

RECONSTRUCTIONS OF MARKET VALUES ACCORDING TO THE ICT-BASED CREATED VALUES TO REACH MARKET EQUILIBRIUM

¹HYUN JUNG LEE, ²YONG SIK CHANG

¹60, Taegeuk-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do, 10374. Goyang Research Institute, Department of Economic and Social Research, South Korea

²137 Hanshindaegil, Osan-si, Gyeonggi-do, 18101. Hanshin University, Department of IT Management, South Korea

E-mail: ¹hjlee5249@gmail.com, ²yschang@hs.ac.kr

ABSTRACT

In this research, we are focusing on the reconstructions of market values according to created services and products in ICT-based environment. The 4th industrial revolution is based on ICT-based technologies like IoT, Big data, AI, and so on. The converged technologies are applied to economies and societies in the direction of creation of new services and products. In the market, it is possible to be conflicted between market values which come from ICT- and non-ICT-based services and products. So, we propose the market equilibrium to solve the confliction of value chains. In the created ICT-based new market, it is possible for multiple value-chains to share values in a market unlike traditional market. To do this, in the value chains, we define priority values which are created primary values in the value chains. It is also necessary to determine conflicted and destroyed values to maximize the market value in each value chain. It also accelerates to increase the global market value in the converged market like a platform. To do this, it is important to reconstruct the market values because ICT-based market creation will be tremendously increased. In this paper, we will discuss for the coexistence of the ICT-based created values in a market and the traditional and ICT-based value chains. To do this, especially, we are comparing the market value of healthcare service with that of ICT-based e-healthcare service.

Keywords: *ICT, Market Value, Equilibrium, Healthcare Service, Value Chain*

1. INTRODUCTION

In this research, we are focusing on the reconstruction of market values in a platform that includes multiple value chains which creates different values. It is possible to bring conflictions in the platform among the multiple market values. So, it is important to solve the conflictions to construct the platform, successfully. Nowadays, according to the upcoming 4th industrial revolution, there are arising a lot of ICT-based new markets. In addition, ICT-based new technologies are leading new type industries and markets to provide services and products according to customers' demands.

The features of ICT-based new markets are different from the traditional markets even if they are developed on ICT-based technologies. For instances, as an old ICT-based service markets, there are the IPTV service or 2G mobile phone service. IPTV service is produced by adoption of

ICT to broadcasting services and 2G phone has added mobile function to the general phone. The general characteristics of the services are that ICT has been a role to be auxiliary materials to accelerate and polish the services. However, it had limitations to create new type businesses in the market, even if it was of help to increase market profit. As a counter example, there is Fin-tech service, Uber taxi, Airbnb, and so on. Fin Tech is an example of converged services to created markets by the adoption of ICT to financial services. The adoption is not just to be an auxiliary material but to be leading and creating role in the new types of created markets. As another example, Uber taxi is created new services by adoption of ICT as a kind of a public transportation service. However, it is differentiated from the traditional Taxi service. Uber adopts ICT for sharing of idle properties which are arising among privately owned

cars. Nowadays it has been called by sharing economy.

Uber creates a new value chain. In the value chain, the suppliers and buyers are not ramified. In traditional market, it was general to ramify between suppliers and buyers. In ICT-based new market like Uber, every private car owner can be suppliers and customers. If car owners supply taxi services to customers, then they can be suppliers, even if they are not engaged in taxi companies. Healthcare services also create new ICT-based services like e-healthcare services, tele-healthcare services, robot-healthcare services and so on [1, 2, 17]. The ICT-based services create new values by the reimagined businesses differentiated from the traditional businesses [3, 4, 19, 20]. In the new value chain systems, it is necessary to newly define the suppliers and customers because the ICT-based services are conducted by multiple value chain systems. For instance, in the tele-healthcare service, there is a shared platform by multiple value chains like ICT related suppliers and customers, medical devices suppliers and customers and so on above the medical service value chain with medical team and patients.

In this light, in new-type markets, it is necessary to define the created market values as well as destroyed. In addition, it needs to define the conflicted and sharable values between the new and old market values. So, in this research, we do discuss the created, destroyed, conflicted and shared values between the created and traditional value chains.

In section 2, we review the ICT-based created values and newly generated value chains. Section 3 describes ICT-based created values in new markets. Section 4 proposes market equilibrium methodologies to solve the conflicted values in markets. Section 5 discusses the experiment and expected value. Finally, we conclude this research and propose the further research.

2. LITERATURE REVIEW

A lot of products and services have been changed and converged into new products and services which are based on the developed ICT [6, 7, 10, 16] according to the market demands and social needs. The new products are equipped with efficiency, productivity, marketability and have been changed into value-added products [14]. Above such products are developed by social or market needs or by the chance of technology developments even if the engineers did not intend.

To develop the services, traditional services are mounted on ICT-based developed technology [8]. The expected new services are predicted by three-type as follows: traditional services are topped on ICT-based infra service, ICT-based new services are created in traditional infra, and totally changed new services are created depending on the development of ICT. The converged or created businesses in industry, products, services, platforms, etc. are having a direction to improve customer satisfaction, satisfy customers' requirements or create new requirements for customers. Especially, on-demand and customized services on forward of value chain have been generalized which are based on dynamics of interactive, personalized, customized services and derived by ICT-based industries. In other words, it can represent decay or change of supplier-based value chain in traditional manufacturing or technology-based industries [13]. However, service-based industries are better qualified on customer side according to the maturation of information industries and society and the development of ICT technology [12, 18, 15, 16]. The newly developed services or the upgrade of traditional services lead supplies of a variety of services in our society and economy. In addition, they are having major roles on creations of social and economic values in our community.

In this research, we discuss conflicted values between newly generated markets and traditional markets and to make equilibrium in market for coexistence of different typed markets. We compare priority values from traditional business with ICT-based new business. In the new and old business, the priority values have been changed, created, improved, disappear and so on within changed value chain structure. It is necessary to discuss how the different typed markets can be sustained in the chaining economy ecosystem [9].

In this discussion, we expect to propose the bright plan to build sound future business according to the creation of a variety of services, because the advent of ICT technology caused the confliction between newly developed value chain and traditional businesses.

3. ICT LEADING MARKET VALUES

The developed ICT leads the creation of new market values in new businesses that are created by the construction of new markets. The ICT-based new markets are differentiated from traditional value chain which is based on a single

value chain with supplier and customer side. The created new markets can be composed of multiple value chains because the markets are generated by converged products and services with ICT. This kind of market is generally called by the platform. The platform can be substituted by markets which were places to trade a single type of the goods. However, ICT-based cyber physical system-based markets are including multiple types of goods to trade between shake holders. Even the goods are also completed by the convergence of multiple goods. So in a platform, it is necessary to manage the various types of market values which can be highly related to multiple value chains. In addition, in a platform there are not only complete goods as traditional markets but also half-finished goods. In the platform, it is possible to trade not only products but also services and the roles of suppliers and buyers can be also changed depends on the contextual environment. In short, anything goods can be traded among the suppliers and buyers and the roles of participants in a value chain can be easily changed depending on market conditions if it creates market values.

To do this, in this section, we define four dimensions of market values like created, destroyed, conflicted and shared values as in *Figure 1*.

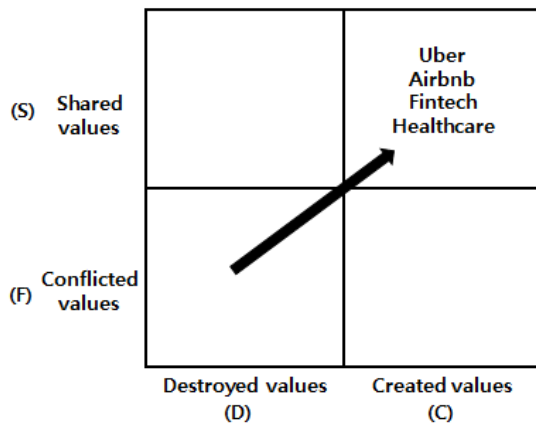


Figure 1: The market values in a market

According to the emerging ICT-based market, new types of market values are created. The created values can be shared by participants in multiple value chains. Some values can bring conflictions with market values in the existed value chains. As the results of conflictions, some values can be destroyed in markets. Thus, the reconstruction of the emerging market structure is indispensable to develop and sustain market values in a new market.

In the platform, there are conflictions among the market values between value chains. So, it is necessary to control the values as was controlled in the traditional market using the supply chain.

In the supply chain, it was true that the markets were focused on the trading of tangible products from inbound to outbound of the value chain. However, the advent of ICT caused the production and trading of intangible products like services. For this reason, the new market values create a new type of a value chain to trade the products in the market. Therefore, the occurrence of conflictions is inevitable because the heterogeneous values are in a market. So, it is necessary to discuss the confliction among values and how to solve the problems.

The created market values are defined as follow.

$$C = \{c_i \mid c_i \text{ is } i^{\text{th}} \text{ created value in a new value chain}\}$$

If the created market value provides the same value to the market, then the traditional market value can be destroyed.

The destroyed value is described as follow.

$$D = \{d_i \mid d_i \text{ is } i^{\text{th}} \text{ destroyed value in the traditional value chain}\}$$

The destroyed values are occurred by confliction between traditional and new market values which are generated from different value chain, even if the market values are not changed.

The conflicted value is described as follow.

$$F = \{f_i \mid f_i \text{ is } i^{\text{th}} \text{ conflicted value between the new and the traditional value chain}\}$$

It is general that one or both of conflicted values will be disappeared in the markets, because the conflicted values in a market are happened by the sharing of a same market. To survive in a market, it is necessary to adjust the market by controls of customers of the conflicted values. In short, simple way to solve the problem is the separation of a market depending on the customers' segmentation. Each customer needs each different service depending on his/her contextual environment. For instance, residence who lives in central town are easily use taxis, but if the residence lives in the outskirts of a city, then it's not easy for them to use taxi services. They can use Uber taxi service. So, it is possible that there are multiple value chains in a taxi service simultaneously like general and Uber

taxi service. Even if they are creating a same market value like the taxi service, it is possible that there are both services with different value chains in a market. They are not shared by the customers but share a market. In addition, it is possible that there are multiple value chains in the market.

If it is possible that there are different value chains which create and deliver a same market value but not in a market, then it is called by the shared value which is defined as follow.

$S = \{s_i \mid s_i \text{ is } i^{\text{th}} \text{ shared value between value chains, but it is not share a market}\}$

For coexistence of multiple value chains in a market, the market should be segmented by contextual customers. The more players share a same market with a same value, the more conflicts will be occurred. On the other hand, the more customers exclusively consumed the values in different markets, the markets will be stabilized.

A market including multiple value chains should create new markets which can be dynamically generated by customers' contexts.

4. RECONSTRUCTION OF MARKET VALUES

In the 4th industrial revolution, according to the advent of ICT-based services and products, it is necessary to make a segmentation of the market with multiple value chains. A market depending on the ICT related converged works creates customer-based values which can be segmented by the types of customers' contextual conditions.

In this research, we are focusing on the reconstructions of market values according to created services and products in ICT-based environment. The 4th industrial revolution is based on ICT-based technologies like IoT, Big data, AI, and so on. The converged technologies are applied to economies and societies in the direction of creation of new services and products. In the market, it is possible to be conflicted between market values which come from ICT- and non-ICT-based services and products. To solve the problem, we propose market equilibrium to solve the conflicted values among different value-chains. In the created ICT-based new market, it is possible for multiple value-chains to exist in a market unlike the past market.

It is also necessary to define conflicted and destroyed values to maximize the market value in

each value chain. It can also accelerate to increase the global market value in the converged market like a platform. In the multiple-sided market, it is possible to individualize the products and to differentiate the value of each product according to the customers' satisfaction.

The value chains are constructed by convergence of traditional- and new- suppliers, services and customers. In addition, the value chains can be dynamically reconstructed by primary values as in *Figure 2*.

//When a new value chain enters in a market already having traditional value chains.

$M \leftarrow$ Market with multiple value chains

$TS \leftarrow$ Traditional-Supplier;

$TSV \leftarrow$ Traditional-Service value;

$TC \leftarrow$ Traditional-Consumer

$NS \leftarrow$ New-Supplier;

$NSV \leftarrow$ New-Service value;

$NC \leftarrow$ New-Consumer

$EVC \leftarrow$ Existing Value Chain which as a set with TS, TSV, TC ;

$NVC \leftarrow$ Created New Value Chain as a set

Switch with (Participants)

{

Case 1: $NS \neq \phi, NSV \neq \phi, NC \neq \phi$ // New-Supplier, New-Service, New-Consumer

$$EVC \cap NVC = \phi$$

Case 2: $NS \neq \phi, NSV \neq \phi, TC \neq \phi$ // New-Supplier, New-Service, Traditional-Consumer

$$EVC \cap NVC = TC \text{ and } \neq \phi, NC = \phi$$

$$\exists(\text{Conflicted } TC) \in M$$

Case 3: $NS \neq \phi, TSV \neq \phi, NC \neq \phi$ // New-Supplier, Traditional-Service, New-Consumer

$$EVC \cap NVC = TSV \text{ and } \neq \phi, NSV = \phi$$

$$\exists(\text{not.Conflicted } TSV) \in M$$

Case 4: $NS \neq \phi, TSV \neq \phi, TC \neq \phi$ // New-Supplier,

<p>Traditional-Service, Traditional-Consumer</p> $EVC \cap NVC = TSV \cup TC \text{ and } \neq \phi,$ $NSV = \phi, NC = \phi$ $\exists(\text{not.Conflicted } TSV \wedge \text{Conflicted } TC) \in M$ <p>Case 5: $TS \neq \phi, NSV \neq \phi, NC \neq \phi$ // Traditional-Supplier, New-Service, New-Consumer</p> $EVC \cap NVC = TS \text{ and } \neq \phi, NS = \phi$ $\exists(\text{not.Conflicted } OS) \in M$ <p>Case 6: $TS \neq \phi, NSV \neq \phi, TC \neq \phi$ // Traditional-Supplier, New-Service, Traditional-Consumer</p> $EVC \cap NVC = TS \cup TC \text{ and } \neq \phi, NS = \phi, NC = \phi$ $\exists(\text{not.Conflicted } TS \wedge \text{Conflicted } TC) \in M$ <p>Case 7: $TS \neq \phi, TSV \neq \phi, NC \neq \phi$ // Traditional-Supplier, Traditional-Service, New-Consumer</p> $EVC \cap NVC = TS \cup TSV \text{ and } \neq \phi, NS = \phi, NSV = \phi$ $\exists(\text{not.Conflicted } TS \wedge \text{not.Conflicted } TSV) \in M$ <p>Case 8: $TS \neq \phi, TSV \neq \phi, TC \neq \phi$ // Traditional-Supplier, Traditional-Service, Traditional-Consumer</p> $EVC \cap NVC = TS \cup TSV \cup TC \text{ and } \neq \phi, NS = \phi, NSV = \phi, NC = \phi$ $\exists(\text{not.Conflicted } TS \wedge \text{not.Conflicted } TSV \wedge \text{Conflicted } TC) \in M$ <p>}</p> $M = EVC \cup NVC$
--

service enters to the traditional healthcare service market.

We can determine the market price P and market value V . In traditional market, it is true that $P > V$, but in ICT-based market, it is not easy to equally measure the V . In the market, depending on the customers' satisfaction, in some cases are $V > P$. In addition, V can be dynamically measured depending on the customers' contextual environments.

If there are multiple value chains in a market, then the market value will be summed by the values like v_1, v_2 , and so on.

$$V = N(v_i) \tag{1}$$

In formula (1), v_i is a market value of i^{th} value chain and N is the number of value chains.

If v_i is all the same in all value chains in multiple-sided market and 1, then the total value in the market is $N(v_i) = N$. However, in the market, all of v_i is not the same. If there is $V = N(v_1, v_2)$ and confliction between v_1 and v_2 , then one of market values or both of them can be destroyed in the market. Therefore, one of them will be survived or a new market value will be created. If a new market value is created in a market, then it is general that they are conflicted between them. In traditional market, it was general that one of market values will be destroyed.

However, in ICT-based creative market, the market values can be differently depended on customers' contextual conditions. Even both of them can coexist in the same market. To do this, each value should be included in each segment as follow.

$$v_1 \subset \text{seg}_1; v_2 \subset \text{seg}_2$$

v_1 is created from seg_1 which is segmentation 1 and v_2 is created from seg_2 which is segmentation 2. The seg_1 and seg_2 are included in a market M .

$$M = \text{seg}_1 \cup \text{seg}_2$$

As was stated, in ICT-based creative market, the market value can be $V > P$ unlike traditional market. So, the market can be shared by multiple value chains because V is increased.

To be solved conflictions of multiple value chains in a market, each value chain should create new value which should be customized and individualized.

Figure 2: The value chains creation and reconstruction in a market

In Figure 2, the possible conflictions between value chains are classified with 8 types when a new value chain enters to the traditional market. It is an example when a new tele-healthcare

In addition, the priority values v_i in multiple value chains should be excluded with segmentation as the central. Thus, the market will be stabilized and the multiple value chains will be sustained in a same market. For instance, if Uber taxi wishes to share a taxi customers' market with the traditional taxi industry, then Uber should create a new consumer-based segmentation with its priority value in the market. So, there is no confliction between v_1 as a market value of traditional taxi industry and v_2 as a market value of Uber.

In addition, in taxi industry including Uber and traditional, the total market value will be increased from V to $V+\alpha$. In the strict sense, Uber and traditional taxi are belonged into different value chains. Even, in real market, Uber and traditional taxi industry are constructing different customer-based segmentation. In another case, in the healthcare service market with the traditional and tele-healthcare service, there are different value chains. So they can have big opportunities to create new market values in the market.

5. MARKET EQUILIBRIUM

In advance of ICT, market should be more detailed segmented. However, the market structure is still based on the traditional value chains. To reach market equilibrium, the created market values are should be controlled by a new market structures. In technology-based market, there is multiple-sided market with multiple value chains. So, it is important to control the value chains in the market to maintain the market equilibrium.

In addition, the importance of coexistence of multi-value chains in a market is that the TV as total of market values in a market including multiple value chains can be larger than the summation of IV^i as individual market values in each value chains.

For instance, in ICT-based tele-healthcare service, the construction of healthcare cloud can have opportunities to increase total market values by making the collaborative market values between traditional- and tele-healthcare. This kind of service can make additive market values in the multiple value chains market. So, multiple value chains can be coexisted in a market with the market equilibrium.

For the market equilibrium in multiple value chains, the algorithm is as follow in *Figure 3*.

$IV^i \leftarrow$ Individual value of i^{th} value chain;

$TV^p \leftarrow$ Total value of a multiple-sided market;

$TV^i \leftarrow$ Total value of individual value chains;

$V^s \leftarrow$ Value of suppliers in the market;

$V^{sv} \leftarrow$ Value of services value in the market;

$V^c \leftarrow$ Value of customers in the market;

$TV^p \equiv TV^i // TV^p$ should be equal to TV^i ;

$TV^p \leftarrow (V^s + V^{sv} + V^c)^p //$ The summation of V^s, V^{sv} and V^c in the market;

$TV^i \leftarrow \sum IV^i$

$IV^i \leftarrow (IV^s + IV^{sv} + IV^c)^i //$ The summation of the value of i^{th} value chain with IV^s, IV^{sv} and IV^c ;

$TV^p \leftarrow \text{Max}(TV^p)$

Switch (TV^p and IV^i)

{

Case 1 ((TV^p) is increased) and ($\forall(IV^i$ is increased)))

$TV^p \geq TV^i$;

$TV^p \propto (\text{Maximize}(IV^i))$;

$TV^p = TV^i + \alpha // \alpha$ is additive value;

Market Equilibrium;

Case 2 ((TV^p is increased) but ($\exists(IV^i$ is decreased)))

$TV^p < TV^i$;

$TV^p \text{ not}(\propto(\text{Maximize}(IV^i)))$;

$TV^p < TV^i + \alpha // \alpha$ is not additive value;

Find a problem why IV^i is decreased // it is necessary to find what are critical points of the decreasing of market value of IV^i ;

Resolve the problem;

}

Figure 3: Market equilibrium in multiple value chains

6. EXPERIMENTS AND DISCUSSION

In this research, we simulate the distribution of market values to reach the market equilibrium between the healthcare and tele-healthcare service. The development of the tele-healthcare service is based on ICT technology. The newly developed tele-healthcare and traditional healthcare service have different value chains. In short, in tele-healthcare service value chain, the created values should be different from those of the traditional healthcare value chain. In traditional healthcare value chain, the players are defined by medical teams and patients, but in tele-healthcare service, the players are defined by medical contents provider, ICT-based medical Apps, medical networks, and so on as well as medical teams and patients. Additively, the boundaries of patients are also expanded to ageing group, tele-located patients, guardians, and so on, if the patients can use the tele-healthcare service.

The tele-healthcare service value chain is generated by convergence of ICT-based technology and the traditional healthcare service. The ICT-based technology creates new values like medical contents, tele-services, and so on in the newly created value chain. So, in this simulation, we try to prove the expansion of traditional markets when we adopt the ICT to the traditional market.

The generated priority values from the value chains are as follows.

$$V = \{v_1, v_2\}$$

, where v_1 is the created value from the traditional medical service and v_2 is the ICT-based created value from tele-healthcare service. v_1 is v_2 can be narrowly segmented by customers' demands as follows.

$$v_1 = \{v_{11}, v_{12}\}$$

$$v_2 = \{v_{21}, v_{22}\}$$

For instance, where v_{11} can be the created values from medical teams, v_{12} can be from patients' care, v_{21} comes from medical contents, v_{22} can be from medical infra like medical contents or information providing, and so on.

We assume that the value of medical contents is α , and the value of medical service is β . In the healthcare service value chain creates value α and tele-healthcare service value chain creates value β which is interpreted by $\beta = \alpha + \delta$. In the view points of the priority players, in healthcare service,

there are medical teams (ψ), patients (ω) and in the tele-healthcare service, some players are added such as ICT technology-based medical contents service providers (ϕ) and contents consumers (χ). The ICT-based medical service providers are providing advanced medical information and contents as well as medical appliances and medical supplies. So ψ will be expanded to $\psi' \geq \psi, \psi' + \epsilon$. The patients' markets are also expanded to $\omega' \geq \omega, \omega' + \chi$, χ is medical contents consumers.

It shows that the tele-healthcare service produces more productive values than the traditional healthcare service. In addition, the number of participating players is also numerically or not increased. Therefore, it proves that the totally created values are also expanded. From the lesson, we can expect the possibility of market equilibrium between the traditional and ICT-based created business through solving conflictions between market values in a market.

7. CONCLUSIONS

In this research, we discuss the coexistence of multiple value chains through the market equilibrium. The advance of ICT-based market caused the confusion between traditional and ICT-based newly generated businesses. For instance, there are market value conflictions among the different value chains in a market.

In the proposed the market equilibrium, it is possible to coexist multiple values in a same market. In addition, the ICT-based newly generated market can create new values which are differentiated from the values of traditional business. So the different value chains can create new creative values in their value chains. The creative values can be play roles of priority values in multiple value chains. The segmentations of a market according to the customers' contextual conditions can guarantee the creation of a variety of market values. Finally, in the multiple value chain in a market, some values can be conflicted and destroyed, but others will be created and can collaborate with multiple value chains. As the results, the market when a new value chain enters, it can make more converged, collaborative, shared and emerged market values and they can be coexisted in a market.

It shows that it is not necessary to concern for the conflictions among market values because the ICT-based market creates new additive values. It means that in the market with multiple value chains, more increased market values can be

created than the summation of individual market values.

To show this, we adopt the tele-healthcare service which is compared with the healthcare services. We find that the participating players are increased and additively the created values are also increased. So the size of total market can be increased when we adopt the ICT technology to businesses. From the instance, we tried to define newly generated participating players and created priority values in the market.

In further research, to polish the proposed market equilibrium, it is necessary to research an in-depth study for a modeling and to adopt more detailed cases for in-depth discussion. In addition, it is expected using real data to prove the proposed market equilibrium to solve the conflicted market values in a market.

REFERENCES:

- [1] J. Anderson, "Evaluation in health informatics: social network analysis," *Computers in Biology and Medicine*, Vol. 32, 2002, pp. 179-193.
- [2] B. Andre', Gerd Ringdal, Jon H. Loge, Toril Rannestad, Hallvard Laerum, and Stein Kaasa, "Experiences with the implementation of computerized tools in health care units: a review article," *International Journal of Human-Computer Interaction*, Vol. 24, No. 8, 2008, pp. 753-775.
- [3] R. L. Chapman, Claudine Soosay, and Jay Kandampully, "Innovation in logistic services and the new business model: a conceptual framework," *International Journal of Physical Distribution & Logistics Management*, Vol. 33, No. 7, 2003, pp. 630-650.
- [4] P. F. Drucker, *Innovation and Entrepreneurship*, Harvard Business School, Cambridge, MA, 1985.
- [5] D. Flint, Everth Larsson and Britta Gammelgaard, "Exploring processes for customer value insights, supply chain learning and innovation: an international study," *Journal of Business Logistics*, Vol. 29, No. 1, 2008, pp. 257-281.
- [6] B. Flynn and Edmund Flynn, "Synergies between supply chain management and quality management: emerging implications," *International Journal of Production Research*, Vol. 43, No. 16, 2005, pp. 3421-36.
- [7] J. Franks, "Supply chain innovation," *Work Study*, Vol. 49, No. 4, 2005, pp. 152-155.
- [8] F. Hacklin, *Management of convergence in innovation: Strategies and capabilities for value creation beyond blurring industry boundaries*, Physics-Verlag Heidelberg, Springer, 2008.
- [9] D. Lambert, Ronald Adams and Margaret Emmelhainz, "Supplier selection criteria in the healthcare industry: a comparison of importance and performance," *International Journal of Purchasing and Materials*, Vol. 33, No. 1, 1997, pp. 16-22.
- [10] D. Li, and Christopher O'Brien, "Integrated decision modeling of supply chain efficiency," *International Journal of Production Economics*, Vol. 59, No 1-3, 1999, pp. 147-157.
- [11] C. Lin, Wing S. Chow, Christian N. Madu, Chu-Hua. Kuei and Pei Pei Yu, "A structural equation model of supply chain quality management and organizational performance," *International Journal of Production Economics*, Vol. 96, No. 3, 2005, pp. 355-365.
- [12] B. A. Lundvall, "Innovation as an interactive process: from user-producer interaction to the national system of innovation," in Dosi, G., Freeman, C., Nelson, R., Silverberg, G. and Soete, L. (Eds), *Technical Change and Economic Theory*, Pinter, London, pp. 349-369, 1985.
- [13] OECD, WTO, and World Bank Group, *Global Value Chains: Challenges, Opportunities, and Implications for Policy*, Report prepared for submission to the G20 Trade Ministers Meeting Sydney, Australia, 19 July, 2014.
- [14] J. J. Okello, "Does use of ICT-based market information services (MIS) improve welfare of smallholder farmers? Evidence from Kenya," *Proceedings of the 4th ACORN-REDECOM Conference*, (Brasilia, D.F.), May 14-15, 2010, pp.1-10.
- [15] S. Roy, K. Sivakumar and Ian. F. Wilkinson, "Innovation generation in supply chain relationships: a conceptual model and research propositions," *Journal of the Academy of Marketing Science*, Vol. 32, No. 1, 2004, pp. 61-79.
- [16] E. Schneller, Larry R. Smeltzer, Lawton R. Burns, "Strategic Management of the Health Care Supply Chain," Jossey-Bass, San Francisco, CA, 2006.
- [17] S. Shih, Patrick A. Rivers, and H. Y. Sonya Hsu, "Strategic information technology alliances for effective health-care supply chain management," *Health Care Management Research*, Vol. 22, No. 3, 2009, pp. 140-150.

- [18] E. Sivadas and F. Robert Dwyer, “An examination of organizational factors influencing new product success in internal and alliance-based processes,” *Journal of Marketing*, Vol. 64, 2000, pp. 31-49.
- [19] J. Tidd, J. Bessant and K. Pavitt, *Managing Innovation: Integrating Technological, Market, and Organizational Change*, Wiley, New York, NY, 1997.
- [20] P. T. Y. Tseng and Huei-Huang Chen, “Reinventing Healthcare Service through M-care Business Model: The Strategy Analysis of WiMAX Adoption,” *Journal of Communications*, Vol. 2, No. 5, 2007, pp. 35-41.