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Towards IoT Entrepreneurship: A Preliminary Investigation

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Research-in-Progress

ABSTRACT

With the rapid developments of Internet of Things (IoT), IoT entrepreneurship becomes a much-interested topic of research. While there is lack of relevant scholarly work, to bridge the gap, this research-in-progress, as a preliminary investigation, aims at exploring cross-disciplinary literature along with industrial dynamics, in anticipation of developing a framework for important research issues related to IoT entrepreneurship and opportunities.

KEYWORD IoT, entrepreneurship, information processing, socio-cognitive

INTERNET-OF-THINGS

Internet of Things (IoT) has become the trend for information and technology development for next decades, and has brought in changes for reshaping the landscape of global businesses. According to industrial research, 73% of global businesses plan to develop IoT products. 95% of the surveyed executives plan to incorporate IoT as part of business operations in three years. By 2025, IoT applications is projected to create \$11 trillion of worth to global economy (Columbia 2017).

Internet of Things (IoT), according to U.S.-based International Telecommunication Union, is a “global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.” Meanwhile, European Research Cluster on the Internet of Things defines it as “a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual things have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network.”

THE NEED FOR DEVELOPING IOT ENTREPRENEURSHIP RESEARCH

By connecting various physical objects and machines to the Internet, IoT creates an ecosystem involving various stakeholders with entrepreneurship opportunities. With the rapid development of IoT technologies, global investments in IoT industries along with vigorous entrepreneurship activities in IoT call for more targeted research: According to major businesses in these fields such as General Electric, Accenture, and McKinsey, the potentials and values demonstrated in various IoT projects sum up to trillions of dollars in the next decade. In addition, IoT entrepreneurship shows its relevancy and significance since this topic embraces various academic disciplines, such as from management viewpoints (George, Haas et al. 2014) and from information systems and technology perspectives (Del Giudice and Straub 2011).

However, currently there is lack of integrative research targeting at IoT entrepreneurship across various related academic disciplines. Accordingly, this research-in-progress, as a preliminary investigation, aims at exploring cross-disciplinary literature along with industrial dynamics, in anticipation of developing a framework for exploring important research issues in IoT entrepreneurship and opportunities.

IOT ENTREPRENEURSHIP LITERATURE REVIEW: CROSS-DISCIPLINARY RESEARCH

Since IoT entrepreneurship is an emerging research field, in order to best understand the current status of scholarly development, this research is positioned as inter-disciplinary, by reviewing literature from management, entrepreneurship, information systems, and technology, in anticipation of capturing the panorama of this research topic.

Business models viewpoints. Management and entrepreneurship scholars primarily view IoT entrepreneurship issues from generic business models perspectives. For example, Metallo, Agrifoglio et al. (2018) apply a business model framework to unveil the common practices taking places in IoT industry regarding innovative business models. Also, focusing on industrial IoT (IIoT), Kiel, Arnold et al. (2017) investigate how IoT impacts the business model of organizations. The operations before and after IoT adoption are surveyed in order to create a new framework for IIoT-specific business model.

Technology or application-based viewpoints. Meanwhile, information technology systems scholars tend to view IoT entrepreneurship issues from technology or application-based viewpoints. For instance, Krotov (2017) reviews several elements in IoT domain such as technological, physical, and socio-economic environments, and proposes generic value propositions obtained from case studies. Additionally, Brown (2017) discusses crowdsourcing- related IoT technologies and proposes an application-based model that fulfills possible entrepreneurship opportunities using sensors.

ENTREPRENEURSHIP OPPORTUNITY AND INFORMATION PROCESSING

From a macro-level economic viewpoint by Schumpeter (1934), entrepreneurship opportunities arise when there is an imbalance between economical resources and available service in the market. For example, when available services is insufficient to match market needs, entrepreneurship chances emerge by exploring potentials enabled by available or unused resources (Casson and Wadeson 2007).

In addition, when viewed from an organizational-level viewpoint, entrepreneurship opportunities embraces the processes of “new economic activities and organizations come into existence” (Davidsson 2015, p. 675) where new products or services are created, new markets are identified, new technologies are ventured into, or new businesses are established (Shane and Venkataraman 2000). In such a process, an individual’s social cognitive involvement is important, where an individual processes information embedded in the environment before entrepreneurship opportunities can be identified. That is, through an individual’s perception through such a process, an entrepreneur can take an action to further explore the chance (Vaghely and Julien 2010).

Some research, on the other hand, views this cognitive process as employing “prior knowledge and experiences, pattern recognition, information processing skills, and social interactions” (Tang, Kacmar et al. 2012, p.79). In specific, entrepreneurs scan and search an alert for entrepreneurship opportunity, and build needed cognitive framework based on the entrepreneur’s knowledge in the specific knowledge domain. The new information received is then linked and applied to various choices or alternatives for unique connections, thereby creating an action. This process is also noted as “to act on the possibility that one has identified an opportunity worth pursuing.” (McMullen and Shepherd 2006, p. 132).

As previously noted, entrepreneurship opportunities are found or created endogeneously by entrepreneurs. Recognizably, some individuals are able to discover entrepreneurial opportunities while others do not—that is, successful ones obtain entrepreneurial alertness which is based on their information processing capabilities (Kirzner 1997). This difference is hinged on two factors, including “the possession of prior information necessary to identify an opportunity, and the cognitive properties necessary to value it.” (Shane and Venkataraman 2000, p. 222)

Some scholars make efforts on some peripheral situations regarding information processing. For example, Gielnik, Krämer et al. (2014) find that, looking for information actively will compensate the weakness of the entrepreneur such as lack of related experiences, and will enhances thinking and mental ability on opportunity recognition. In addition, personal traits appear to play a role in such an information processing process. Zhao, Lumpkin et al. (2015) analyze entrepreneurship and its relationship with the entrepreneur’s age, and find that there is a bivariate relationships with some subjective success measures: Aged and young entrepreneurs tend to be more successful than the ones whose ages falling in between.

FUTURE RESEARCH PLAN

In order to capture IoT landscape, IoT can be structured as having several components, including perception, transmission, computation, and application, as detailed in Table 1 (Trappey, Trappey et al. 2017). Based on this component-based framework, this research plans to identify major actors, processes, and interactions within this framework, and to apply aforementioned

factors and characteristics of IoT entrepreneurship to these actors, processes, and interactions. Data could be collected through interviewing businesses in IoT industry.

IoT component	Definition
Application	Providing business-specific applications for consumer and business in various industries.
Computation	Receiving and processing data, making decisions to application component, including hardware, software, algorithms, cloud computing, and data analytics.
Transmission	Collecting information is transmitted to computation layer, and is subject to power, range, and storage, e.g.
Perception	Employing various sensors and actuators that enable physical object to perceive and detect changes in physical world

Table 1. Components of IoT. Source: Trappey, Trappey et al. (2017)

EXPECTED RESULTS AND CONTRIBUTION

The research is expected to elucidate relevant issues of IoT entrepreneurship, and to identify IoT entrepreneurship opportunities. For example, from information processing perspectives, the entrepreneurship opportunities from perception to application components can be mapped to sensemaking from organizational theory (Weick, Sutcliffe et al. 2005, p. 418). To sum up, this research is expected to build a framework that elucidates the factors and characteristics impacting IoT-specific entrepreneurship and the identification of IoT entrepreneurship opportunities, and to contribute to the arena of IoT research by building a foundation for future research and the practice.

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