apple pencil. It replicates the process of overlaying a photograph or drawing with tracing paper and using freehand technique to develop design ideas (Archipreneur, 2018: 5). Other products are 'Board' and 'Journal' (Morpholio, [n.d.]).

Figure 14: Morpholio Trace marketing material
Source: Morpholio, [n.d.]: online

4.12 Coin-craft

Coin-craft is a practice and project management support platform developed for architectural businesses (Archipreneur, 2015d: 1). Developed by Ryan King while working in an architectural practice, the platform provides accurate real-time predictions and insights on projects and project teams (Coin-craft, [n.d.]) as well as insight into a practice's business and project position at a particular point in time. It integrates with a range of other platforms such as ArchiOffice and WorkflowMax (Coin-craft, [n.d.]).

5.   DISCUSSION AND ANALYSIS

The 12 examples introduced above not only have some commonalities, but also differ markedly in how they have ventured outside what many would regard as conventional practice. The biggest similarity is, as can be expected, that they have all acted entrepreneurially. They did so by extending the boundaries of architectural practice (UIA, 2014: 14) (see Section 3). Frank O. Gehry customised advanced engineering software for architectural application and started a subsidiary business that expanded the range of software application services offered for architects. They also expanded their range of work by undertaking stage, exhibition, furniture, and jewellery design. Foster and Partners have, through the growth mindset of Lord Foster, developed into an architectural firm that is at the forefront of adopting to 4IR and utilising the benefits of new technologies. The Bjarke Ingels Group ventured into product and furniture design, by setting up a subsidiary for this purpose. Furthermore, they have introduced on-

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line selling of these products in starting a new subsidiary and in the range of products they offer commercially. Aectual have embraced new technological developments to offer architects and others the opportunity to turn their bespoke designs into products they can offer clients and the commercial sector. MIMA have turned to a product-based offering and have pushed the boundaries even further by offering this advantage to other architects as a franchise. Al Stratford added product design (building components) and manufacture to his business operation. 00+/ pushed the boundaries on many aspects associated with the paradigm of conventional architectural practice. In doing so, they have given effect to the UIA's policy of bringing the benefits architects can offer to areas that traditionally did not benefit from architects. They are involved in a wide range of activities that aim to empower communities, while providing sustainable construction methods. As such, they have become entrepreneurial – particularly socially entrepreneurial – role models who have shown that it is indeed possible for architects to get involved in these spheres. Francis Kéré, not unlike 00+/, adopted social commitment into a holistic operation that includes design, building, and knowledge sharing. In addition, his approach to architectural projects has, at times, included fundraising, as well as interior and product design. In this way, he brought social entrepreneurship and a different business model for architects to the forefront of practice. Jonathan Segal introduced a new business model, wherein architects are no longer service providers depending on clients who have a need to develop a new building. Architects are independent operators who can identify a viable opportunity to which they can respond by applying their innate creativity, skills, and experience in the design and construction of the building required. In the process, several intermediaries are bypassed with concomitant cost savings and greater efficiencies. Thereafter, realising that many architects will not have the skills required by this business model, he started offering training courses to architects who wish to adopt it. Eric Reinholdt has much in common with some of the previously discussed examples. Like MIMA, he has managed to turn from a service-oriented practice to a product-oriented one, offering not only standardised plans utilising a modular design system. Like MIMA and Al Stratford, he used this attribute to practise in an area of his choice, away from mainstream economic activity. These practices did this by identifying new opportunities, widening their vision, and adopting new approaches to problem-solving, as called for by Van Schendel (2019: 4), while creating new value through their designs. From the above, it seems that many firms have turned to offering products and not only services, as called for by Grozdanic (2016: 1) (see Section 3). This includes Johnatan Segal, Al Stratford, and MIMA. Furthermore, they were open to new opportunities while being unafraid to venture into new fields, as called for by Harrouk (2021: online). In this, they found opportunities by responding to the need of other architects, particularly in developing software and software applications that respond to the needs of colleagues. Examples include Gehry, Aectual, Reinholdt, Morpholio, and Coin-craft. Furthermore, some like MIMA and Stratford have used design thinking, as called for by Daniel (in Neck & Greene, 2011) (see above), to show that even the disadvantage of a peripheral location can be overcome through entrepreneurial and design thinking. In the process, they too became architectural role models, thereby creating new opportunities for the profession as a whole.

6. CONCLUSIONS AND RECOMMENDATIONS

This study set out to review existing literature to highlight the need for a more entrepreneurial stance among architects, and to show that entrepreneurship and architectural practice have much in common, and how architects can become more entrepreneurial by reviewing the entrepreneurial actions of 12 practices. The findings from the study are as follows:

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- Entrepreneurial architects have created opportunities not only for themselves, but also for others, including persons who previously enjoyed hardly any benefit from architects' involvement and skills.
- Entrepreneurial architects can practise away from mainstream locations.
- The advent of the 4IR will bring a host of entrepreneurial opportunities to those who are ready and have an entrepreneurial mindset.
- Entrepreneurial architects seem willing to share and help others who wish to follow in their tracks.
- Entrepreneurship and good design are not incompatible.
- The profession, in general, benefits from the entrepreneurial endeavours of its members and will continue to do so.
- These findings, read within the context of the wider study, suggest that, for the profession to survive, more entrepreneurial architects are needed because in pushing current boundaries, they open up new opportunities not only for themselves, but also for all architects. It is through filling the spaces so created that the profession will be able to reinvent itself over time.

This study confirmed some of the findings of the aforementioned RIBA study, most notably the need for architectural education to adapt to the changing environment and for architects to find new areas where their unique abilities can be applied. The review clearly shows that architectural education programmes must introduce entrepreneurship education and training. Furthermore, programmes should broaden their foci to include relevant theory and group projects with students from other builtenvironment and design disciplines. Research by Vosloo et al. (2018: 307) suggests a phased strategy for entrepreneurship education for South African architects and that the four phases be packaged and presented into a single framework. The framework should include experiential learning and offer a range of supportive components. The first phase should focus on developing entrepreneurial consciousness among students and should take place early in their education programme. Phase 2 should endeavour to motivate learners to become entrepreneurs. This can take place during their postgraduate studies. Phase 3 must further develop the entrepreneurial learning of Phase 2 and thereafter the focus on becoming an architectural entrepreneur. This can take place after their professional studies, for instance during their 'candidacy' period and/or as postprofessional studies. In Phase 4, a support system should be established to provide various services, including mentoring and peer support groups. It would appear that the current system's mindset, wherein the architect is practising within a narrow and defined field, needs revisiting. The question may be raised as to whether, with the advent of the 4IR, the time has not come for task specialisation within the profession and with that the time for a range of post-professional programmes. The concept of post-professional programmes implies lifelong learning beyond what the vast majority of continuous professional development can offer. The rapid changes envisioned as part of the 4IR and the increased reliance on technology could also require such continuous upskilling. This could even be a way of reclaiming lost ground. Furthermore, there appears to be a need for support in the form of mentorship, incubators, and support groups from professional organisations such as the SAIA. It is also evident that, if the UIA and its constituent professional organisations are serious about widening the scope of architectural involvement, these aspects would also require action on their part. At the very least, it should become part of their validation requirements.

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