行政院國家科學委員會專題研究計畫 成果報告

整合設計鏈與顧客鏈建構高創新力供應鏈之研究(I)
研究成果報告(精簡版)

計 畫 類 別 ：個別型
計 畫 編 號 ：NSC 99-2221-E-216-024-
執 行 期 間 ：99 年 08 月 01 日至 100 年 07 月 31 日
執 行 單 位 ：中華大學科技管理學系（所）

計畫主持人：沙永傑

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其他-兼任助理人員：陳屏國

報 告 附 件 ：出席國際會議研究心得報告及發表論文

處 理 方 式 ：本計畫可公開查詢

中 華 民 國 100 年 10 月 12 日

1. INTRODUCTION

In globalization decades, how to build an absolute competitive edge in competing markets around the globe has always been an issue that constantly concerns manufacturers. Skinner (1969) suggested that customers will choose the one who can produce the highest quality product at the lowest cost. Besides, if any manufacturer can further offer the shortest delivery time and have a high-flexibility response ability, then he will be the first choice for customers. As a result, if manufacturers desire to gain a competitive edge, they should make quality, cost, delivery time, and flexibility (QCDF) their performance goals.

How should an organization be able to have the ability to achieve the four performance goals? According to relevant scholars and practitioners, if manufacturers can establish an effective supply chain management (SCM) in a global operation environment, it will enable them to achieve the ability. Introduction of a SCM can shorten lead time of manufacturing operations, effectively control product cost and quality, and enable the organization to have a high-flexibility response ability in order to respond to a highly volatile market (Guillen et al., 2007; Kuei et al., 2002; Rosenzweig et al, 2003; Samiee & Walters, 2006; Wisner, 2003). Moreover, cases of SCMs constructed by Wal-Mart, Dell, etc. also verify a positive effect of SCM.

Nevertheless, as most of the competitors can sit on equal SCM basis in recent years, manufacturers merely having the aforementioned ability are not adequate to be viewed as having a global competitiveness. It is suggested that manufacturers must further have a product innovation capability (PIC) in order to really secure their own global competitive edge, i.e. if customer needs can be known and physical products can be produced rapidly, then they will retain customers and maintain high competitiveness. Therefore, in addition to QCDF, how to equip an organization’s internal operations with PIC has become a critical issue that concerns manufacturers commonly.

Relevant researches that addressing SCM and product innovation issues argued that “collaboration” between manufacturers and suppliers is key to facilitating product innovation performance. For instance, Kim (2000), Ulusoy (2003), Nieto & Santamaría (2007), et al. indicated that introducing collaborative design between manufacturer and supplier can indeed equip supply-chain (SC) operation with PIC. However, the above conclusion is questioned by the industry practitioners. This is because the traditional SCM model underlines an upgrading ability in QCDF, though weak in product innovation. Besides, in recent years in some often illustrated successful cases, no strong relevance was found between successful operation of SCM and product innovation.

In order to arm SC with a high PIC, a set of management model which can upgrade PIC is suggested to be developed from the original SC operating environment. Therefore, a Design Chain (DC) viewpoint gradually emerges. DC is a concept which evolved from collaborative design. It emphasizes closely integration with suppliers, setting up a product design/development process, and establishing a channel with customers during the process of development (Twigg, 1998). A number of empirical studies (Choi et al., 2005; Fagerstrom & Jackson, 2002; Shiau & Wee, 2008) showed that introducing a DC management model can indeed facilitate effective execution of collaboration between manufacturer and supplier, thereby achieving PIC and avoiding negative problems derived from coordination operations. On the other hand, some research proposed regarding a DC construction model. For example, Wu et al. (2007) proposed a CDCORM (Collaboration Design Chain Operations Reference Model) and Choi et al. (2005) suggested a DCCF (Design Chain Collaboration Framework).

Although relevant literatures argued that introducing a DC can upgrade SC's PIC, as a matter of fact, successful cases are rare. The practitioners believe that the cause may be in the negative effect of "coordination operation" of manufacturer and supplier. In fact, when manufacturer and supplier desire to undertake product design and development under a DC framework, coordination plays a key role if mutual collaboration is to be complete. In an SC operating environment, all partners' operations must go through coordination in order to make operations effective (Nieto & Santamaría, 2007). In order to be able to coordinate effectively, researchers like Ghiassi et al. (2003), Goutsos & Karacapilidis (2004) proposed increasing coordination ability through information technique. Nevertheless, Langerak & Hultink (2008) found that in fact coordination operations are time-consuming. Even if through the aid of relevant techniques, a great quantity of time will still be needed. This result is very likely to prolong time-to-market so that finally the new product may not meet customer's needs. Langerak and Hultink's research result corresponds to observations of the industry practitioners. Consequently, how to conquer the negative effect derived from coordination before introducing and constructing DC is key to effective execution of DC. From small number of successful cases of DC such as Kwang Yang Motor, Sanyang Industry, AAEON Technology Inc., Avent, Amkor, etc., the practitioners believe that before introducing and constructing DC, these cases had executed some key operations to change collaboration model between supplier and manufacturer so that both could effectively raise their innovation ability under the control of DC. But as for what key operations successfully improved the negative effect of the coordination operation between supplier and manufacturer, it does not be well defined yet.

Based on the above discussion, the objective of this empirical study is to identify the key factors that will affect the successful execution of DC. This study is based on the samples from the International Manufacturing Strategy Survey (IMSS) database, a global research network initiated by London Business School.

The remaining part of this report is structured as follows. Section 2 is the literature review and the hypothesis. Section 3 describes the methodology. Section 4 shows the empirical test results and discussion. Finally, we draw our conclusion and indicate directions for further research.

2. LITERATURE AND HYPOTHESIS

Some observation showed that, before introducing successful cases to DC, two items of key operations would be carried out to change the cooperative relationship between supplier and manufacturer - business process reengineering (BPR) and buildup of a supplier management system (SMS). An observation on some cases suggested that BPR becomes a key cause because it can solve problems that in the past collaborative design could only be undertaken through coordination. Langerak and Hultink (2008) pointed out coordination operations are time-consuming. In practice, a number of manufacturers have also found, in introducing for product collaborative design with their suppliers, that coordination was indeed time-consuming and that it brought about a negative effect on product design results. This is because manufacturer and supplier are two independent companies which have different operating models. As a result, every time a message of need for new product is received, operations for each other must first be coordinated before proceeding to further collaborative design. As such, even though there is a good management system, as long as there is coordination, it may affect the performance of product innovation. Those successful cases show that, in the process of introducing DC, the first step is to integrate relevant operations of manufacturer and supplier to avoid subsequent coordination. Thus, the positive effect of BPR on production design was increasingly paid attention to by industry practitioners (Allen & Brady, 1997; Pawar & Driva, 1999). Sharma (2005) also indicated that the practitioners did find integration of business process has a definite effect on execution of product collaborative design.

That establishment of an SMS is crucial because it can ensure stability in relationship with suppliers. DC is a management concept which promotes collaborative design between manufacturer and supplier. If they have an unstable or poor relationship, it will be very likely lead to problems in product collaborative design for the manufacturer under a DC framework, leading to a delay in design process, poor design quality, etc. As a result, in order to make sure DC is executed effectively, a solution in which optimum suppliers are selected in advance through an SMS is also viewed as an influential key operation. Yang et al. (2010) pointed out that construction of an SMS and its effectiveness would indeed affect PIC. In addition, Petersen et al. (2003) also mentioned the influence of construction of an SMS on production innovation.

Furthermore, an observation on successful cases also found that BPR and SMS affect each other. This is because the subject for BPR is a selected supplier. If an SMS can select an outstanding supplier, it would facilitate the BPR. Kallio et al. (1999) pointed out that supplier had some influence on BPR and that poor supplier management would affect the result of the BPR.

According to above discussion, the construct model was built as shown in Figure 1 and the following hypotheses were tested in this study:

H1: SMS positively affects BPR

H2: BPR positively affects DC effectiveness

H3: SMS positive affects DC effectiveness

H4: DC effectiveness positively affects PIC

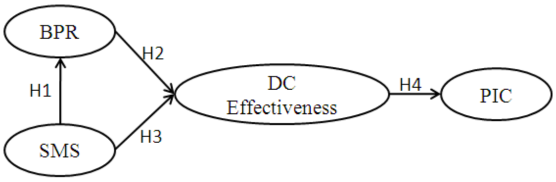

Figure 1: construct model

3. RESEARCH DESIGN

3.1 Survey Database and Test Samples

This study is based on the database of IMSS. The IMSS is an international cooperative research network focusing on manufacturing strategy and SCM. It gathers data about practice and performance related to manufacturing strategy in a global setting, and data pertaining to practice in SCM are also collected. The survey employed questionnaire of five-point Likert scale as the means of measurement.

The survey data of fifth iteration (IMSS-Ⅴ) was published in early 2010. It is involved by researchers worldwide including Europe, the Americas (including Canada), and some of Asia countries (Taiwan, China, and Japan). IMSS-V focuses upon the manufacturing firms related to fabricated metal products; machinery and equipment; office, accounting and computing machinery; electrical machinery and apparatus; radio, television and communication equipment and apparatus; medical, precision and optical instruments, watches and clocks; motor vehicles, trailers and semi-trailers; other transport equipment. Total 562 responses from 17 countries were recorded in the first releasing. These data were used in this study.

Firstly, 156 samples were eliminated whose responses were not complete or with missing values for variables of BPR, SMS, DC effectiveness, and PIC. Therefore, only 406 of the 562 responses were remained. And then, the samples were further classified by citing the method of Frohlich and Westbrook (2001). As a result, only 63 samples were able to fit our research purpose, i.e. the sample size of this study is 63.

3.2 Operationalization Variables and Independent Construct Measurement

In terms of research purpose, this study involves the testing of four variables: BPR, SMS, DC effectiveness, and PIC.

Definition of BPR in this study focused on the activities of organizational integration when firm try to improve product design and innovation. IMSS-V includes four kinds of organizational integration operations on product research and development with suppliers and manufacturers, including: (1) rules and standards, (2) formal meetings, (3) standard process, and (4) concurrent engineering, to measure the effectiveness of organizational business process integration and reengineering. For these four kinds of integration activities, this study used independent sample t-test and Skewness and Kurtosis to check whether the data are normally distributed at first. Test result indicated that data distribution has shown normally. To ensure that these test variables meet this research's requirements, then a construct validity test for BPR by factor analysis was performed. The test results indicated that the Kaiser-Meyer-Olkin (KMO) measure of performance adequacy was 0.7, Bartlett's test of sphericity was significant, Factor loading for all four items exceeded 0.60, and the results of Cronbach's α in factor exceeded 0.7.

IMSS-V includes five measurement items regarding to SMS: (1) logistical costs, (2) innovation and co-design, (3) physical proximity, (4) information sharing, and (5) potential to measure.

Following the same processes, an independent sample t-test and Skewness and Kurtosis were used to test data normally, significant results were achieved for these five items. And then, a factor analysis was done to check construct validity of SMS. The test results showed that the Kaiser-Meyer-Olkin (KMO) measure of performance adequacy was 0.757, Bartlett's test of sphericity was significant, Factor loading for all five items exceeded 0.54, and the results of Cronbach's α in factor exceeded 0.7.

According to IMSS-V, there are four measurement items of SC operations for investigating the integration level of product development and production with suppliers: (1) inventory level information, (2) product and production planning, (3) order (including new product) tacking/tracing, and (4) delivery frequency. As usual, an independent sample t-test and Skewness and Kurtosis were firstly performed to test data normality, and the result showed that all data of four measurement items are normally distributed. And then, a factor analysis was done to check the construct validity. The test results indicated that the Kaiser-Mayer-Olkin (KMO) measures of performance adequacy were 0.733, Bartlett's test of sphericity was significant, Factor loading for all four items exceeded 0.60, and the results of Cronbach's α in factor exceeded 0.7.

Finally, according to IMSS-V, only two kinds of performance are used to investigate the PIC: (1) time to market, and (2) product innovativeness. The results of independent sample t-test and Skewness and Kurtosis showed the data normality is significant for these two measurement items. And also, the test result of Cronbach's α in factor exceeded 0.7.

4. RESULTS AND DISCUSSION

In this section, analyses of test results for those four hypotheses of this study are presented. The regression method was employed for the analysis

The test results showed that the influence of SMS on BPR is insignificant ($p > 0.05$, $F = 2.284$), however, the results proved that BPR ($p < 0.05$, $F = 4.239$) and SMS ($p < 0.05$, $F = 9.379$) both have significant positive effect on DC effectiveness. Finally, DC effectiveness by BPR and SMS it really can achieve high product innovation performance ($p < 0.05$, $F = 7.775$). All test results for those four hypotheses are summarized in Table 1.

According to test results, it could be found that BPR and SMS are critical successful factors for manufacturing firms to build an effective DC framework for upgrading their PIC. Meanwhile, it also can be deduced why the BPR and SMS play important roles on DC effectiveness.

Table 1: Test results

Hypotheses	Results
H1: SMS positively affects BPR	Un-supported
H2: BPR positively affects DC effectiveness	Supported
H3: SMS positively affects DC effectiveness	Supported
H4: DC effectiveness positively affects PIC	Supported

5. CONCLUSION

The objective of this empirical study is to identify the key factors that will affect the successful execution of DC. The test results showed that two factors, BPR as well as SMS, are able to significantly influence the effectiveness of DC. In addition, the test results also proved that an effective DC framework can significantly improve the PIC of manufacturing firms. In the implication, manufacturer can consider the result to construct an effective DC framework and to secure high innovative performance through successful execution of DC. On the other hands, researchers can refer to the result to explore deeply the issues of DC.

[note] The result of this study has been presented in「11th Asia Pacific Industrial Engineering & Management Conference 2010」: D. Y. Sha, Kun-Chih Huang, P.K. Chen (2010.12), "A Study on the Key Factors of Design Chain Effectiveness", Proceedings of the 11th Asia Pacific Industrial Engineering & Management Systems Conference (APIEMS2010), Melaka, Malaysia, Paper ID: 305.

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國科會補助專題研究計畫項下出席國際學術會議心得報告

日期：100 年 10 月 12 日

計畫編號	NSC 99－2221－E－216－024－		
計畫名稱	整合設計鏈與顧客鏈建構高創新力供應鏈之研究(I)		
出國人員姓名	沙永傑	服務機構及職稱	中華大學科技管理學系
會議時間	99 年 12 月 07 日至 99 年 12 月 10 日	會議地點	Melaka, Malaysia（馬來西亞）
會議名稱	（中文）第十一屆亞太工業工程與管理系統研討會 （英文）The 11th Asia Pacific Industrial Engineering & Management Systems Conference		
發表論文題目	（中文）影響設計鏈有效執行關鍵因素之探討 （英文）A Study on the Key Factors of Design Chain Effectiveness		

一、參加會議經過

第十一屆亞太工業工程與管理系統研討會，主要是由國際期刊 IEMS Journal 與 Universiti Malaya 共同舉辦。APIEMS 主要提供工業工程與管理領域學術界/產業界的研究者和工程師交流最新發展技術的論壇。本次研討會同時與 The 14th Asia Pacific Regional Meeting of International Foundation for Production Research 和 The 3rd AUN/SEED-Net Regional Conference in Manufacturing Engineering 兩項研討會聯合舉行。 在年初獲悉第十一屆工業工程與管理系統國際研討會的訊息後，便積極準備投稿，於 5 月 24 日將論文摘要投出，6 月中旬收到摘要接受通知，7 月 30 日將論文全文投出，9 月下旬收到全文接受通知。之後即開始後續報名與行程安排。於 12 月 07 日搭機前往馬來西亞參加 APIEMS 研討會。

我們的報告被歸類在 Supply Chain Management and Logistics 的 session, 于 12 月 08 日 15:10 開始報告，我們的報告為此 session 的第二篇。報告十五分鐘，之後有與會學者提問，提問的內容皆相當有深度且有意義，部份學者特別對 IMSS-V 跨國合作問卷調查事項感到興趣。這個 session 所發表的六篇論文，涵蓋不同產業的供應鏈管理議題，透過自己與其他學者的報告還有問題討論的互動，可以充分了解我們的研究內容中仍可進行修正之處，另一方面也了解到，供應鏈管理議題在國際上主要的研究方向。

二、與會心得

本屆亞太工業工程與管理系統研討會，主題涵蓋近年來學術與產業界的研究與發展，包含的主題有：Artificial Intelligence in IE, Management Information System, CAD/CAM/CIM, Manufacturing Process/Management, Concurrent Engineering System, Manufacturing/Industrial Automation/Robotics, Decision Making Models and Analysis, Operations Research/Optimization, Decision Support Systems and Management, Product Design/Development, Engineering Economy and Cost Analysis, Productivity and Business Strategies, Enterprise Information System/ERP, Production Systems Design, Planning and Control, Environment Friendly Technologies, Project Management, Facilities Design and Location, Quality Engineering, Flexible Manufacturing Systems, Quality Cost, Reliability and Maintenance, Green Design/Green Manufacturing, Research Methods in Industrial Engineering, Health Care Management, Safety Management, Human Factors/Industrial Ergonomics, Service Systems and Management, Human Computer Interaction, Small and Medium Enterprises and IE, Human Resource Management, Soft Computing /Heuristics, Human Simulation and Virtual Reality/Environment, Supply Chain Management and Logistics, Industrial Engineering Education, System Engineering and Management, Inventory System and Management, Systems Simulation, Lean Manufacturing, Total Quality Management, Management of Technology and Innovations, Transportation Technology and Management。除了傳統的工業工程的主題外，並擴及健康管理、服務系統與管理、系統工程與管理、科技管理、綠色設計/綠色製造、環境保護技術等非傳統工業工程的領域。

透過參與此次會議，對於演講者/論文發表者的講題，不僅可以暸解到目前國外學者的研究方向，於此當中，亦強化與國外學者間之互動，同時也更深刻體認到學術交流的重要性，當然，參與的場次中聽眾皆有相當熱烈的回應與討論。透過此次會議的參與，吸收了更多寶貴的經驗，也藉由與國外學者的密切互動，讓自己更加暸解未來工業工程與管理發展的趨勢。

三、攜回資料名稱及內容

1. 大會手冊一本
2. 大會論文摘要集一本
3. 大會論文光碟一片
4. 環保手提袋一只
5. 與在場學者交流之名片

四、論文摘要

The concept of supply chain management (SCM) that integrating upstream and downstream has been well accepted in the industries to improve the competitiveness of products in today's highly volatile global market. However, product innovation capability becomes critical once most of the competitors sit on equal SCM basis. It was found in the industries that traditional collaboration between manufacturer and supplier had limited help to the innovation of product and no strong connection between the "collaboration" and "product innovation" had been confirmed in relative studies. The short of product innovation in traditional supply chain may be explained by over-emphasis on manufacturing operation in the past. Although design chain has been suggested in recent years by practitioners and scholars to be integrated into traditional supply chain so that problem of product innovation could be improved, very few successful cases are reported yet. An empirical study by regression was performed to find thoroughly regarding key factors that may influence the effectiveness of design chain to be integrated into traditional supply chain. The analysis results reveal that situation of business process reengineering as well as supplier management are the mainly factors.

Keywords: supply chain; design chain; business process reengineering; supplier management

五、論文被接受發表之大會證明文件

The 11th Asia Pacific Industrial Engineering and Management Systems Conference
The 13th Asia Pacific Regional Meeting of International Foundation for Production Research

Melaka, 7 – 10 December 2010

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Warmest greetings of the day,

The initial review process for your paper has been completed. However, there is another review process to consider the suitability of your paper to be forwarded for publication to associated journals of the conference is still on-going. You will receive a different notification if your paper is accepted for that purpose.

Based on the recommendations of the reviewers and the Program Committee, I am very pleased to inform you that your paper **ID:305-"A Study on the Key Factors of Design Chain Effectiveness"** has been accepted for presentation. You are cordially invited to present the mentioned paper at the APIEMS2010 conference to be held on December 7th - 10th, 2010 in Melaka, Malaysia.

Please be advised that this notification email serves as our formal acceptance of your paper as well as an invitation to present your work at the APIEMS2010 conference.

The acceptance of your paper is made with the understanding that at least one author will **REGISTER** and **ATTEND** the Conference to present the paper. Failure to do so will result in the paper being expunction from the conference proceeding and database. Further details for registration will be mailed to you the soonest possible.

I would like to take this opportunity to thank you for choosing the APIEMS2010 conference to present your research results and am looking forward to seeing and listening to you in Melaka, Malaysia.

Expecting a great conference!

Regards,
Aznijar Ahmad-Yazid,
Paper & Proceeding Committee Head,
APIEMS 2010 Conference

Conference Secretariat
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國科會補助計畫衍生研發成果推廣資料表

日期:2011/10/11

<table>
<tr><td rowspan="3">國科會補助計畫</td><td>計畫名稱: 整合設計鏈與顧客鏈建構高創新力供應鏈之研究(I)</td></tr>
<tr><td>計畫主持人: 沙永傑</td></tr>
<tr><td>計畫編號: 99-2221-E-216-024-　　　　學門領域: 生產系統規劃與管制</td></tr>
<tr><td colspan="2">無研發成果推廣資料</td></tr>
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99 年度專題研究計畫研究成果彙整表

計畫主持人：沙永傑			計畫編號：99-2221-E-216-024-				
計畫名稱：整合設計鏈與顧客鏈建構高創新力供應鏈之研究(I)							
成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	1	1	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	1. Join IMSS-V（International Manufacturing Strategy Survey）program：collected 31 enterprises' sample data in Taiwan, received 725 enterprises' sample data from 17 countries worldwide（including Taiwan). 2. The IMSS-V database could be used for further research works regarding the subjects of Supply Chain Management

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

　　□實驗失敗

　　□因故實驗中斷

　　□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：■已發表 □未發表之文稿 □撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：（以 100 字為限）

1.已發表研討會論文「11th Asia Pacific Industrial Engineering & Management Conference 2010」：D.Y. Sha, Kun-Chih Huang, P.K. Chen (2010.12), ’’’’’’’’’ A Study on the Key Factors of Design Chain Effectiveness’’’’’’’’’, Proceedings of the 11th Asia Pacific Industrial Engineering & Management Systems Conference (APIEMS2010), Melaka, Malaysia, Paper ID: 305.

2.期刊論文投稿中

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

1.由本年度透過 IMSS-V 調查資料之實證研究，已可充分了解影響設計鏈有效執行之關鍵作業與導入設計鏈對產品創新力的正面效益；

2.在此基礎之下，未來可進一步探討另外兩項相關議題：(1).影響顧客鏈有效執行之關鍵作業(2).導入設計鏈與顧客鏈之供應鏈運作模式對產品創新、成本、品質、交期及彈性等績效之影響。