Effect of Internet of Things on Business Strategy: An Organizational Capability Perspective

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Abstract

Innovative developments in Internet of Things (IoT) have invoked tremendous attention from both academics and industries. Studies suggest that IoT not only serves as an innovative tool for enterprise operations but also triggers impacts on business performance. Referring to the theory of organizational capability, this study constructed a research framework which links IoT capability and business strategy formation. An empirical survey was performed and an analysis of the data was conducted to test the hypotheses. The results confirmed the link between IoT capability and business strategy formation. Discussions with managerial implications are then elaborated.

Keywords: Internet of Things, business strategy, organizational capability, differentiation, cost leadership

1. Introduction

Recent development of the extensive globalization, the meticulousness of enterprise internationalization and business integration, and the rapid development of innovative technologies have caused business environments to change rapidly and enormously. For enterprises, customers require an increasingly fast response and personalized fulfillment. To respond effectively to changing internal situations and external environments, a firm must interact closely with changes through its distinctive capabilities to form a highly robust competitive strategy. This makes a firm's organizational capabilities especially critical facing competitions, because organizational capabilities are the source of competitive advantage [1-6].

To many organizations worldwide, the evolution of Internet of Things (IoT) is considered as "the next big thing" [7, 8] of information technology. The development of various IoT related technologies is expected to affect enterprises' managerial paradigm, including business strategy. IoT attracted attention as a possible source of strategic advantage for firms [9]. It may provide business opportunities for companies, and may even change the future market [10]. Therefore, aligning with the development of IoT has become critical for the formulation and execution of a firm's business strategy.

The perceived capability of IoT implies that firms make strategic decisions more efficiently. By employing IoT, firms should be able to recognize new business opportunities, identify possible threats, and maintain competitiveness. However, so far studies of the relationship between IoT and business strategy are rare in the literature. To fill this gap, this study intent to investigate the link between IoT and business strategy.

The paper begins with a review of the relevant literature about the relationships between Internet of Things and business strategy. Then it proposes hypotheses which link these variables. Following that, the hypotheses are tested using a sample of Taiwanese companies with global operations. Finally, the findings are presented along with managerial implications of the study and recommendations for future research.

2. Hypotheses

2.1 Internet of Things and Organizational Capability

Several researchers have elaborated the technological features of Internet of Things [7, 8, 11-16]. These features are classified and summarized as follows.

- Ubiquitous sensing: This is the mechanism that the "things" or devices in IoT perceive the surrounding physical environment, detect and record the changes in the environment, and respond to the changes. Ubiquitous sensing is enabled by wireless sensor network (WSN) technologies [7, 12, 13].

- Pervasive connectivity: IoT contains multiple layers of communication networking infrastructure to provide the pervasive communications between people and people, people and things, and things and things, to form a smart environment [11, 12].
- Embedded computing: IoT devices contain embedded hardware and software to work intelligently within the environment. The embedded hardware includes processor chips, data storage units and power units. The embedded software includes embedded operating systems, mobile apps and middleware. In particular, IoT devices can be embedded further in other devices [12, 14].
- Real-time analytics: IoT monitored and detected information are invisibly embedded in the environment around users, results in the generation of big data in real-time which are distributed, stored, processed, presented and interpreted in a seamless, efficient, and easily understandable form [12, 14, 17, 18].
- Cloud support: Cloud services are deployed to assist the processing and storage of IoT analytics, and provide IoT users ubiquitous access of supporting services initiated by IoT devices around the smart environment [11-13, 19].
- Interactive user interface: Visualization, touching and voice are critical for an IoT application as this allows the awareness and interaction of IoT users with the environment. 3D viewing and printing technologies, personal mobile assistants, wearable devices, and augmented-reality devices provide novel interface for users to interact with the smart environment [12, 13, 20].
- Interconnected smart products: IoT enables evolution of various products such as smart home appliances, robots, drones, unmanned cars, automated factory machines and business equipment, and many other innovative devices [8, 14, 16, 21].
- Cyber-physical convergence: The convergence of computer network, telecom network and IoT triggers further convergence of cyber space and physical space, and results in various smart spaces, such as smart home, smart office, smart factory, smart laboratory, smart store, smart marketplace, smart hospital, smart museum and smart city [8, 12, 13, 15].

IoT capability refers to the firms' ability to integrate firm resources and skills arising from IoT to align with the firms' strategic directions [2, 22]. IoT capability enables an organization to exploit and incorporate the above IoT technological features for business value. By using IoT, firms are able to identify new business opportunities and potential threats, and maintain competitiveness, thus establishing the IoT capability to be a source of competitive advantage [23]. Depending on different industry sectors and business models, a firm with IoT capability could be competent in developing or deploying IoT core components for business applications, or it could be competent in making or using IoT connected products for business benefits, or it could be competent in implementing or operating IoT enabled environments for business value [9, 16].

2.2 Internet of Things and Business Strategy

Organizational capabilities play a pivotal role in the business strategy which a firm pursues. The essence of strategy formulation is to design a strategy that makes the most effective use of these core capabilities [3]. Furthermore, designing strategy around the most critical capabilities implies that the firm focuses its strategic scope to those activities where it possesses a clear competitive advantage [5]. These propositions suggest that IoT capability can have potential effect on business strategy formation.

From the strategic management perspective, cost leadership and differentiation are two important approaches to competitive advantage and basic choices of business strategy [24, 25]. Furthermore, researchers have argued that cost leadership and differentiation are not mutually exclusive, but rather are compatible approaches to dealing with external situations, and a combination of strategies could lead to success in various circumstances [26-28]. In the IoT context, whether a firm wants to achieve cost advantage, differentiation advantage, or a combination of both through its IoT capability is an important strategic intent, which causes the firm to formulate and implement IoT facilitated cost leadership strategy, differentiation strategy, or a combination of both types of strategy.

Cost leadership strategy requires organizational capabilities to achieve operational efficiency, including time efficiency, cost efficiency and flexibility. The problem is that people have inadequate time and imperfect accuracy and therefore they are not accurate in capturing information about things in the physical world. The IoT sensor technology enables connected devices to sense, observe, and understand the physical world – without the limitations of human-entered data [29]. Furthermore, enterprises will be flexible enough to respond to production changes swiftly with IoT capability. The functions of IoT enabled smart factory integrate technologies of many disciplines. IoT capability enables an enterprise to make extensive use of artificial intelligence, simulation, automation, robotics, sensors, data collection systems and networks towards advanced engineering and precision machining. These systems make possible the establishment of efficient, collaborative and sustainable industrial production to achieve cost leadership [30].

Differentiation strategy requires organizational capabilities to achieve product or service uniqueness for higher customer premium. Products or services differentiation are realized through innovation or customization. IoT capability provides higher accuracy on analyzing and identifying distinctive customer preferences through hidden analytics of interconnected products. Sensor-based information collected through IoT embedded products covers actions of customer purchase and use, and can therefore be analyzed to obtain a much more precise and complete picture of the customer's characteristics and of their preferences [31]. Smart laboratories can provide test fields for innovative products and services before delivery to customers. Customer feedbacks are collected and transmitted in real-time through various sensor networks and supportive cloud services for further refinement of innovation or customization. Thus IoT capability could expand opportunities for product or service differentiation, moving competition away from cost alone.

Therefore, the following two hypotheses are proposed:

H1. IoT capability is positively associated with cost leadership strategy formation.

H2. IoT capability is positively associated with differentiation strategy formation.

3. Method

3.1 Survey Instrument

This study operationalized the study variables by using multi-item reflective measures on a 7-point scale [32].

Following the definition of information technology capability by Bharadwaj [22], a firm's IoT capability is measured here by its ability to develop or deploy IoT based resources, which include the tangible IoT resources, the intangible IoT resources, and the human IoT resources. The tangible IoT resources are physical things such as IoT components, IoT connected products, and IoT enabled smart environments. The intangible IoT resources are assets such as knowledge, know-how, and synergy about IoT. The human IoT resources comprise technical and managerial IoT staffs. Thus we measure the core capability arising from IoT with three items according to the utilization of the three types of IoT based resources.

The construct of cost leadership strategy formation was measured using four items that reflect the extent to which a firm forms a cost-oriented strategy. The formation of cost leadership strategy aims at achieving low manufacturing and distribution costs [24, 33, 34]. The third item was the economic scale. A firm can usually lower cost through economies of scale or superior manufacturing processes [24, 35]. Finally, formation of cost leadership is often reflected in lower price of products or services [33, 36].

The construct of differentiation strategy formation was measured using four items that reflect the extent to which a firm forms a differentiation strategy. Differentiation implies being unique or distinct from competitors by providing superior functionality or customized feature within products or services to customers [24, 37]. Extending Porter's business strategy framework, Miller [38] discriminated differentiation strategy based on innovation from that based on intensive marketing [38, 39]. This distinction forms two items included in the construct.

All items for this study were assessed with a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." Furthermore, firm size, IT department size and industry sector were used as control variables, as these variables have been noted in several studies to affect deployment of information technologies [40, 41]. Table 1 presents the items used to measure each of the independent and dependent construct variables.

Table 1 Constructs and items used in the survey

Construct and item description (1 – strongly disagree; 7 – strongly agree)
IoT: Internet of Things capability
IoT1: My company is competent in developing or deploying IoT technologies such as IoT components, IoT connected products or IoT enabled environments.
IoT2: We possess sophisticated IoT knowledge, intelligence and synergy.
IoT3: Our employees are proficient in IoT technologies and related managerial topics.
CLS: Cost leadership strategy formation
CLS1: We provide low cost products or services based on manufacturing efficiency
CLS2: Our products or services have lower distribution cost than our competitors
CLS3: We develop and deliver products or services with economy of scale
CLS4: Our products or services have lower prices than competitors in the market
DFS: Differentiation strategy formation
DFS1: We deliver products or services with superior functionality to our competitors
DFS2: We provide products or services with customized feature to our customers
DFS3: Our firm differentiates our products or services based on innovation
DFS4: Our firm differentiates our products or services based on intensive marketing
Control Variables (rescaled)
Industry: Industry sectors of firms. 1 for service firms and 0 for manufacturing firms.
Firm Size: Total number of employees.
IT Size: Total numbers of IT staffs.

3.2 Sample and Data Collection

A sample of 1,000 firms was randomly selected from the top 5,000 list of the largest companies in Taiwan published by a Taiwanese marketing research organization. Most of the companies in the list are public listed corporations with international operations and global bases.

The survey, which took three months to complete, was initially conducted by postal mail and e-mail, and then followed up with telephone calls and in-person visits. A total of 217 responses were received, of which 15 were unusable and eliminated. The remaining 202 responses were used in this study, for a response rate of 20.2%.

The mean differences between responding and non-responding firms were compared along firm attributes using t-tests and all statistics were non-significant ($p > 0.5$). Furthermore, the responses were classified into two groups to examine whether there was any response bias. The responses received during the first two months were classified as early returns, and those received during the last months as late returns. The two groups were then compared for any significant difference in responses using the chi-square test of independence. No significant difference was found between the two groups, supporting that response bias is not an issue in this study [42]. Table 2 shows the profile of the final sample list.

Table 2 Profile of the final sampling firms

	Sample size	Percentage
Industry		
Manufacturing	92	45.5%
Services	110	54.5%
Total	202	100.0%
Firm size		
Under 100	50	24.8%
100-199	53	26.2%
200-499	40	19.8%
500 and above	59	29.2%
Total	202	100.0%
IT department size		
Under 5	67	33.2%
5-19	62	30.7%
20 and above	73	36.1%
Total	202	100.0%

4. Results

Our goal was to investigate the impact of a firm's IoT capability on business strategy formation. The empirical results were expected to demonstrate that a firm's formation of business strategy, such as cost leadership strategy and differentiation strategy, is influenced by IoT capability.

4.1 Reliability and Validity

Table 3 summarizes the descriptive statistics and results of the reliability and validity tests.

The reliability of the instrument was examined using composite reliability estimates by employing Cronbach's α. All the coefficients exceeded Nunnally's recommended level (0.70) of internal consistency [43, 44].

In addition, factor analysis was performed to confirm the construct validity. The results supported the constructs of our research model. The discriminant validity was confirmed since items for each constructs loaded on to single factors with all loadings greater than 0.8. These results confirmed that each of the construct in our hypothesized model is unidimensional and factorially distinct, and that all items used to operationalize a construct is loaded onto a single factor.

Table 3 Descriptive statistics and reliability and validity test

Construct	Item	Mean	SD	Cronbach's alpha	Cronbach's alpha if item deleted	Factor loading on single factor
IoT	IoT1	4.123	1.554	0.815	0.752	0.851
	IoT2	3.671	1.479		0.731	0.864
	IoT3	4.708	1.554		0.756	0.849
CLS	CLS1	4.329	.910	0.951	0.933	0.931
	CLS2	4.375	.863		0.937	0.941
	CLS3	3.988	.729		0.943	0.937
	CLS4	4.724	.990		0.930	0.946
DFS	DFS1	4.675	.962	0.891	0.837	0.911
	DFS2	4.616	1.106		0.859	0.872
	DFS3	4.616	1.039		0.870	0.848
	DFS4	4.787	.959		0.873	0.848

Table 4 summarizes the correlations among different factors. We also assessed discriminant validity on the basis of the construct correlation that Campbell and Fiske [45] proposed. The tests indicated acceptable results with respect to discriminant validity.

Table 4 Construct correlation

Construct	1	2	3	4	5	6
1. IoT	1					
2. CLS	0.322**	1				
3. DFS	0.355**	0.576**	1			
4. Industry	0.131	0.080	0.046	1		
5. Firm Size	0.150	0.099	0.055	-0.100	1	
6. IT Size	0.148	0.148	0.138	-2.790**	0.402**	1

*p < 0.05, **p < 0.01

4.2 Tests of Hypotheses

To test our hypotheses, regression analysis was performed using SPSS version 21. We examined the degree to which our data met appropriate statistical assumptions in the case of regression analysis such as normality and linearity, and our data met the requisite assumptions.

Table 5 summarizes the test results regarding the parameter estimates and p-values of the hypotheses. We also included industry, firm size and IT department size as control variables in the analysis.

Table 5 Tests results of the hypothesized model

Dependent variable	Explanatory variable		Control variable						
	IoT		Industry		Firm Size		IT Size		
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	R^2
CLS	0.291	0.000***	0.077	0.278	0.014	0.847	0.120	0.118	0.119
DFS	0.340	0.000***	0.028	0.687	-0.038	0.600	0.111	0.146	0.135

*p < 0.05, **p < 0.01, ***p < 0.001

The results in Table 5 supported our hypotheses. The direct effects of IoT on CLS and DFS are both tested significant.

5. Discussion

5.1 Research Implications

With its technological features, IoT has been asserted as essential for organizational innovation and adaptation in a changing environment [46, 47], especially for firms with high amounts of connectivity and data. However, so far few studies have examined the capabilities incorporating IoT in an organization, and how these relate to different types of business strategy. Therefore, to contribute with a required research framework of IoT and business strategy, this study examines the role of IoT capability further in business strategy formation.

This study investigated the impact of a firm's IoT capability on business strategy formation. By supporting the research hypotheses, this study could be directed toward helping managers and practitioners realize the links between organizational capabilities and business strategy formation.

The cultivation of organizational capabilities, in general, is expected to enhance an organization's business strategies and further elevate its competitive advantage [1, 3, 48]. This study substantiates the positive correlation between a firm's organizational capabilities and business strategy formation. The findings demonstrate that IoT capability has positive effects on the formation of both cost leadership strategy and differentiation strategy, which could further lead to competitive advantage [24, 35].

In essence, IoT capability and its output, pervasive sensing and connectivity with embedded analytics, enable firms to deploy and operate in smart environments, and thus could enhance the functional level operations with efficiency and flexibility to achieve cost leadership or differentiation, or a combination of both. In addition, it is also because of the cross-functional nature of pervasive sensing and connectivity with embedded analytics, IoT capability can have a positive influence on some other organizational capabilities which also contribute to the formation of differentiation strategy and cost leadership strategy. Integrating IoT capability with other organizational resources and capabilities is thus a critical management task.

Furthermore, the positive impact of IoT capability on business strategy formation may facilitate firms to identify opportunities for improvement and novel solutions. One of the opportunities is to explore the feasibility of mass customization, which may achieve cost leadership and differentiation simultaneously [49, 50].

5.2 Suggestions for Further Research

This paper focuses on the relationship between IoT capability and business level strategies. It is suggested that the links between IoT capability and functional level strategies such as marketing, production and supply chain strategies could be further studied.

Further research could also investigate the relative importance of the factors affecting each stage of the strategy shaping process. These efforts should involve studies identifying IoT related organizational capabilities which affect business operation, information processing, and decision support mechanism.

In addition, special attention could be focused on data collected in various sub-industries or specific contexts over an extended period of time. The analysis of these data may enable conclusions to be drawn about more generalized relationships among business level strategy, functional level strategy, and technology based organizational capability.

References

[1] G. S. Day, "The Capabilities of Market-Driven Organizations," *Journal of Marketing,* vol. 58, pp. 37-52, 1994.

[2] R. M. Grant, "Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration," *Organization Science,* vol. 7, pp. 375-387, 1996.

[3] R. M. Grant, "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation," *California Management Review,* vol. 33, pp. 114-135, Spring91 1991.

[4] J. B. Barney, "Looking inside for competitive advantage," *The Academy of Management Executive,* vol. 9, pp. 49-61, 1995.

[5] D. J. Teece, G. Pisano, and A. Shuen, "Dynamic Capabilities and Strategic Management," *Strategic Management Journal,* vol. 18, pp. 509-533, 1997.

[6] G. S. Day, "Closing the Marketing Capabilities Gap," *Journal of Marketing,* vol. 75, pp. 183-195, Jul 2011.

[7] E. Borgia, "The Internet of Things vision: Key features, applications and open issues," *Computer Communications,* vol. 54, pp. 1-31, 2014.

[8] D. Miorandi, S. Sicari, F. De Pellegrini, and I. Chlamtac, "Internet of things: Vision, applications and research challenges," *Ad Hoc Networks,* vol. 10, pp. 1497-1516, 2012.

[9] M. E. Porter and J. E. Heppelmann, "How smart, connected products are transforming competition," *Harvard Business Review,* vol. 92, pp. 64-88, November 2014.

[10] M. Iansiti and K. R. Lakhani, "Digital Ubiquity - How Connections, Sensors, and Data Are Revolutionizing Business," *Harvard Business Review,* vol. November, pp. 91-99, November 2014.

[11] L. Atzori, A. Iera, and G. Morabito, "The Internet of Things: A survey," *Computer Networks,* vol. 54, pp. 2787-2805, 2010.

[12] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, "Internet of Things (IoT): A vision, architectural elements, and future directions," *Future Generation Computer Systems,* vol. 29, pp. 1645-1660, 2013.

[13] D. Bradley, D. Russell, I. Ferguson, J. Isaacs, A. MacLeod, and R. White, "The Internet of Things – The future or the end of mechatronics," *Mechatronics,* vol. 27, pp. 57-74, 2015.

[14] V. Krotov, "The Internet of Things and new business opportunities," *Business Horizons,* vol. 60, pp. 831-841, 2017/11/01/ 2017.

[15] N. Agarwal and A. Brem, "Strategic business transformation through technology convergence: implications from General Electrics industrial internet initiative," *International Journal of Technology Management,* vol. 67, pp. 196-214, 2015.

[16] M. E. Porter and J. E. Heppelmann, "How smart, connected products are transforming companies," *Harvard Business Review,* vol. 93, pp. 96-16, 2015.

[17] W. H. Weng and W. T. Lin, "A Big Data Technology Foresight Study with Scenario Planning Approach," *International Journal of Innovation in Management,* vol. 1, pp. 41-52, 2013.

[18] W. H. Weng and W. T. Lin, "Development trends and strategy planning in big data industry," *Contemporary Management Research,* vol. 10, 2014.

[19] W. H. Weng and W. T. Lin, "Development assessment and strategy planning in cloud computing industry," *International Journal of Electronic Commerce Studies,* vol. 5, pp. 257-266, 2014.

[20] W. H. Weng and W. T. Lin, "A scenario analysis of wearable interface technology foresight," in *The International Conference on Electronic Business (ICEB)*, Taipei, 2014, pp. 8-15.

[21] W. H. Weng and W. T. Lin, "Development assessment and strategy planning in mobile computing industry," in *2014 IEEE International Conference on Management of Innovation and Technology*, Singapore, 2014, pp. 453-457.

[22] A. S. Bharadwaj, "A resource-based perspective on information technology capability and firm performance: an empirical investigation," *MIS Quarterly,* vol. 24, pp. 169-196, 2000.

[23] X. Yu, B. Nguyen, and Y. Chen, "Internet of things capability and alliance," *Internet Research,* vol. 26, pp. 402-434, 2016 2016.

[24] M. E. Porter, *Competitive strategy*. New York: Free Press, 1980.

[25] M. E. Porter and V. E. Millar, "How information gives you competitive advantage," *Harvard Business Review,* vol. 63, pp. 61-78, July/August 1985.

[26] C. B. Li and J. J. L. Li, "Achieving superior financial performance in China: Differentiation, cost Leadership, or both?," *Journal of International Marketing,* vol. 16, pp. 1-22, 2008.

[27] C. V. L. Hill, "Difierentiation versus low cost or differentiation and low cost: A contingency framework," *Academy of Management Review,* vol. 13, pp. 401-412, 1988.

[28] A. I. Murray, "A contingency view of Porter's "generic strategies"," *Academy of Management Review,* vol. 13, pp. 390-400, 1988.

[29] M. Haddara and A. Elragal, "The Readiness of ERP Systems for the Factory of the Future," *Procedia Computer Science,* vol. 64, pp. 721-728, 2015.

[30] N. Benias and A. P. Markopoulos, "A review on the readiness level and cyber-security

challenges in Industry 4.0," in *Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA-CECNSM), 2017 South Eastern European*, 2017, pp. 1-5.

[31] I. Ng, K. Scharf, G. Pogrebna, and R. Maull, "Contextual variety, Internet-of-Things and the choice of tailoring over platform: Mass customisation strategy in supply chain management," *International Journal of Production Economics,* vol. 159, pp. 76-87, 2015.

[32] C. B. Jarvis, S. B. MacKenzie, and P. M. Podsakoff, "A critical review of construct indicators and measurement model misspecification in marketing and consumer research," *Journal of consumer research,* vol. 30, pp. 199-218, 2003.

[33] G. G. Dess and P. S. Davis, "Porter's (1980) Generic Strategies as Determinants of Strategic Group Membership and Organizational Performance," *Academy of Management Journal,* vol. 27, pp. 467-488, 1984.

[34] J. C. Narver and S. F. Slater, "The Effect of a Market Orientation on Business Profitability," *Journal of Marketing,* vol. 54, pp. 20-35, 1990.

[35] M. E. Porter, *Competitive advantage*. New York: Free Press, 1985.

[36] R. B. Robinson and J. A. Pearce, "Planned Patterns of Strategic Behavior and Their Relationship to Business- Unit Performance," *Strategic Management Journal,* vol. 9, pp. 43-60, 1988.

[37] J.-J. Wu, "Influence of market orientation and strategy on travel industry performance: an empirical study of e-commerce in Taiwan," *Tourism Management,* vol. 25, pp. 357-365, 2004.

[38] D. Miller, "Relating porter's business strategies to environment and structure: analysis and performance implications," *Academy of Management Journal,* vol. 31, pp. 280-308, 1988.

[39] D. Miller, "Configurations of Strategy and Structure: Towards a Synthesis," *Strategic Management Journal,* vol. 7, pp. 233-249, 1986.

[40] H. Liu, W. Ke, K. K. Wei, J. Gu, and H. Chen, "The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems," *Journal of Operations Management,* vol. 28, pp. 372-384, 2010.

[41] H. H. Teo, K. K. Wei, and I. Benbasat, "Predicting intention to adopt interganizaitonal linkages: an institutional perspective " *MIS Quarterly,* vol. 27, pp. 19-49, 2003.

[42] J. S. Armstron and T. S. Overton, "Estimating Nonresponse Bias in Mail Surveys," *JMR, Journal of Marketing Research (pre-1986),* vol. 14, p. 396, Aug 1977 1977.

[43] D. V. Cicchetti, K. Koenig, A. Klin, F. R. Volkmar, R. Paul, and S. Sparrow, "From Bayes through marginal utility to effect sizes: a guide to understanding the clinical and statistical significance of the results of autism research findings," *J Autism Dev*

Disord, vol. 41, pp. 168-74, Feb 2011.

[44] J. C. Nunnally and I. H. Bernstein, *Psychometric theory*, 3 ed. New York: McGraw-Hill, 1994.

[45] D. Campbell, T. and D. Fiske, W., "Convergent and discriminant validation by the multitrait-multimethod matrix," *Psychological Bulletin,* vol. 56, pp. 81-105, 1959.

[46] Y. Li, M. Hou, H. Liu, and Y. Liu, "Towards a theoretical framework of strategic decision, supporting capability and information sharing under the context of Internet of Things," *Information Technology and Management,* vol. 13, pp. 205-216, December 01 2012.

[47] I. Lee and K. Lee, "The Internet of Things (IoT): Applications, investments, and challenges for enterprises," *Business Horizons,* vol. 58, pp. 431-440, 2015.

[48] T. Ravichandran and C. Lertwongsatien, "Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective," *Journal of Management Information Systems,* vol. 21, pp. 237-276, 2005.

[49] S. Kotha, "Mass Customization: Implementing the Emerging Paradigm for Competitive Advantage," *Strategic Management Journal,* vol. 16, pp. 21-42, 1995.

[50] B. J. Pine, B. Victor, and A. C. Boynton, "Making mass customization work," *Harvard business review,* vol. 71, pp. 108-11, 1993.