Startups in the Built Environment Sector: Barriers and the Way Forward

Patrick T.I. Lam¹*, Bernard Y.S. Suen²,a, S.H. Mok¹,b

¹The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
²The Chinese University of Hong Kong, Sha Tin, The New Territories, Hong Kong

*bsplam@polyu.edu.hk; a bernard@cuhk.edu.hk, b sh.mok@polyu.edu.hk

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Abstract. Startups have sprung up in recent years, providing innovative solutions to the market. Whilst Internet-of-things (IoT) and Artificial Intelligence (AI) form the core of innovative products and services, built environment startups have emerged in the once conservative construction and real estate industries. The aim of this paper is to summarize the supportive ingredients and barriers to the growth of startups in this sector based on a systematic literature review.

Introduction

The building environment sector consists of buildings, infrastructure and environmental facilities and is served by the construction industry. The construction industry has been regarded as having a slow rate of technological innovations compared with other industries such as manufacturing.0 Despite its importance to GDP contribution, the construction industry has not been known for the creation of high-tech entities in the soaring growth of startups in the last decade.0 Many SMEs are well-talented to deliver technologically innovative products and processes with their small scale activities0 Whilst heavy construction techniques still lie within the realms of large construction firms due to the large investment required, the nascent enterprises are capable in environmental mitigation and sustainable technology, as well as the use of Artificial Intelligence (AI) in the construction and maintenance of the built environment. The suppliers of renewable energy technologies are not always large corporations0, and in the “clean-tech” business, SMEs play an important role in increasing diversity and innovations for this growing industry.0 However, startups are often bound by the institutional setup and their own constraints when they attempt to advance. Hardie and Newell0 noted a significant gap in the literature on SME innovation delivery experience in their study. Whilst a small number of high-tech start-ups may benefit from incubator and accelerator programs, nascent entrepreneurs in the majority of innovative start-ups lack support in acquiring finance, intellectual property rights, human capital and market advice. The aim of this study is to examine their status of development and the research objectives include examining the barriers faced by built environment startups in the global arena. Through a systematic literature review on the growth of startups in the built environment sector, the essential ingredients in the development of these nascent enterprises are discussed.

Research Methodology

Systematic Literature Review (SLR) is a clear and repeatable information searching process consisting of a series of phases that entail researchers determine research goals and plan how to retrieve and report articles.0 The SLR process adopted was in accordance with the following steps: (1) Planning the review, (2) Conducting the review, and (3) Reporting the findings of review.

After the selection process, the literature was categorized into different aspects: (1) Theory behind the development of startups, (2) Essential ingredients for growth of startups in the built environment sector and (3) Perceived Barriers to the growth of the innovative startups.
Theories on Startup Development

Various theories have been established to expound the development of innovative start-ups and their effects. With the development of the technology, many nascent entrepreneurs in the built environment sector have provided the driving force in producing innovative solutions, affecting the lives of many in an incremental manner. However, many failures have occurred during the startups development. To explain this, Philips and Kirchhoff indicated that the early growth period of new businesses is critical for their survival. Cressy asserted that the degree of success for nascent entrepreneurs was dependent on their positions within the control-aversion spectrum. In the study of Tsai and Lan in start-up development and growth, the evolution of the “Life Cycle” theory was noted, which explains firm’s growth following a predictable pattern, and the “Complexity” theory was also proposed, describing organizations as dissipative structures in disequilibrium. More recently, Coad et al made a further distinction between the “Resource” theory and the “Gambler’s Ruin” theory. The former links sustained superior enterprise performance to identifiable capabilities and resources, with the latter indicating the firm size evolving as a random walk. These theories provide the foundation for this research.

Growth Ingredients

The following ingredients complement each other for the betterment of startups development in the built environment sector:

Market demand: The construction industry needs to improve quality, safety and cost performance for both new-build and retrofits. These management-oriented aspects are the expertise of contract or consulting business experts. They may become nascent entrepreneurs themselves, or work with others to start new practices in their respective niche areas, providing services to larger firms. In terms of environmental mitigation, there is a wide range of opportunities in the growing demand for clean technologies. Green materials are also in growing demand for substituting the conventional materials. Nanotechnology is being used in the built environment such as dye-sensitized solar cells and high-Albedo surfaces for cooling. Carbon and energy audits are becoming commonplace due to various government and private sector initiatives. The recent boom in distributed renewable energy sources such as photovoltaic panels and small wind turbines has led to new business models, mainly operated by SMEs, for installation and leasing. Eco- and smart cities have attracted the establishment of consulting firms, providing planning and IT integration services. At the individual building level, many intelligent systems are being deployed to automate building operations.

Innovation and skill: For the new businesses to grow, they must find a competitive edge in the products or services they provide. Although not all start-ups are high-tech companies, they have to continuously improve their products and the ways in which their services are delivered. Such incremental improvement efforts and research and development (R&D) activities should be customer-focused and maintain environmental-friendliness. User-involvement is common and desirable. Early-stage R & D is usually carried out by the entrepreneurs themselves, whilst later stage work, such as testing and verification, may be outsourced to better-resourced and accredited facilities provided that confidentiality can be maintained. Technology brokerage is beginning to take shape in the built environment by research coordination bodies or technology incubators providing links and aligning interests and resources.

Financing: Most governments provide some funding for early stage innovation development with varying rates of success in terms of application and results. Amongst one thousand respondents to a 2011 survey conducted in G20 countries, two-thirds reported difficulty in accessing funding. The injection of VC acts as a positive signal to potential employees of the quality of the start-up, and VC finance reduces the time to market for innovator firms. Venture capitalists often bring in their experience and knowledge of similar industries to the entrepreneurs, along with valuable advice on strategic planning, marketing, finance, budgeting and human resource management.

Human capital: Problems arising in the built environment often entail a multi-disciplinary approach to formulate solutions. Hence, start-ups need good access to human capital for the
companies to tap into multifarious market needs. The build-up of human capital encompasses education, business experience and motivation level. Investors, including venture capitalists, often accord a high level of importance to the skills and experience of entrepreneurs. Being an intangible asset, it is difficult to evaluate but definitely crucial to the success of start-ups. Entrepreneurs cannot wait for formal training to be conducted by universities to acquire their staff strength and resort to running their own courses as a quick fix. To a similar extent, green building assessment courses are often fully subscribed.

Intellectual property (IP) Rights: Start-ups engaged in R & D are keen to protect their innovations from infringement by seeking legal recognition. Study results reveal the strong positive influence of venture capitalists on patenting activities, the levels of which are often used as innovation indicators. When interactions are needed with outside firms, entrepreneurs prefer to grant licenses for the innovative processes to be operated, rather than to sell their rights. Unlike large corporations which have begun to call for openly shared intellectual property, SMEs tend to safeguard their intangible assets as a survival means.

Business models: Business models are defined as “the rationale of how an organization creates, delivers and captures economic, social, and other forms of values”.[1] Typically, a business model comprises strategic decisions on customer segmentation, value-adding products and services, value distribution channels, business partners, resources, revenue and cost structures which ensure financial feasibility. Value creation, both for the start-up itself and its customers, forms the heart of any business model and is the gist of commercialization and growth.

Networking: To promote their businesses, entrepreneurs need to join networks for the sharing of market information, learning about innovations achieved by others and gathering the necessary resources, including human and financial capital. They should not be concerned only with their proprietary tasks at hand but also learn from others to build up a good infrastructure. Technology incubators provide such opportunities for nascent entrepreneurs. It was found that such networking facilitates human capital acquisition and enhances the firms’ access to international market.

Government policies: Listing government policies as the last ingredient by no means indicates its low importance, but rather because this factor is outside the control of entrepreneurs. In fact, government policies shape the innovation eco-system of start-ups. Taking Singapore as an example, the government spares no efforts in attracting multinational corporations to undertake manufacturing and service operations for export to regional and world markets. It also fosters the development of a venture capital industry to boost the growth of start-ups. Various incentives and assistance schemes have been put in place at different times to build up the capacity of specific industries. Programs such as Sector Specific Accelerator are targeted at assisting medical and clean-tech start-ups.

Barriers to Growth

Barriers with particular relevance to the Asian arena include: Lack of long-term view for R & D; Business community prefers short-term trading focusing on low-tech; Chinese family business culture emphasizes ownership and control; Shortage of post-seed stage funding; and underperformance of the Growth Enterprise Market as an IPO exit. In global context, the barriers come from: Affective bias of idea developers, such as over-attachment; Investors misjudging the commercialization capability of high-tech ventures, often using gut feeling rather than objective criteria; and the burden in seeking intellectual property rights through a maze of different country patent systems.

Conclusions

In this paper, the characteristics of the construction and real estate industries in relation to the growth of startups are identified from the literature. Given the urgent need for the built environment sector to create and maintain efficient, safe and environmentally-friendly assets, the construction industry should lessen the constraints faced by startups. Apart from funding, a welcoming attitude
of building owners, regulators, construction managers and occupants is very important for startups to flourish and contribute to the industry. The needs for a clearly structured improvement process for various growth ingredients cannot be over-emphasized. Further research should pave the way to provide conditions conducive for the burgeoning of built environment startups in the coming decade.

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