



## Customer Relationship management and knowledge Management enhancing on innovation Competence: Case Study

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### ABSTRACT

Customer Relationship management (CRM) oriented knowledge management focus on customer knowledge more valuable to the company. The integration of customer relationship management and knowledge management concepts on process level are beneficial for both management approaches. Therefore, the aim of this paper is to examine and elaborate the linking between knowledge management process and customer relationship management to create a customer knowledge management (CKM) model. We need a CKM outputs impacting on business innovation. Under the objective, we studied literatures about CKM. We results are CKM process, CKM competence, CKM outputs. We have 12 ways of innovation competence and their corresponding CKM outputs. The implication of Knowledge innovation of Taiwan Semiconductor Manufacturing Company's experience is presented.

**Keywords:** Customer relationship management; Knowledge management; Innovation competence.

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## 1. INTRODUCTION

Knowledge management (KM) is an important role in selecting the right information at the right time from several pertinent resources (Plakoyiannaki and Saren, 2006) while converting it to useful insight. Effective knowledge management can help the enterprise to accumulate core knowledge, build corporate intelligence and obtain a competitive competence. CRM aims at leverage investments in customer relations to strengthen the competitive position and maximize returns (Campbell, 2006). Various researchers has extolled the potential of CRM as opportunity for firms to achieve a competitive advantage by offering move value to customers (Cavusgil et al. 2003). In order to support commerce leading to competitive advantage, KM and CRM have been the focus of attention in organizations and academic contexts, since both strive to obtain the constant benefits of competition through the optimization of the organizational resource (Gebert et al. 2002). Customer-focused companies have to provide knowledge that customers demand, process the knowledge that customers pass to the company and processes knowledge about customer (Campbell, 2006). Focusing on customer processes requires knowledge of considerable extent (Campbell, 2006). CRM focuses on the integration of customer information, knowledge for finding and keeping customer to grow customer lifetime value. Therefore, the organization needs complete integration between KM and CRM to become successful in competitive market (Bechina Amzien and Voransachai, 2008)

Innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new product or manufacturing process or equipment (Zanjani et al. 2008). Innovation is defined as a knowledge process aimed at creating new knowledge geared towards the development of commercial and viable solutions (Huang and Lin, 2005). In innovation function, innovation can help you discover what opportunities exist now, or are likely to emerge in the future. Successful businesses not only respond to their current customer or organizational needs, but often anticipate future trends and develop an idea, product or service that permits them to meet this future demand rapidly and effectively. This means that business innovation is important. The innovation process includes the physical, technical, and knowledge-based activities that are core in forming product development routines (Claycomb et al. 1999). Knowledge management is the mechanism through which innovation complexity can be addressed (Claycomb et al. 1999). Innovation has become the driving force for business growth and success. But, knowledge is the base of CRM and unfortunately few companies change the information in the customer knowledge, therefore most companies lose the opportunity of value creation for customers (Guangming, 2007). Successful and sustained innovation presents challenges rooted in technological uncertainties, embryonic competitive structure, and ambiguous market signals (Jayashree and Shojace, 2011), which need improved managerial approaches. Since, innovative organizations focus on new knowledge, knowledge process and customer knowledge process. Thus, successful innovation is highly dependent on how the process is managed. The aim of this paper is that proposing a CKM framework. Base on this framework, we discussed the outputs of CKM and impact on innovation dimensions.

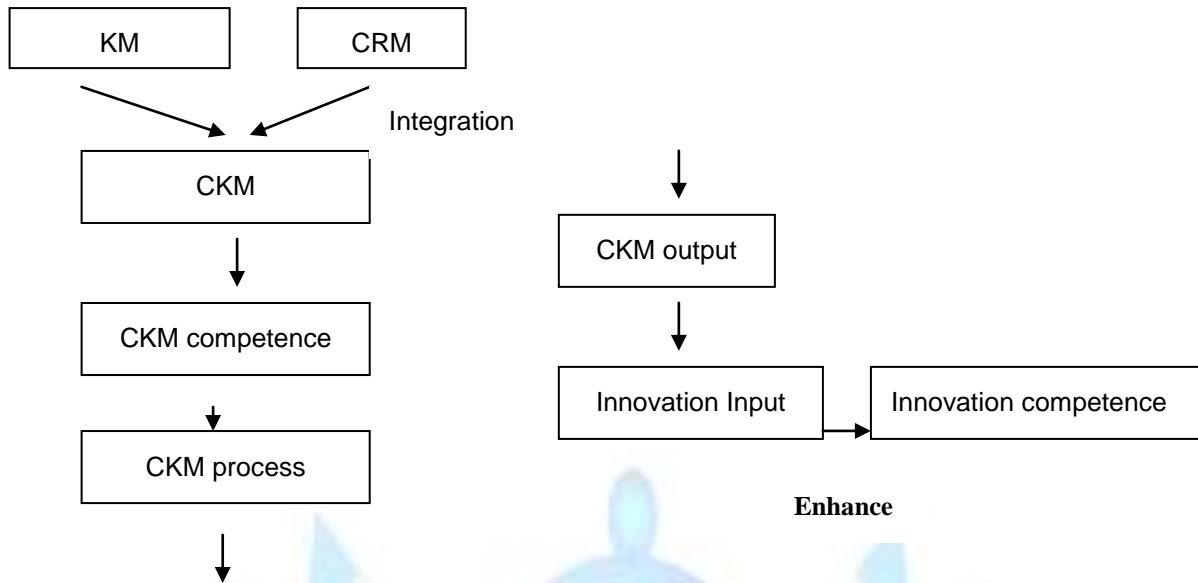


Figure 1: A conceptual framework of this research

The rest of this paper is organized as follows. In section 2, we reviewed the literature of knowledge management and customer relationship management. We discussed the process of CKM with business innovation and the conceptual model of innovation based on CKM in section 3. In section 4, we develop relationships between CKM outputs with support business innovation. We discussed the possible KM outcomes and 12 ways of innovation competence. In section 5, a case study and section 6 is conclusion

## 2. LITERATURE REVIEW

### 2.1 Knowledge management

KM is described as a set of management activities that aim at designing and influencing processes of knowledge creation and integration. The process of sharing knowledge has emerged as one of the most influential new organizational practices (Li and Calantone, 1998). Common reasons to implement KM are : (1) To enable and foster organizational learning, (2) To improve an organizational performance by link experts to each other, (3) To apply best practices to future problems and opportunities, and (4) To produce long-term competitive advantage (Ghafari et al. 2011). KM efforts focus on organizational objectives, management of knowledge, help individuals and groups (Attafar et al. 2013; Mentzer et al. 2000). KM process is used for analyzing from knowledge creation to its application, a quantum of knowledge progresses through four primary stages: creation, diffusion, transfer and application of knowledge (Andriessn, 2004). Therefore, Knowledge management process includes knowledge discovery, knowledge capture, and knowledge sharing and knowledge application. Table 1 denoted as knowledge management and their objective.



Table 1: knowledge management and their objective

KM efforts	objective
Organizational objectives	Improved enterprise performance, Competitive advantage, innovation, Sharing of lessons learned, Integration and continuous improvement of organization
Management of knowledge	Strategic assets, Sharing knowledge
Help individuals and group	Sharing valuable organizational insights, To reduce redundant work, To avoid reinvesting the wheel in organization, To reduce training for new employees, To retain intellectual capital as employees' turnover in an organization, To adopt to changing environments and markets.

## 2.2 Customer relationship management

CRM has an important role to help organizations to keep their customers and to make them loyal (Akram et al. 2011; Davenport et al. 2001; Herkema, 2003). Sh (2011) defined CRM as activities that manufacturers practice for understanding customer demands and improving customer satisfaction. CRM role is more important in customer analysis and in customer retention. The acquisition of customer knowledge, especially the potential knowledge is far more important than acquiring customer loyalty. Hence, the aim of CRM should be extended from customer loyalty to obtaining and exploring customer knowledge and making customer a value-added collaborator (Handen, 2000). CRM Process includes five processes: strategy development process, value creation process, multi-channel integration process, performance process, and information management process (Perko and Bobek, 2007; Schweds, 2000).

### (1) Strategy development process

The organizational customer strategy causes the identification of the existing and potential customer base on recognition of the most appropriate form of customer segmentation.

### (2) Value creation process

The customer value process is an independent process to indicate for turning the organization's understanding toward producing product and delivering services that able to add value, and for incorporating the customer in the design and production of new products or services (Perko and Bobek, 2007).

### (3) Multi-channel integration process

In this process, the outputs from the strategy process and development process and the value creation process can create the value-adding activities with customer (Schweds, 2000).

### (4) Performance assessment process

The performance assessment process in achieving an organizational strategic is the basis for establish future improvement method.

### (5) Information management process

The information management process provides a method of sharing relevant customer and other information throughout the enterprise (Schweds, 2000).



The classification of systems connected to CRM is the following: (Sin et al. 2005).

- Operational CRM: Systems improve the efficiency of CRM business process and comprise solutions for call center/customer integration center management, sales force automation, and marketing automation.
- Analytical CRM: Systems manage and evaluate knowledge about customers for a better understanding of each customer and this or her behavior. Typical systems in this area include data warehousing and data mining solutions.
- Collaborative CRM: Systems manage and synchronize customer interaction points (e.g. pre-sale marketing, point of sale, and post-sales service) and communication channel (e.g. telephone, email, Web).

Whereas operational CRM systems focus on the support of distinct front-office business process, analytical and collaborative CRM systems only have a supporting role for operational CRM. CRM is supporting the relationship between business and its customers (Kautz and Mahnke, 2003; Zanjani, et al. 2008). Table 2 denoted as the customer relationship efforts and their mean.

Table 2: The customer relationship efforts and their meaning

CRM efforts	Meaning
Support the relationship between business and its customers	<ul style="list-style-type: none"><li>• Business acquires new customers through excellent contact management, direct marketing, selling and fulfillment (Zanjani, et al. 2008).</li><li>• CRM developed new strategies that accommodated work between understandings, sharing information and increasing customer satisfaction (Kautz and Mahnke, 2003).</li><li>• CRM collects and maintains all valuable information about the customers so the organizations can know about their customers for predicting their future behavior and producing other valuable knowledge for marketing more profit (Kautz and Mahnke, 2003).</li><li>• By gathering and storing customer data, and then using business intelligence to making information and making knowledge, by use of knowledge management system, CRM can improve its knowledge about clients (Kautz and Mahnke, 2003).]</li></ul>
CRM implementation	CRM is an implementation of comprehensive solution that by integrating people, process and technology make a perfect communication among all activities of customers to enhance relationship of organizations and their customers (Handfield and Bechtel, 2002).

### 2.3 The relationship between KM and CRM

KM can help organizations to provide better service, enhance quality product, reduce cost and respond faster to their customers (McAdam and McCreedy, 2000). Customer-focused companies have to provide knowledge that customers demand, process the knowledge that customers pass to the company and processes knowledge about customer (Campbell, 2006). This mean that knowledge support makes for performance enhancement with customer oriented business process (Campbell, 2006). Customer knowledge is a kind of knowledge, in the areas of customer relationship, which has direct on

indirect effect on our organizational performance (Chen 2001). KM Researchers identified three flows of information in customer business intelligence knowledge management (Payne and Frow, 2005; Talet, 2012):

- Knowledge for customer: Satisfies customer's requirements for knowledge about products, the market and other relevant items.
- Knowledge about customer: Captures customers' background, motivation, expectation and preference for products or services.
- Knowledge from customer: Understands customers' needs pattern and/or consumption experience of products and/or services (Talet, 2012).

### 3. CKM WITH BUSINESS INNOVATION

#### 3.1 CKM competence

Li, Calantone (1998) defined that market knowledge competence are the processes that generate and integrate market knowledge. The market knowledge competence in new product development is composed three organizational processes: (1) Customer knowledge process, (2) Competitor knowledge process, and (3) Marketing research and R&D interface (Li et al. 2006). This research conceptualizes enterprise's processes, which, together, generate and integrate knowledge management with the customer relationship management [9]: (1) Customer Information process, (2) Marketing – IT (Information technology interface), (3) Management Innovation, (4) Employee Reward, (5) Organization performance, and (6) Business Intelligence (BI) systems (in Figure 2).

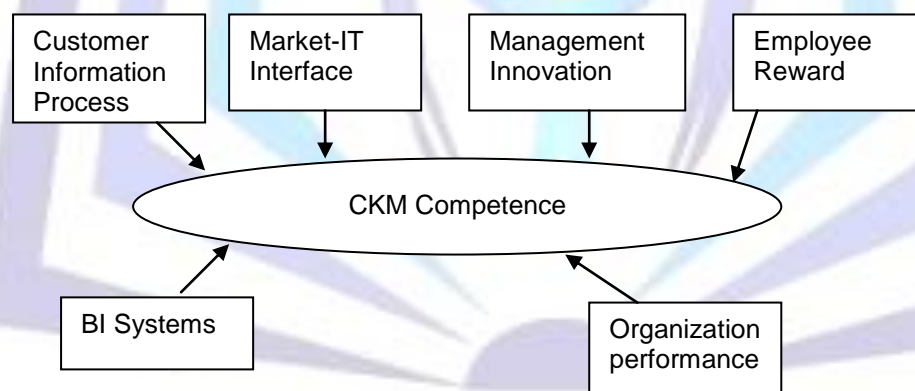


Figure 2: CKM competence

Source: Extended from (Cavusgil et al. 2003)

We simply describe of the CKM competence. Marketing – IT interface refers to the process by which marketing and information technology functions communicate and cooperate with each other. Management Innovation refers to the processes by which top management signals its support for generation and integration of customer knowledge within the firm (Cavusgil et al. 2003). The employee evaluation and reward system refers to the process by which employee behavior is aligned to the firm's goals of generating and integrating knowledge into the firm's marketing strategies (Bechina et al. 2005).



### 3.2 CKM process

This research identifies the integration barriers of CRM and KM in organizations in order to make clear the possibility of achieving CKM (Bechins Amzien and Voransachai, 2008). The enterprise should fully explore and utilize customers' information to implement CKM and combine it with corporate knowledge (Handen, 2000). The integration of KM and CRM must be looked at in several crucial areas (Zanjani, et al. 2008):

Organization mission: The review exercise of the strategic planning process include knowledge audit and knowledge map that would act as reference in development of knowledge management to support customer relationship management. This includes people, process (structural capital and intangible assets), information technology and content (explicit knowledge).

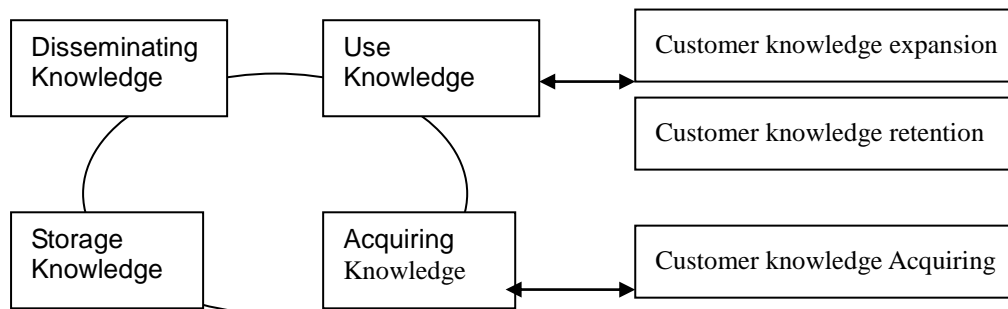
- (1) Knowledge process about customer: It is accumulated to understand motivations of customer and to address them in a personalized way. This includes customer histories, connections, requirements, expectations, and purchasing activity (Garacia-amurillo and Annabi, 2002). The objective of this process is customer acquisition.
- (2) Knowledge process for customer: It is required in CRM process to satisfy knowledge needs of customers. This includes knowledge about product, markets and suppliers (Gebert et al. 2003). The objective of this process is customer retention.
- (3) Tacit knowledge conversion: It is manipulate customer data sources applying data mining techniques, in order to extract useful knowledge about to extract useful knowledge about customers segments, potential market and needs in each segment (Herkema, 2003).
- (4) Knowledge process from customer: It is knowledge of customer about products, suppliers and markets. Within interactions with customers this knowledge can be gathered to feed continuous improvement, such as service improvement or new product developments (Gevert et al. 2003). The objective of this process is customer expansion.
- (5) Organization vision: Enterprise must be monitored for performance against expectation or goal for any newly implemented system.

The categories of customer knowledge are Knowledge from customer, Tacit Knowledge conversion, Knowledge for customer, Knowledge process about customer.

## 4. DEVELOP RELATIONSHIPS BETWEEN CKM WITH INNOVATION

### 4.1 Integration of KM systems and CRM systems

KM is an approach that is used to capture, store, create, and use knowledge to make the CRM process successful. CRM and KM have been recently gaining wide interest in business environment (Ghafari et al. 2011). There are four phases involved in the KM process model in order to employ the knowledge in the organization (Hashemi and Hajiheydari, 2011). Customer relationship management process includes three phase: Customer knowledge expansion, Customer knowledge retention, and Customer knowledge acquiring (see figure 3).



### Customer relationship processes

Figure 3: Phase of customer knowledge management process

## 4.2 CKM output

In a previous research work such as (Brand, 1998; Bueren et al. 2004; Guangming, 2007; Abthony Liew, 2008) the CKM outputs and its meaning are:

- Knowledge sharing: Knowledge Sharing refers to the open and efficient sharing and use of the critical pieces of knowledge that enables an employee to increase its value. Diffuse knowledge among all employees to increase its value.
- Knowledge creation: Knowledge creation is about continuous transfer, combination, and conversion of the different types of knowledge, such as users practice, interacts, and learns.
- Knowledge using: It includes making knowledge actionable, integration knowledge into daily task and process, and managing cultural changes.
- Knowledge actualization: Update the knowledge according external environment such as competitors, benchmarking-inter (Abthony Liew, 2008). It is absorption of external knowledge
- Knowledge acquisition: A range of techniques that are used to obtain domain knowledge about an application for the purpose of constructing an expert system.
- Knowledge capitalization: An intangible asset that comprises the skills and information of a company's employees, their experience with business processes, group work and on-the-job.
- Productivity: Use of appropriated ICT and provide socio-environmental framework for employees to increase employee productivity (Abthony Liew, 2008).
- Business routines creation: Define and implement corporate repetitive tasks. Integrate individual's knowledge in corporate knowledge (Brand, 1998).
- Knowledge management measurement: Asses the impact of knowledge management on business processes. Select metrics and measurement methods.
- Identify and localize knowledge: Specify what the company knows and know where to find people and expertise.
- Use the right infrastructure: Use of appropriated ICT and set up the KM technological framework.
- Employee satisfaction: Obtain employee's memberships to collective objectives. This create a good working





environment such as reward systems

- **Background knowledge:** Information that is essential to understanding a situation or problem. Create a background favorable to the achievement of goals.
- **Customer information sharing:** Customer information sharing refers to the exchange of essential and exclusive information between organizations and their customers through interactive activities. This information includes some matters such as market demand, customer preferences, and sales promotion (Olszak and Ziemba, 2007).
- **Customer partnership:** Customer partnership means involving the customer in activities related to development and improvement of a new product, holding technical meeting, supply chain annual conferences, and market evaluation conference. Customers provide market trend and technical support for the organizations. It should lead to better understanding of future market demands (Su et al. 2005).
- **Long-term relationship:** Long-term relationship means that there is commercial relationship with trust and commitment between two parties or two organizations. In this parties must have similar goals and flow mutual profits based on a reliable and dependable base (Hashemi and Hajiheydari, 2011).
- **Joint problem-solving:** Joint problem-solving can be described as a kind of collaboration between organizations and customers for solving problems and also sharing the responsibility when a problem occurs or difficult and unexpected conditions are encountered (Islam, 2010).
- **Technology-base CRM:** This term includes organizations that use computer technology to facilitate different activities of CRM and actively offer technical aids including data storage, data mining, OLAP and CRM software systems to their customers (Su et al. 2006).

Table 3: 12 ways of business innovation competence and their corresponding CKM outputs

<b>Innovation competence</b>	<b>Definition</b>	<b>Corresponding CKM outputs</b>
Product Offering	Develop innovative new products or service	Create knowledge Background knowledge
Platform	Use common components or building blocks to create derivative	Knowledge management measurement Create knowledge
Customer offerings	Create integrated and customer offerings that solve end-to-end customer problems.	Business routines creation Background knowledge Joint problem solving
Customers	Discover unmet customer needs or identify underserved customer segments.	Background knowledge Knowledge actualization Long-term relationship
Customer Experience	Redesign customer interactions across all touch points and all moments of contact.	Productivity Create knowledge



		Knowledge acquisition Customer partnership
Value Capture	Redefine how company gets paid or create innovative new revenue streams.	Knowledge using Knowledge capitalization Long-term relationship
Business Processes	Redesign core operating processes to improve efficiency and effectiveness	Background knowledge Create knowledge
Organization	Change form, function or activity scope of the time	Knowledge sharing Background knowledge
Business model	Think differently about sourcing and fulfillment	Business routines creation Employee satisfaction Customer information sharing
Presence	Create new distribution channels or innovation points of presence including the places where offering can be bought or used by customers.	Create knowledge Knowledge actualization Background knowledge Technology-based CRM
Networking Capability	Create network-centric intelligent and integrated offerings.	Use the right infrastructure Background knowledge
Brand value	Leverage a brand into new domains.	Create knowledge Background knowledge

Source extended from Sawhney et al. (2006) [45]

### 4.3 12 ways of business innovation competence

There are 12 ways of business innovation competence: product offering, platform, customer offering, employee, customer experience, value capture, business process, organization, presence, networking capability, and brand value (Sh, 2011). Table 3 denotes the 12 ways of business innovation competence and their corresponding CKM output.

## 5. CSAE STUDY— OPEN INNOVATION PLATFORM

TSMC is the world's largest and fastest growing dedicated semiconductor foundry. Its corporate headquarters are in Hsinchu, Taiwan. The summary of experience in TSMC's customer knowledge management and innovation are denoted as Table 4.

The effects of proper customer knowledge management innovation are obvious (Hsien et al. 2002; Chen, 2002):

In TSMC's Virtual manufacturing environment

The rapid growth in the new fabrication (Fab) number is direct results of "smart copy". It means that knowledge required in the Fab could be easily transferred to the new one through a central team, thus copying the Fab from one context to another. Virtual manufacturing environments can assist company to rapidly and effectively react to change in market conditions and technology (Chen, 2002).



Its characterizes relations between many foundries and fables design houses, it is essential to manage the flow of knowledge so as to facilitate smooth, efficient transfer of new designs to production.

In TSMC's e-business

(1) TSMC established its Total Order Management (TOM) system. It was meant to structure future e-business. In July 1999, three subsystems were further developed from TOM, including TSMC-direct, TSMC- on line and TSMC –Yield Enhancement System (YES). All aspects of communications and procedures are automated and easily accessible, thus allowing customers constantly maintaining information reports on shipments, technology, and inventory (McGehee et al. 1994).

(2) Total Order Management (TOM) system was the first step toward to the realization of Virtual Factory (VF). Customer can able to inquires through Web directly to TSMC's information system and receive immediate reports about the Work in Process (WIP) status and the production and shipping schedules of their orders.

(3) TSMC-direct is a system to system integration service. This system acts as a translator, which receives information from TSMC's engineering system, and Enterprise Resource Planning (ERP) applications, and then transforms and stores the information into customers' systems. TSMC-direct connects TSMC and other supply chain members (McGehee et al. 1994).

(4) TSMC-direct: It is Internet-based, the former is a system-to-system and business-process-to-business-process information link that transmits and receives mission-critical information between the ERP systems to TSMC and its customers (Sawhney et al. 2006).

(5) TSMC –YES: This promotes engineering collaboration between TSMC and its customers in order to achieve shorter yield-analysis cycles improve yield-enhancement efficiency and faster ramp-to-production times.

(6) TSMC has built a state-of-the-art knowledge management, and Best Known Method (BKM) systems. TSMC maintains a vast database that features a sophisticated expert system that embeds captured knowledge into TSMC's engineering system.

(7) Elabview is a mask-inspection software system- the first of its kind in the foundry industry – which allows external customers to view mask images anytime or anywhere through their favorite Eeb browser (Hsieh et al. 2002).

(8) eFoundry consist of internet based applications, which provide customers with real-time support in wafer design, engineering and logistics—the master tool of the virtual foundry (Hsieh et al. 2002).

(9) TSMC formed electronic links with suppliers by implementing “Continuous Replenishment Programming” in order to minimize inventory costs.

In TSMC's e-commerce

(1) The successful establishment of TOM and implication Information and Communication Technology (ICT) made TSMC an e-Foundry, a new term invented by TSMC. It mean that the TSMC can online access to the engineering information and supply chain information.

(2) TSMC has drawn on a portfolio of design solutions from third parties to help customers achieve better designs, more



reliable design reuse and faster time-to-market, leading to virtual integration of a network of firms.

(3) TSMC's customers received value-added service directly through the Internet. Because of the connectivity of the Internet, customers can keep in touch with TSMC or its strategic alliance partners at any time and any place, which is a structural bond between customers and suppliers.

(4) TSMC has set the rules of the game for the industry, which dictate that foundries must go beyond manufacturing muscle to become essential platforms for customers to gain access to across-the-board competencies.

(5) TSMC e-commerce initiatives meet the across-the-broad needs of customers, enhancing customer loyalty.

(6) TSMC has a proven record of providing consistent on-line delivery. The TSMC's company has equipped a state-of-the-art supply chain management system that improves both our customers' forecast processes and TSMC's delivery schedule.

In TSMC's Design service alliance

(1) Design Service Alliance (DSA) includes the four service areas that make up the design process-third-party libraries, experienced IC designers, silicon-verified IPs and proven Electronic Design Automation (DEA) software (Hsieh et al. 2002).

(2) The Library Alliance enables TSMC customers to gain access to require technical services, cutting-edge process-specific technologies and documents on design requirement.

(3) The intellectual property rights (IP) Alliance encompasses a large category of silicon verified and production-proven foundry specific IPs, which are useful for designers in IP assembly (Hsieh et al. 2002).

(4) TSMC- on line is a Web-based, browser-based information services. This system makes TSMC's Fabs more transparent to customers because they can get all the information in different stages, which lower the entry barrier for customers. It provides customer facilitates customers to place orders, WIP and shipping status during the foundry service cycle,

TSMC have important factors such as ICT, IP, and knowledge action to make the knowledge community boarder and virtualized. Table 4 is denoted as summary of experience in TSMC customer knowledge management and innovation

Table 4: Summary of experience in TSMC customer knowledge management and innovation

	<b>TSMC's experience</b>	<b>Description</b>	<b>Corresponding Innovation competence</b>
1	Total Order Management (TOM)	A tool for bridging supply and demand in fabrication, and for scheduling orders and production.	Business process Business model Platform
2	Continuous Replenishment Programming (CRP)	TSMC formed electronic links with suppliers by implementing "Continuous Replenishment Programming" in order to minimize inventory costs.	Business model Value capture Organization.
3	Arms-length approach	Its characterizes relations between many foundries and fables design houses, it is essential to manage the flow of knowledge	Product offering Platform



		so as to facilitate smooth, efficient transfer of new designs to production	Presence
4	Virtual foundry (VF)	TSMC VF promotes virtual integration with its customers by means of business-to-business applications, thus rendering TSMC as the facilitator of its customers' supply-chain management.	Customer Business process Business model Customer Customer offering
5	eFoundry	eFoundry covers major aspects: design collaboration, logistical support and engineering.	Business process Organization Business model
6	TSMC-online for logistics	TSMC-online provides access to real-time production and updates in areas such as the status of wafer fabrication, assembly and testing, as well as ordering and shipping.	Product offering Platform Customer Customer experience
7	TSMC-online for engineering	TSMC-online provides a variety of capabilities, including interactive view of prototyping, lot status, yield analysis and quality – reliability data.	Networking capability Product offering Business process
8	TSMC-online for design service alliance	TSMC-online provides selected blocks of IP owned by third parties- these are robust design solutions that conform to TSMC production technologies – which are then made available to designers.	Product offering Presence Customer offering Customer Business model
9	TSMC-Direct	TSMC-Direct acts as an extension of customers' own international systems, enabling collaborative planning, work-in-process tracking, engineering data-sharing, real-time order placement, confirmation and other importance business control features.	Customer Customer Experience Business model Organization
10	TSMC-YES	TSMC customers can perform remote yield-enhancement analysis from workstations or PCs using exactly the same tools, data and models as those employed by TSMC engineers.	Platform Customer offerings Product Offering
11	TSMC-ILV	TSMC-ILV is a real-time Web-based distributed layout – information-viewing service, providing an engineering collaboration platform for communicating on layout issues.	Customer Networking capability Platform Presence
12	Value-chain management	TSMC has come to resemble a provider of integrated service package covering a wide range of value-chain management activities thanks to its extensive application of e-commerce.	Value capture Business model Business process
13	B2B e-commerce model	It acts as portal providing comprehensive support for its customers' major operational	Business process



		tasks, ranging from prototyping and design, to engineering and logistics.	Business model Value capture Customer experience
14	Relationship marketing (RM)	RM is a new marketing paradigm. It focuses on approaches to build, develop and maintain all successful relational exchanges.	Value capture Customer experience Organization Customer offering
15	Design Service Alliance (DSA)	TSMC also formed the design Service Alliance with third parties. Emergence of system-on-chip design highlighted the importance of silicon intellectual properties, and as a result, IC design has come to resemble the assembly of System in Package (SIP), from both internal and external sources.	Business model Business process Customer Customer experience Customer offering.
16	Flexible manufacturing Management	Flexible manufacturing address fluctuations in demand forecasts.	Product offering Platform Business process
17	Inventory management	TSMC has built integrated supply and demand information into its inventory management system to improve the company's responsiveness to the variability of wafer demand forecasts.	Brand value Business process Product offering
18	Knowledge management	TSMC has built a state-of-the-art knowledge management, and Best Known Method (BKM) systems.	Value capture Brand value

Source: modified from (Hsieh et al. 2002)

## 6. CONCLUSION

CKM as an imperative strategy is emphasizes for improving the organization's innovation capabilities. From the process of KM and CRM, we define the 18 outputs of customer knowledge management. In order to strengthen the competitive position, a 12 ways of business innovation competence and their corresponding CKM outputs. TSMC has become one of the world's largest and fastest growing dedicated IC foundry companies. Implications of TSMC experience are discussed.

## REFERENCES

- [1] Abthony Liew, C. B. (2008). "Strategic integration of knowledge management and customer relationship management", Journal of Knowledge Management, Vol. 12, No. 4, pp. 131-146.
- [2] Akram, K., Siddiqui, S. H. Nawaz, M. A. Ghauri, T. A. and Cheema, A. H. H. (2011). "Role of knowledge management to bring innovation: An integrated approach", International Bulletin of Business Administration, Vol. 11, PP. 121-134.
- [3] Andriessen, D. (2004). "IC valuation and measurement: classifying the state of the art", Journal of Intellectual Capital, Vol. 5, No. 2, PP. 230-242.
- [4] Attafar, A. Sadidi, M. Attafar, H. and Shahin, A. (2013). "The Role of Customer Knowledge (CKM)". In Proving Organization Customer Relationship, Middle-East Journal of Science Research. Vol. 13, No. 6, PP. 829-835.



- [5] Bechina Amzten, A. and Voransachai, L. (2008). "Aligning knowledge management process and innovation management capability a global business". Communication of the IBIMA, Vol. 6, PP. 130-135.
- [6] Bechina, A. A., Michon, N. and Nakata, K. (2005). "Pathway to innovation through knowledge management", Proceeding of 2<sup>nd</sup> conference on Intellectual capital, Academic Conference Limited 2005, 21-22 November, pp.89-102.
- [7] Brand, A. (1998). "Knowledge Management and Innovation at 3M". Journal of Knowledge Management, Vol. 2, No. 1, PP. 17-22.
- [8] Bueren, A., Schierholz, R., Kolbe, L. and Brenner, W. (2004). "Customer knowledge management - improving performance of customer relationship management with knowledge management", Proceedings of the 37th Hawaii International Conference on System Sciences – 5-8 Jan, 2004
- [9] Campbell, A. J. (2006). "The role of organizational knowledge management strategies in the quest for business intelligence". IEE international Conference on Engineering Management, 17-20 Step 2006. PP. 231-236.
- [10] Cavusgil, S, T. Calantone, R. J. and Zhao, Y. (2003). "Tacit knowledge transfer and firm innovation capability". Journal of Business & Industrial Marketing, Vol. 18, No.1, PP. 6-21.
- [11] Chen, S. H. (2002). "TSMC's Virtual foundry transforms IC industry", Taiwan Today, 06/07/2002, 2002.
- [12] Chen, T. W. (2001). "Knowledge community: a synthetic perspective on innovation", Electronic paper for Nelson and Winter Conference 2001, PP. 1-21
- [13] Claycomb, C., Droge, C. and Germain, R, (1999). "The effect of just-in-time with customers on organizational design and performance". International Journal of Logistics management. Vol. 10, No. 1, PP. 37-58.
- [14] Davenport, T., Harris, J. and Kohli, A. (2001). "How to they know their customer so well?". MIT Sloan Management, Review, Winter, 13 page, December, 1, 2001.
- [15] Garacia-Murillo, M. and Annabi, H. (2002). "Customer knowledge management". Journal of Operational Research Society, Vol. 5, No. 3, PP. 875-884.
- [16] Gebert, H., Geib, H. and Kolbe, L. (2003). "Knowledge-enabled customer relationship management: integrating customer relationship management and knowledge management concepts", Journal of Knowledge Management, Vol. 7, No. 5, PP. 107-123.
- [17] Gebert, H., Geib, H. and Kolbe, L., Riempp, G. (2002). "Towards customer knowledge management: Integrating customer relationship management and Knowledge management concepts". In the 2<sup>nd</sup> International Conference on Electronic Business, Taipei, Taiwan. December 10-13, 2002.
- [18] Ghafari, P., Karjalian, R., and Mashayekhnia, A. (2011). Studying the relationship between different dimensions of CRM and innovation capabilities in Melli bank of Iran, World Academy of Science, Engineering and Technology, Vol. 60, PP. 906-910.
- [19] Guangming, Z. (2007). "CRM- based customer knowledge management", Proceeding of International Conference on Enterprise and Management Innovation, 2007, PP. 417-421



- [20] Handen, L. (2000). *Customer relationship management: a strategic imperative in the world of e-business*, New York: John Wiley & Son
- [21] Handfield, R. B. and Bechtel, C. (2002). "The role of trust and relationship structure in improving supplies chain responsiveness". *Industrial Market Management*, Vol. 31, No.4, PP. 367-382.
- [22] Hashemi, N. and Hajiheydari, N. (2011). "Customer knowledge management framework in E-commerce". 2011 International Conference on E-business, Management and Economics, IACSIT Press, Singapore. PP. 129-133.
- [23] Herkema, S. (2003). "A complex adaptive perspective on learning within innovation projects", *The Learning Organization*, Vol. 10, No. 6, PP. 340-346.
- [24] Hsieh, Y. C. Lin N. P. and Chiu, H. C (2002), "Virtual factory and relationship marketing – a case of Taiwan semiconductor manufacturing company", *Information management*, Vol. 22, pp. 109-126.
- [25] Huang, D. Y. and Lin, C. Y. (2005). "Customer-oriented financial service personalization". *Industrial Management & Data system*, Vol. 105, No. 1, PP. 26-44.
- [26] Islam, N. (2010). "Innovation manufacturing readiness levels (IMRLs): a new readiness matrix". *International Journal of nanomanufacturing*, Vol. 6, No. 1/2/3/4, PP. 362-375.
- [27] Jayashree, S. and Shojace, S. (2011). "A critical analysis customer relationship management from strategic perspective", 2010 International Conference on E-business Management and Economics, IACSIT Press, Hong Kong. Vol. 3, PP. 340-345.
- [28] Kautz, K. and Mahnke, V. (2003). "Value creation through IT-support knowledge management? The Utilization of a knowledge management system in global consulting company". *Information Science Journal*. Vol. 6, PP. 75-688.
- [29] Li, T. and Calantone, R. J. (1998). "The impact of market knowledge competence on new product advantage: conceptualization and empirical examination", *Journal of marketing*, Vol. 62, pp. 13-29.
- [30] Lin, Y., Su, H. Y. and Chien, S. (2006). "A knowledge-enable procedure for customer relationship management". *Industrial Marketing Management Journal*, Vol. 35, PP. 446-456.
- [31] McAdam, R. and McCreedy, S. (2000). "A critique of knowledge management using a social constructionist model", *New Technology, Work and Employment*, Vol. 15, No. 2, PP. 155-168.
- [32] McGehee, J. Hebley, J. and Mahaffey, J. (1994). "The MMST computer-integrated manufacturing system framework", *IEEE Transaction on Semiconductor Manufacturing*, Vol. 7, No. 2, pp. 107-116.
- [33] Mentzer, J. T., Min, S. And Zacharia, Z. G. (2000). "The nature of inter-firm partnering in supply chain management". *Journal of Retailing*, Vol. 76, No. 4, PP. 549-568.
- [34] Olszak, C. M. and Ziemba, E. (2007). "Approach to building and implementing business intelligence systems". *Interdisciplinary Journal of Information, Knowledge and Management*. Vol. 2, PP. 135-148.
- [35] Payne, A. and Frow, P. (2005). "A strategic framework for customer relationship management", *Journal of Marketing Management*, Vol. 69, PP. 167-176





- [36] Perko, L. and Bobek, S. (2007). "An agent model in BI knowledge intensive environment". *International Conference on Information Technology Interfaces*, June 25-28, 2007.
- [37] Plakoyiannaki, E. and Saren, M. (2006). "Time and the customer relationship management process: conceptual and methodological insights", *Journal of Business and Industrial Marketing*. , Vol. 2, PP. 218-230.
- [38] Sawhney, M. Wolcott, R. C. and Arroniz, I. (2006). "12 different ways for companies to innovation", *Management of Technology and Innovation*, Vol. 47, No. 3, pp. 75-81.
- [39] Schweds, S. 2000. Vision and reality of CRM. *Information Management & Consulting*, Vol. 1, No. 15, PP. 7-11.
- [40] Sh, M. (2001). "The perception of customer relationship management Adoption –Case of Mobile Companies in Saudi Arabia", *Journal of Mobile Technologies, Knowledge Society*, pp. 397-409
- [41] Sin, L. Y. M., Tse, A. C. B. and Yin, F. H. K. (2005). "CRM: conceptualization and scale development", *European Journal of marketing*. Vol. 39, No. 11/12, PP. 1264-1290.
- [42] Su, C. T. Chen, Y. H. and Sha, D. A. (2006). "Linking innovative product development with customer knowledge: a data-mining approach", *Technovation*, Vol. 26, PP. 784-795.
- [43] Talet, A. N. (2012). "KM process and CRM process to manage customer knowledge relationship management". 2012 *International Conference on Economic, Business and Marketing Management*, Vol. 29, PP. 60-67.
- [44] Zanjani, M. S., Rouzbehani, R. and Dabbagh, H. (2008). "Proposing a conceptual model of customer knowledge Management: A study of CKM tools in British Dotcoms". *International Journal of Human and Social Sciences*, Vol. 3, No.5, PP. 363-367.