Winter 12-6-2015

The Impact Of Internet Of Things Technologies On Supply Chain Performance: The Mediating Role Of Competitive

Wei-Hsiu Weng

Wootsong Lin

THE IMPACT OF INTERNET OF THINGS TECHNOLOGIES ON SUPPLY CHAIN PERFORMANCE: THE MEDIATING ROLE OF COMPETITIVE STRATEGY

Wei-Hsiu Weng, National Chengchi University, Taiwan, wh.weng@msa.hinet.net
Woo-Tsong Lin, National Chengchi University, Taiwan, lin@mis.nccu.edu.tw

ABSTRACT

Recent advancement of Internet of Things (IoT) technologies has invoked tremendous attention from both academics and industries. The emerging IoT technologies not only serve as possible new tools for enterprise operation, but also trigger impacts in the management arena such as supply chain management (SCM). This study investigates the role of competitive strategy underlying the link between IoT technologies and supply chain performance. By referring to the resource→strategy→performance model, this study builds a research framework in which three strategic positions of firms—low cost, differentiation and market focus—mediate the effect of IoT technologies on supply chain performance. Empirical survey and analysis of enterprise data are conducted to test the hypotheses. The test results support the mediation effects of competitive strategies. Research contributions and managerial implications are elaborated in the conclusions.

Keywords: Internet of Things, Supply chain performance, Cloud computing, Big data, Mobile app, Sensing, Competitive strategy, Mediation.

INTRODUCTION

The recent trends of information technology development center around the evolution of IoT technology such as cloud computing, big data analytics, and mobile connected applications [9] [14] [15]. These emerging IoT technologies have also invoke tremendous attention from the academics [13] [34]. Facing this flourishing of emerging information technologies, how enterprises react to these technologies becomes an important issue. The IoT technologies are innovative technologies and still under development. Their impacts on supply chain performance have not been thoroughly realized, and deserved further investigation.

By now there is few rigorous research regarding the impact of the emerging IoT technology on firm's management activities and performance. Since supply chain management is critical to firm's operation and financial outcome [35], this study will focus on the influence of the emerging IoT technology on firm's supply chain performance. This study will explore the link between IoT technologies and supply chain performance, and investigate the mediators in the link. Through the research process and results, this study expects to clarify the effect of emerging information technologies on supply chain performance, and also to identify possible mediators and moderators [3] [18] in the effect.

LITERATURE REVIEW

Emerging IoT Technologies

The emerging IoT technologies have attracted attentions as possible sources to strategic advantages for firms [34]. Their influence on economy and society has also attracted the attention of governments and companies worldwide [26]. This study focuses on the emerging IoT technologies embedded in the "new technology stack" depicted in Porter and Heppelmann [34].

Cloud in IoT

The innovation of cloud has made a major impact on the products, services and business models of the IT software and hardware industries [1] [38] [42]. Cloud computing has therefore become an emerging concept and technology that has drawn attention from the IT software and hardware industries. The scope of the industry as well as the fact that it spans both the enterprise and consumer markets has led to much discussion on its future business potential [10] [17] [22]. Nevertheless, cloud computing technologies and business models as well as the new products, services, competition and alliances that arise as a result offer an emerging market that is well worth monitoring [12].

Sensing in IoT

There are various IoT infrastructure and application prototypes. Near Field Communication (NFC) [27] [39] evolved from Radio-Frequency Identification (RFID) [16] and interconnection technology. In the past, non-contact chips were always produced as card applications. In recent years, chips have been embedded into mobile devices for greater convenience. Mobile devices have therefore been turned into a payment tool that allows downloading and payment of services in any public setting and can also be used for exchanging data on mobile devices. This development extends the possible applications of smart, connected products and the product clouds [34].

Big data analytics in IoT

"Big data" refers to the technology applied in big, immediate and manifold structured and unstructured information. It helps companies store, transform, transmit and analyze huge amounts of information [28]. It also provides advanced business analytics, develops business intelligence and leads to gains in business values [5]. As the rapid growth of cloud computing,

electronic commerce, social media, internet of things and mobile devices, data volume grew explosively, and makes companies all over the world started to pay attention to big data related technology [25]. Big data technology means to use computing processes such as storing, transforming, streaming, transferring and analyzing to handle structural or non-structural data that are dynamic, massive and variable, for the business benefits [19]. The use of big data is to perform instant and complex analysis to massive dynamic data, and support companies' decision-making in a short period of time. The rise of big data has provided new opportunities for future ICT industries and data scientists [20].

Mobile app in IoT

The Connectivity and Smart Mobile Applications embedded in "things" are used to establish exchange of information in a mobile and ubiquitous way [13] [34]. In order to provide ubiquitous mobile computing, infrastructure of wireless communication network need to be constructed first. Currently, various IoT networking infrastructure are under development [2], most of which are based on wireless sensor networking [31].

Information security in IoT

Porter and Heppelmann [34] describes identity and security as "Tools that manage user authentication and system access, as well as secure the product, connectivity, and product cloud layers." This description of identity and security comprises cloud security and device security. Cloud security software technology has two dimensions. One dimension is the adoption of IT security technology, products or services by businesses to improve the security of cloud services. This is known as "Security for the Cloud" [21]. The other dimension is the use of cloud computing by IT security vendors to strengthen, expand or transform their existing IT security technologies and services. This is known as "Security as a Service". Device security involves Mobile Device Management (MDM) and Mobile Data Protection (MDP). One controls physical mobile devices while the other secures data saved in mobile devices, including user authority and privacy [11] [37].

Supply Chain Management

The goal of supply chain management (SCM) is to facilitate the efficient and effective movement of products, services, finances, and information from a provider to a consumer. SCM is not only essential for effective production, distribution, and logistical performance of today's companies, but can also influence their strategic posit [41]. Understanding how firms can profit from their supply chain management is highly important for both management practitioners and academics [7].

Prior research has characterized SCM as fundamentally changing the enterprise competition and evolving as a part of firm's new dominant strength [43]. Investigators have argued that the firm's practices for leveraging associations with supply chain can be fundamental to sustaining a competitive advantage in the market [35].

HYPOTHESES DEVELOPMENT

The Impact of IoT Technologies on Supply Chain Performance

Zhang et al. [45] conduct a systematic review of literature on the period of 1995 to mid-2010 and find that a majority of papers confirm a positive relationship between IT and supply chain performance. DeGroote and Marx [7] investigate the impact of information technology on supply chain agility measured by the ability to sense and respond to market changes. Their data are collected from supply chain executives at 193 U.S. manufacturing firms. The results suggest that IT improves the supply chain's ability to sense market changes by improving the adequacy, accuracy, accessibility, and timeliness of the information flows among members of the supply chain. It is therefore hypothesized:

H1: There is a significant association between IoT technology and supply chain performance.

The Role of Competitive Strategy

Porter's framework for competitive strategy is one of the most widely accepted business competition models [29]. Porter's research in industrial economics suggests three generic strategies of competing above average rates of return: low cost, differentiation and focus [32] [33].

Low cost

By now there are few studies of how companies compete in a market in terms of IoT can be related with low cost strategy. However, previous studies have shown that the integration of information technology with supply chain management can reduce the cost of information exchange between parties in the supply chain, and thus impacting the supply chain performance [8] [35]. Therefore, we propose that emerging information technology indirectly affects firm performance by increasing efficiency and driving down costs, implying that emerging information technology significantly affects a firm's low cost position, leading to superior supply chain performance. It is thus hypothesized:

H2a: There is a significant association between IoT technology and low cost strategy position.
H2b: There is a significant association between low cost strategy position and supply chain performance.
H2c: Low cost mediates the relationship between IoT technology and supply chain performance.

Differentiation

Adoption of IoT technologies may enable a firm to obtain in-depth information about its suppliers and customers and then use

this knowledge to adapt its offerings to meet the needs of its supply chain operations in a better way than does its competitors. Therefore, the emerging information technology is linked to the business strategy of differentiation, which enables firms to achieve superior performance. This link is consistent with the sources→positions→performance framework, with emerging IoT technology as the source that allows firms to achieve a differentiated position, which in turn drives firm's supply chain performance [6].

H3a: There is a significant association between IoT technology and differentiation strategy position.
H3b: There is a significant association between differentiation strategy position and supply chain performance.
H3c: Differentiation mediates the relationship between IoT technology and supply chain performance.

Market focus

With a focus strategy, a firm concentrates its efforts on a specific market segment [32]. There have been no extensive empirical studies of the behavior and performance of firms competing on the basis of focus strategy. Koo et al. [24] examined Porter's competitive strategies in electronic virtual markets and find that on-line firms incline to differentiation strategy, whereas click-and-mortar firms prefer strategies based on focus strategy. Both on-line firms and click-and-mortar firms are pioneer adopters of emerging IoT technologies such as cloud computing and big data analytics. We thus hypothesize:

H4a: There is a significant association between IoT technology and market focus strategy position.
H4b: There is a significant association between market focus strategy position and supply chain performance.
H4c: Market focus mediates the relationship between IoT technology use and supply chain performance.

Drawing from these hypotheses proposed above, the research framework is depicted in Figure 1.

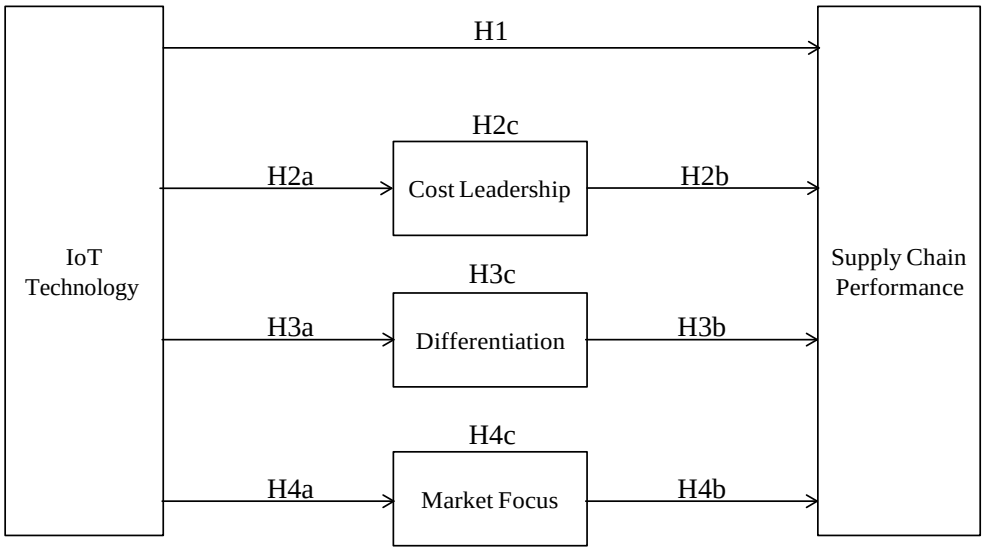

Figure 1. Research framework

RESEARCH METHOD

Survey Instrument

The survey instrument is developed with questions derived from the literature on emerging information technologies, Porter's competitive strategies, resource→strategy→performance framework, and supply chain performance discussed above. We operationalize the study variables using multi-item reflective measures on a seven-point scale (Jarvis et al. 2003). Table 1 summarizes the independent and dependent variables, which are further elaborated below.

Table 1. Research variables

Construct	Operational Definition	Supporting Literature
Emerging information technology	A firm's intention to adopt the emerging IoT technology	Armbrust et al. [1]] [Cegielski et al. [4]
Low cost	A firm's posture of competition based on lower cost of operation and resource relative to the firm's competitors.	Koo et al. [24] Reimann et al. [36] Oltra and Luisa Flor [30]
Differentiation	A firm's ability to compete by being unique within their industry in a number of perspectives.	Koo et al. [24] Reimann et al. [36]
Market Focus	A firm's ability to compete by targeting specific groups of buyers, product lines, product lifecycle, or geographic areas.	Koo et al. [24] Kim et al. [23]
Supply chain performance	A firm's assessment of the efficiency and effectiveness of its supply chain.	Wu et al. [44] Vijayasarathy [41] DeGroote and Marx [7] Qrunfleh and Tarafdar [35]

Table 2 presents the items used to measure each of the independent and dependent variables.

Table 2. Items used in the survey

Variable	Item
Intention of IoT technology adoption (1 – to no extent; 4 – to some extent; 7 – to a great extent)	
	IoT1: Cloud in IoT
	IoT2: Sensing in IoT
	IoT3: Big data analytics in IoT
	IoT4: Mobile app in IoT
	IoT5: Security and privacy in IoT
Low cost strategy orientation (1 – strongly disagree; 7 – strongly agree)	
	CL1: Developing products or services with lower cost
	CL2: Delivering products or services with lower price
	CL3: Providing products or services in large quantity or scale
Differentiation strategy orientation (1 – strongly disagree; 7 – strongly agree)	
	DF1: Differentiating products and services based on operational efficiency
	DF2: Differentiating products and services based on innovation
	DF3: Delivering products or services with superior functionality in current market
	DF4: Delivering products or services with innovative business model
Market focus strategy orientation (1 – strongly disagree; 7 – strongly agree)	

	MF1: Focusing in a niche market segment
	MF2: Focusing in first to market position
	MF3: Focusing in market position as a fast follower
	MF4: Focusing in a mature market segment
Supply Chain Performance (1 – greatly below average; 4 – average; 7 – greatly above average)	
	SCP1: Delivering products or services on time
	SCP2: Reducing lead time
	SCP3: Responding to changes of customer requirement
	SCP4: Avoiding lack of critical resources
	SCP5: Inventory and logistics flexibility
	SCP6: Reducing cost of the whole supply chain management
	SCP7: Reducing inventory cost

Sample and Data Collection

Empirical data to test the hypothesized relationships is obtained by using a survey of large Taiwanese companies. An online questionnaire developed in accordance with Table 2 above is implemented as the survey instrument. It is pre-tested in an iterative manner among a sample of 15 executives and supply chain managers. The questionnaire items is revised on the basis of results of the expert interviews and refined through rigorous pre-testing to establish content validity. Table 3 shows the profile of the sampling list.

Table 3. Profile of the sampling firms

Industry	Frequency	%
High-tech manufacturing	946	41%
Other manufacturing	332	14%
IT and Telecom services	450	20%
Other services	301	13%
Retail and wholesale	271	12%
Total	2,300	100%

RESULTS

Table 4 summarizes the descriptive statistics, reliability and validity tests.

Table 4. 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	4.12	1.554	0.886	0.870	0.782
	IoT2	4.58	1.564		0.860	0.830
	IoT3	4.45	1.619		0.861	0.824
	IoT4	4.71	1.554		0.869	0.784
	IoT5	4.99	1.500		0.873	0.765
Low Cost	CL1	4.46	1.414	0.719	0.724	0.732
	CL2	3.72	1.521		0.596	0.824
	CL3	3.60	1.460		0.557	0.842
Differentiation	DF1	4.55	1.371	0.905	0.893	0.854
	DF2	4.39	1.375		0.857	0.921

	DF3	4.31	1.579		0.889	0.866
	DF4	4.21	1.456		0.870	0.895
Market Focus	MF1	4.52	1.379	0.852	0.806	0.839
	MF2	4.31	1.485		0.812	0.834
	MF3	4.32	1.311		0.835	0.792
	MF4	4.22	1.372		0.792	0.864
Supply Chain Performance	SCP1	4.51	1.460	0.931	0.926	0.795
	SCP2	4.61	1.330		0.918	0.858
	SCP3	4.94	1.338		0.917	0.866
	SCP4	4.55	1.330		0.921	0.832
	SCP5	4.55	1.396		0.917	0.868
	SCP6	4.42	1.465		0.922	0.828
	SCP7	4.64	1.338		0.920	0.847

Table 5 summarizes the correlation between constructs.

Table 5. Construct correlation

Construct		IoT	CL	DF	MF	SCP
IoT Technology	IoT	1				
Low Cost	CL	0.324**	1			
Differentiation	DF	0.356**	0.647**	1		
Market Focus	MF	0.421**	0.663**	0.864**	1	
Supply Chain Performance	SCP	0.362**	0.622**	0.650**	0.759**	1

**p < 0.01

Table 6 summarizes the test results of the hypothesized model.

Table 6. Tests of hypothesized model

Hypothesis		Coefficient	p-value	Test Result	VIF	Mediated
H1	IoT → SCP	0.362***	0.000	Supported		
H2a	IoT → CL	0.324***	0.000	Supported		
H2b	CL → SCP	0.622***	0.000	Supported		
H2c	IoT → SCP	0.180**	0.002	Supported	1.118	Partial
	CL → SCP	0.564***	0.000	Supported		
H3a	IoT →DF	0.356***	0.000	Supported		
H3b	DF →SCP	0.650***	0.000	Supported		
H3c	IoT → SCP	0.150**	0.009	Supported	1.145	Partial
	DF →SCP	0.596***	0.000	Supported		
H4a	IoT →MF	0.421***	0.000	Supported		
H4b	MF → SCP	0.759***	0.000	Supported		
H4c	IoT → SCP	0.052	0.304	Rejected	1.215	Complete
	MF → SCP	0.737***	0.000	Supported		

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

CONCLUSIONS

Research Contributions

This study investigates the impact of IoT technology on supply chain performance, mediated by the firm's position of competitive strategy. The empirical results demonstrate that emerging IoT technology such as cloud computing, big data and mobile app [13] [34] influences the supply chain performance such as reducing cost, increasing flexibility and shortening time. The results also verify the mediating role of Porter's theory of generic strategy [32] [33] on the link between IoT technology and supply chain performance. Finally, these results also make a solid case for the the sources→strategy→performance framework of competitive strategy [6] [40].

Managerial Implications

Supporting these research hypotheses, the insight we obtain from our empirical results is that the link between IoT technology and supply chain performance is fully mediated by the strategies of firms. That is, the link between IoT technology and supply chain performance is not direct, but rather indirect. By adopting a mediational framework such as in this study, managers could realize different strategy position in the IoT links to supply chain performance. To the best of our knowledge, this is the first empirical study to investigate critical mediators in the IoT-SCM link as well as to examine IoT technologies in the context of business strategies.

Research Limitations

Although this study reports meaningful implications toward the development of factors that influence supply chain performance, we recognize that the validity of an instrument cannot be universally established on the basis of a single study. Especially, data used for tests in this study were all collected in firms located in Taiwan. Though Taiwan is a relatively efficient and competitive arena for accepting innovative information technology, it has its unique industry environment and culture. It is therefore suggested for SCM practitioners and academicians to interpret our findings as a reference model, rather than generalizing our results in all emerging technologies and economics.

.

REFERENCES

[1] Armbrust, M., Stoica, I., Zaharia, M., Fox, A., Griffith, R., Joseph, A. D., . . . Rabkin, A. (2010) 'A view of cloud computing', *Communications of the ACM,* Vol. 53, No. 4, pp. 50, doi: 10.1145/1721654.1721672

[2] Atzori, L., Iera, A., & Morabito, G. (2010) 'The internet of things: A survey', *Computer Networks,* Vol. 54, No. 15, pp. 2787-2805, doi: 10.1016/j.comnet.2010.05.010

[3] Baron, R. M. & Kenny, D. A. (1986) 'The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology,* Vol. 51, No. 6, pp. 1173-1182, doi: 10.1037/0022-3514.51.6.1173

[4] Cegielski, C. G., Allison Jones-Farmer, L., Wu, Y. & Hazen, B. T. (2012) 'Adoption of cloud computing technologies in supply chains', *The International Journal of Logistics Management,* Vol. 23, No. 2, pp. 184-211, doi: 10.1108/09574091211265350

[5] Chang, R. M., Kauffman, R. J. & Kwon, Y. (2014) 'Understanding the paradigm shift to computational social science in the presence of big data', *Decision Support Systems,* Vol. 63, No. pp. 67-80, doi: 10.1016/j.dss.2013.08.008

[6] Day, G. S. & Wensley, R. (1988) 'Assessing advantage: A framework for diagnosing competitive superiority', *Journal of Marketing,* Vol. 52, No. 2, pp. 1-20.

[7] DeGroote, S. E. & Marx, T. G. (2013) 'The impact of it on supply chain agility and firm performance: An empirical investigation', *International Journal of Information Management,* Vol. 33, No. 6, pp. 909-916, doi: 10.1016/j.ijinfomgt.2013.09.001

[8] Dong, S., Xu, S. X. & Zhu, K. X. (2009) 'Research note—information technology in supply chains: The value of it-enabled resources under competition', *Information Systems Research,* Vol. 20, No. 1, pp. 18-32, doi: 10.1287/isre.1080.0195

[9] Gartner. (2015) Research guide: The top 10 strategic technology trends for 2015, Retrieved 2/25, 2015, from https://www.gartner.com/doc/2966917

[10] Graham, M. (2011) 'Cloud collaboration: Peer-production and the engineering of the internet', Vol. No. pp. 67-83, doi: 10.1007/978-90-481-9920-4_5

[11] Hancke, G. P., Markantonakis, K. & Mayes, K. E. (2010) 'Security challenges for user-oriented rfid applications within the internet of things', *Journal of Internet Technology,* Vol. 11, No. 3, pp. 307-313.

[12] Helland, P. (2013) 'Condos and clouds', *Communications of the ACM,* Vol. 56, No. 1, pp. 50, doi: 10.1145/2398356.2398374

[13] Iansiti, M., & Lakhani, K. R. (2014) 'Digital ubiquity - how connections, sensors, and data are revolutionizing business',m *Harvard Business Review,* Vol. November, No. pp. 91-99.

[14] IDC. (2015) 'Idc predictions 2015: Accelerating innovation — and growth — on the 3rd platform'.

[15] IEEE. (2015) Top technology trends for 2015, Retrieved 12/31, 2014, from http://www.computer.org/portal/web /membership/Top-Tech-Trends-for-2015

[16] Ilie-Zudor, E., Kemény, Z., van Blommestein, F., Monostori, L. & van der Meulen, A. (2011) 'A survey of applications and requirements of unique identification systems and rfid techniques', *Computers in Industry,* Vol. 62, No. 3, pp. 227-252. doi: 10.1016/j.compind.2010.10.004

[17] Iyer, B. & Henderson, J. C. (2010) 'Preparing for the future: Understanding the seven capabilities of cloud computing', *MIS Quarterly Executive,* Vol. 9, No. 2, pp. 117-131.

[18] Jaccard, J., Wan, C. K. & Turrisi, R. (1990) 'The detection and interpretation of interaction effects between gontinuous variables in multiple regression', *Multivariate Behavioral Research*, Vol. 25, No. 4, pp. 467-478.
[19] Jacobs, A. (2009) 'The pathologies of big data', *Communications of the ACM*, Vol. 52, No. 8, pp. 36, doi: 10.1145/1536616.1536632
[20] Jelinek, M. & Bergey, P. (2013) 'Innovation as the strategic driver of sustainability: Big data knowledge for profit and survival', *IEEE Engineering Management Review*, Vol. 41, No. 2, pp. 14-22, doi: 10.1109/emr.2013.2259978
[21] Kalloniatis, C., Mouratidis, H. & Islam, S. (2013) 'Evaluating cloud deployment scenarios based on security and privacy requirements', *Requirements Engineering*, Vol. 18, No. 4, pp. 299-319, doi: 10.1007/s00766-013-0166-7
[22] Katzan, H. J. (2009). 'Cloud software service: Concepts, technology, economics', *Service Science*, Vol. 1, No. 4, pp. 256-269.
[23] Kim, E., Nam, D.-i. & Stimpert, J. L. (2004) 'The applicability of porter's generic strategies in the digital age: Assumptions, conjectures, and suggestions', *Journal of Management*, Vol. 30, No. 5, pp. 569-589, doi: 10.1016/j.jm.2003.12.001
[24] Koo, C. M., Koh, C. E. & Nam, K. (2004) 'An examination of porter's competitive strategies in electronic virtual markets: A comparison of two on-line business models', *International Journal of Electronic Commerce*, Vol. 9, No. 1, pp. 163-180.
[25] Kwon, O., Lee, N. & Shin, B. (2014) 'Data quality management, data usage experience and acquisition intention of big data analytics', *International Journal of Information Management*, Vol. 34, No. 3, pp. 387-394, doi: 10.1016/j.ijinfomgt.2014.02.002
[26] Lee, I. & Lee, K. (2015) 'The internet of things (iot): Applications, investments, and challenges for enterprises', *Business Horizons*, Vol. 58, No. 4, pp. 431-440, doi: 10.1016/j.bushor.2015.03.008
[27] Leong, L.-Y., Hew, T.-S., Tan, G. W.-H. & Ooi, K.-B. (2013) 'Predicting the determinants of the nfc-enabled mobile credit card acceptance: A neural networks approach', *Expert Systems with Applications*, Vol. 40, No. 14, pp. 5604-5620, doi: 10.1016/j.eswa.2013.04.018
[28] McAfee, A. & Brynjolfsson, E. (2012) 'Big data- the management revolution', *Harvard Business Review*, Vol. October, No. pp. 1-9.
[29] Miller, D. (1988) 'Relating porter's business strategies to environment and structure: Analysis and performance implications', *Academy of Management Journal*, Vol. 31, No. 2, pp. 280-308.
[30] Oltra, M. J. & Luisa Flor, M. (2010) 'The moderating effect of business strategy on the relationship between operations strategy and firms' results', *International Journal of Operations & Production Management*, Vol. 30, No. 6, pp. 612-638, doi: 10.1108/01443571011046049
[31] Piran, M. J., Murthy, G. R. & Babu, G. P. (2011) 'Vehicular ad hoc and sensor networks: Principals and challenges', *International Journal of Ad hoc, Sensor & Ubiquitous Computing*, Vol. 2, No. 2, pp. 38-49, doi: 10.5121/ijasuc.2011.2204
[32] Porter, M. E. (1980) *Competitive strategy*, New York: Free Press. [33] Porter, M. E. (1985) *Competitive advantage*, New York: Free Press.
[34] Porter, M. E. & Heppelmann, J. E. (2014) 'How smart, connected products are transforming competition', *Harvard Business Review*, Vol. November, No. pp. 64-88.
[35] Qrunfleh, S. & Tarafdar, M. (2014) 'Supply chain information systems strategy: Impacts on supply chain performance and firm performance', *International Journal of Production Economics*, Vol. 147, No. pp. 340-350, doi: 10.1016/j.ijpe.2012.09.018
[36] Reimann, M., Schilke, O. & Thomas, J. S. (2009) 'Customer relationship management and firm performance: The mediating role of business strategy', *Journal of the Academy of Marketing Science*, Vol. 38, No. 3, pp. 326-346, doi: 10.1007/s11747-009-0164-y
[37] Shin, S., Kim, K., Kim, K.-H. & Yeh, H. (2012) 'A remote user authentication scheme with anonymity for mobile devices', *International Journal of Advanced Robotic Systems*, Vol. No. pp. 1, doi: 10.5772/50912
[38] Sultan, N. (2013). 'Cloud computing: A democratizing force?', *International Journal of Information Management*, Vol. 33, No. 5, pp. 810-815, doi: 10.1016/j.ijinfomgt.2013.05.010
[39] Tan, G. W.-H., Ooi, K.-B., Chong, S.-C. & Hew, T.-S. (2014) 'Nfc mobile credit card: The next frontier of mobile payment?', *Telematics and Informatics*, Vol. 31, No. 2, pp. 292-307, doi: 10.1016/j.tele.2013.06.002
[40] Venkatraman, N. (1989) 'The concept of fit in strategy research - toward verbal and statistical correspondence', *Academy of Management Review*, Vol. 14, No. 3, pp. 423-444.
[41] Vijayasarathy, L. R. (2010) 'An investigation of moderators of the link between technology use in the supply chain and supply chain performance', *Information & Management*, Vol. 47, No. 7-8, pp. 364-371, doi: 10.1016/j.im.2010.08.004
[42] Vouk, M. A. (2008). 'Cloud computing – issues, research and implementations', *Journal of Computing and Information Technology*, Vol. 16, No. 4, pp. 235-246, doi: 10.2498/cit.1001391
[43] Wagner, S. M., Grosse-Ruyken, P. T. & Erhun, F. (2012) 'The link between supply chain fit and financial performance of the firm', *Journal of Operations Management*, Vol. 30, No. 4, pp. 340-353, doi: 10.1016/j.jom.2012.01.001
[44] Wu, F., Yeniyurt, S., Kim, D. & Cavusgil, S. T. (2006) 'The impact of information technology on supply chain capabilities and firm performance: A resource-based view', *Industrial Marketing Management*, Vol. 35, No. 4, pp. 493- 504, doi: 10.1016/j.indmarman.2005.05.003
[45] Zhang, X., Pieter van Donk, D. & van der Vaart, T. (2011) 'Does ict influence supply chain management and performance?', *International Journal of Operations & Production Management*, Vol. 31, No. 11, pp. 1215-1247, doi: 10.1108/01443571111178501