南京航空航天大学

论 文 集

（二〇〇二年）

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九院

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九　　院

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1	蔡启明 段始黎	副高 其他2	091 980	民航华北管理局空中交通管理局发展战略研究	改革与战略	2002.00.05	H
2	蔡启明	副高	091	非上市股份有限公司股票期权计划的探析	中国管理科学	2002.10.03	J
3	蔡延峰 蔡启明	硕士 副高	091 091	异构数据库间的数据转换	计算机与现代化	2002.00.01	
4	陈可嘉 刘思峰	硕士 正高	091 091	不确定性决策准则的使用误区	江南大学学报	2002.01.04	
5	陈毅然	正高	091	选购装潢物料的工效学测度	人类工效学	2002.8.01	J
6	陈毅然	正高	091	家居布局的工效学设计	人类工效学	2002.8.02	J
7	陈毅然	正高	091	装潢过程工效学的应用	人类工效学	2002.00.00	J
8	陈毅然	正高	091	家具设计、制作与购置的工效学应用	人类工效学	2002.08.04	J
9	陈琪 宁宣熙	博士 正高	091 091	真能聘到"超级英雄"吗	企业管理	2002.00.01	H
10	楚岩枫	初级	091	建立核心竞争力 实施虚拟企业运作	南航学报（社科版）	2002.4.02	
11	党耀国 刘思峰	博士 正高	091 091	The GM Models That x(n) be Taken as Initial Value	the 10th International Manufacuring Conference in China	2002.01	
12	党耀国 刘思峰	博士 正高	091 091	江苏省第一产业内部结构调整的数学模型与策略分析	农业系统科学与综合研究	2002.18.04	J
13	方志耕 刘思峰	博士 正高	091 091	国际贸易自由化与发展中国家经济利益一致性与矛盾性分析	中国管理科学	2002.10.00	J
14	方志耕 刘思峰	博士 正高	091 091	军事装备项目管理质量成本模式研究	管理工程学报	2002.10.00	J
15	方志耕 刘思峰	博士 正高	091 091	基于组合GERT网络模型的企业技术创新项目群的风险周期评估	中国系统工程学会年会	2002.01	
16	方志耕 刘思峰	博士 正高	091 091	Algorithm Model Research of the Logical Cutting Tree on the Network Maximum Flour	the Joint Conference of the 12th WOSC Congress and the 4th IIGSS Working	2002.01	
17	顾平 宁宣熙	博士 正高	091 091	论八项质量管理原则的核心	商业研究	2002.00.08	H
18	顾平 宁宣熙	博士 正高	091 091	虚拟产业及其在船舶工业中的应用	船舶工程	2002.00.00	H
19	顾平 宁宣熙	博士 正高	091 091	从顾客满意到顾客忠诚	商业研究	2002.00.11	H

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20	胡问鸣 宁宣熙	博士 正高	091 091	国有企业吸引和稳定人才的几个要素	经济师	2002.00.09	
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23	李南	正高	091	中国大学教育体制改革与大学生的思想道德教育	21世纪伦理课题研究	2002.01	
24	刘成钢 宁宣熙	硕士 正高	091 091	变动市场环境下的马尔可夫决策	南京航空航天大学学报	2002.34.05	J
25	刘敏 蔡启明	硕士 副高	091 091	基于Internet/Intranet的企业管理顾问系统的分析与设计	航空计算技术	2002.32.04	J
26	刘思峰	正高	091	国防科技工业人才资源核心竞争力作用分析	第二届国防软科学学术交流会	2002.01	
27	刘思峰	正高	091	科技综合实力评估指标与数学模型	南京航空航天大学学报	2002.00.00	J
28	刘思峰 党耀国	正高 博士	091 091	the G-C-D Model and Technical Change	the Joint Conference of the 12th WOSC Congress and 4th IIGSS Worksop	2002.01	
29	刘思峰	正高	091	the Technical Change and the Funds for Science and Technology	the Joint Conference of the 12th WOSC Congress and 4th Worksop	2002.01	
30	刘思峰 陈可嘉	正高 硕士	091 091	我国科技经费配置结构与使用效率分析	中国管理科学	2002.10.专辑	J
31	刘思峰 陈可嘉	正高 硕士	091 091	Analysis of SCM in the Air Conditioning Industry in China	the 3rd International Conference on Quality and Reliablity	2002.01	
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33	刘雪妮 周根然	硕士 副高	091 091	中小企业如何走向世界	生产力研究	2002.00.05	H
34	宁宣熙 范华敏	正高 硕士	091 091	电子商务环境下的需求链管理模式研究	商业研究	2002.00.00	H
35	宁宣熙 钱雷 孙宇	正高 其他2 博士	091 980 091	流通网络中随机流动的仿真研究	数据采集与处理	2002.00.05	H
36	齐向阳 蔡启明	硕士 副高	091 091	基于Internet/Intranet的人力资源管理信息系统	航空计算技术	2002.32.04	J
37	任君卿	中级	091	市场份额.企业利润.价格战与错位经营	淮海经济	2002.11.00	

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39	吴海燕	中级	091	虚拟技术在工业工程试验中的应用设想	实验技术与管理	2002.19.03	J
40	吴海燕	中级	091	科研成果在工效学试验中的应用	实验技术与管理	2002.19.02	J
41	许建伟 石卫星	硕士 其他1	091 091	规模经济探讨	南京航空航天大学第四届研究生学术会议论文集	2002.00.00	
42	严俊 蔡启明 齐祥阳	硕士 副高 硕士	091 091 091	管理信息系统中的数据存取技术的选择	计算机与现代化	2002.00.11	
43	郁阳刚 李南 朱静	硕士 正高 硕士	091 091 091	航空企业的人力资源管理	航空科学技术	2002.00.04	
44	郁阳刚 陈可嘉	硕士 硕士	091 091	国防科研的经济效应与经济开发	南京航空航天大学第四届研究生学术会议	2002.01	
45	郁阳刚	硕士	091	资本营运与航空企业改革	航空科学技术	2002.00.03	
46	张光明 宁宣熙	博士 正高	091 091	供应链物流管理	工业技术经济	2002.21.05	
47	张佳春 宁宣熙	博士 正高	091 091	当前财务管理面临的十大变革	财会通讯	2002.00.10	H
48	张佳春 宁宣熙	博士 正高	091 091	商誉---人力资本的超额效用	技术经济与管理研究	2002.00.06	H
49	张佳春 宁宣熙	博士 正高	091 091	试析会计信息质量特征	财会月刊	2002.00.12	
50	张玉玲 周根然 王鲁捷	硕士 副高 正高	091 091 091	如何保障企业培训虚求的有效性	吉林工学院学报（自然科学版）	2002.00.09	
51	张玉玲 王鲁捷 陈龙	硕士 正高 正高	091 091 外	企业管理创新再认识	南京航空航天大学学报社科版	2002.00.02	
52	钟磊 王鲁捷	硕士 正高	091 091	试比较企业战略管理思想及其应用价值	东北师大学报（哲社科版）	2002.00.增刊	H
53	仇冬芳	中级	092	关于"达到预定可使用状态的在建工程"的会计处理	上海会计	2002.00.09	H
54	刘莉莉 傅铅生	硕士 副高	092 092	应用PetreNet方法建模分析制造企业ERP的实施工程	航空工程与维修	2002.00.06	
55	刘万明 刘益平	硕士 副高	092 092	我国航空运输发展速度及相关问题研究	中国民用航空	2002.00.05	
56	刘益平 魏旺祥	副高 硕士	092 092	我国'证券市场的现状、问题及对策	企业经济	2002.00.11	H
57	王鲁捷	正高	092	企业培训绩效综合评价指标体系研究	中国培训	2002.00.12	H

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58	王锐兰	副高	092	试析企业管理创新的五大"瓶颈"问题	南京理工大学学报（社会科学版）	2002.15.06	
59	王锐兰	副高	092	对商品过度包装的反思及对策	江苏企业管理	2002.00.04	
60	王锐兰 王鲁捷	副高 正高	092 092	基于国防创新体系的高校研究生创新能力研究	中国高校研究	2002.00.10	H
61	徐海清 刘益平	博士 副高	092 092	民营企业的组织发展问题及其对策	企业经济	2002.00.03	H
62	徐益华 杨晓明	硕士 副高	092 092	中国证券市场效率的实证研究	财经问题研究	2002.00.01	H
63	张卓	副高	092	Quality Factors in a Product Development Process-an Empirical Research on the Development Process of Automobile coolers in China	The 3rd International Conference on Quality and Reliability	2002.01	
64	张卓	副高	092	研究型大学的基本特征和评价体系	南航学报（社科版）	2002.4.02	
65	曹锟生 顾杰	副高 硕士	093 093	对新时期我国房价的思考	商业研究	2002.6.00	H
66	曹锟生 张建芬	副高 硕士	093 093	浅析西部地区民航运输现状及发展战略	商业研究	2002.8.00	H
67	陈圻	正高	093	与时俱进，修订和完善我国价值工程国家标准	价值工程	2002.01	
68	陈圻	正高	093	大规模制造的启示——产品功能导向和功能竞争	北京工商大学学报	2002.00.04	
69	邓晶	中级	093	转基因产品，何必怕亮出身份？	国际市场	2002.00.10	
70	龚菲 王鲁捷	硕士 正高	093 092	组织文化影响的内在机理探索	东北师大学报（哲学社科版）	2002.00.06	H
71	龚菲 潘军	硕士 副高	093 093	从公司价值、顾客让渡价值到公司战略的理性思考	商业研究	2002.00.11	H
72	韩杰 曹锟生	本科 副高	093 093	诚信与推销	商业时代	2002.00.232	
73	黄昕 潘军	硕士 副高	093 093	关于汽车工业生态系统的几点思考	商业研究	2002.00.04	H
74	江可申 田颖杰	正高 硕士	093 093	动态企业联盟的小世界网络模型	世界经济研究	2002.00.05	H
75	江可申 刘晓红	正高 硕士	093 093	洪都航空股份公司股票上市及资本运营分析	中华外国经济学说研究会第十次学术研讨	2002.01	
76	李志荣 江可申	硕士 正高	093 093	新思路开发新西部	经济体制改革	2002.00.06	H

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77	刘晓红 江可申	硕士 正高	093 093	洪都航空股份有限公司和昌河汽车股份有限公司股票上市实证研究	南航学报（社科版）	2002.00.04	
78	宁健 潘军	硕士 副高	093 093	挑战传统：互动营销新理念	商业研究	2002.00.01	H
79	潘军	副高	093	论集成化模式与并行工程在高校教育管理中的应用	教育发展研究	2002.00.专辑	
80	潘军 黄锦	副高 硕士	093 093	古城文物资源保护的监控与测评指标体系研究	华中科技大学学报	2002.19.04	H
81	潘军	副高	093	市场营销过程的虚拟化管理	商业研究	2002.00.02	H
82	潘军 黄昕	副高 硕士	093 093	南京市第三产业的现状和发展对策	今日企业	2002.00.02	
83	潘军 李焰	副高 副高	093 外	中学生考试焦虑的发展	沈阳师范学院学报	2002.00.04	
84	施建伟 陈圻	硕士 正高	093 093	增强产品竞争力的功能创新方法	南航学报	2002.00.04	
85	宋永春	硕士	093	加入WTO后，我国民间审计的市场化——审计营销	华东经济管理	2002.16.05	
86	宋永春	硕士	093	现代企业财务管理目标的衍展	盐城工学院学报	2002.00.03	
87	宋永春	硕士	093	入世人力资源管理创新——"人本原则"	经济师	2002.00.08	
88	王英	中级	093	经理股票期权：令人欢喜令人忧	商业研究	2002.00.总250	H
89	王英	中级	093	对承租人的信用风险评估及防范	南航学报（社科版）	2002.4.02	
90	张建芬 曹锟生 李军生	硕士 副高 硕士	093 093 093	私营企业贷款难原因辨析	商业研究	2002.8.02	H

Analysis of Supply Chain Management in The Air Conditioning Industry in China*[1]

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Abstract In order to quantify the size of the opportunity to develop a supply chain management strategy for China, assessment of the current operations of the supply chain management in the air conditioning industries in China. We have engaged an investigation with The Aeronautical Enterprises Society of China, The Light Industrial Enterprises Society of China and The Custom Headquarters of China. 150 Questionnaires which with 44 questions and 14 tables have designed, printed and sent out. And an interview schedule have been done. According to our interview guidelines, there are eight key topics/issues each with five dimensions of inquiry, we have interviewed 14 enterprises. 22 questionnaires have been returned by May 31,2001.Some useful findings were obtained from interview and the data collected from questionnaires.

1. Introduction

Supply chain optimization is an economic complement of E-Business: improvement in business-to-business communications via the internet can be combined with capacity and inventory models and optimization to improve the flow of goods and services(Harrison, 2002, Paulson 2001). On the other hand, fulfillment of orders taken using the internet as a channel requires a high degree of efficiency in the supply chain(Xie, 2002, Xu, 2000). There is an opportunity to develop a supply chain optimization strategy for China(Zhou, 2002). In order to quantify the size of this opportunity, assessment of the current operations of the supply chain management in the air conditioning industries in China. From September 10, 2000 to May 31, 2001, we have engaged an investigation with The Aeronautical Enterprises Society of China, The Light Industrial Enterprises Society of China and The Custom Headquarters of China. 150 Questionnaires with 44 questions and 14 tables have designed, printed and sent out. And an interview schedule has been done. According to our interview guidelines, there are eight key topics/issues, each with five dimensions of inquiry. We have interviewed 14 enterprises, and 22 questionnaires have been returned by May 31, 2000. Some useful findings were obtained from interview and the data collected from questionnaires.

2. Design Questionnaires

There are two parts in the questionnaires. The first is selection part that is divided into three parts: the basic function with 2 questions, the purchasing function with 24 questions, and the sales function with 18 questions. The second is table part that is divided into two parts: the purchasing part with 8 tables, and the sales part with 6 tables.

2.1 Selections

Basic function with 2 questions:
(1) Which category does the company be investigated belong to? Such as state enterprise, collective enterprise, privately owned enterprise, or foreign capital enterprise.
(2) What is the leading product of your company?

Purchasing Function with 24 questions:
(1) Which of the organizational structure is utilized for performing your purchasing function? Such as centralized, decentralized, centralized /decentralized, or virtual centralization, etc(Randall, 2002).
(2) Which of the activity areas are considered part of your purchasing? Such as price, quality, supplier quality, or service, etc.
(3) Who takes charge of the purchasing reports?
(4) Which department takes charge of the purchasing reports?
(5) How the organizational structure has changed over the reporting period?
(6) Which of the purchasing performance measures is utilized in your company? Such as internal and external customer satisfaction survey, supplier satisfaction survey, cost and cycle-time reduction, etc.
(7) Whether the education is considered as a key factor to promotion?
(8) Whether the company has a formal purchasing employee training/education program?

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[1] Qiming Cai, Xiao Wang, Haiying Zeng, Min Fang and Xinrui Zhang also participated in this research.

(8) Whether the company has a internal supply chain?
(9) Whether the company has a formal supplier rating system?
(10) Whether the company has a formal supplier feedback/recognition program?
(11) Whether the company has a formal supplier training/education program?
(12) Whether the company has a formal certification program?
(13) Which of the measure is utilized to process purchase transaction? Such as bar code receiving, EDI acknowledgment, electronic funds transfer, electronic invoice matching, internet, intranet, etc.
(14) How long does the company take stock?
(15) Whether the inventory list of your company is clarity?
(16) Whether the company participates in multi-company buying?
(17) Whether the company requires the legal department to approve/sign-off on contracts?
(18) Whether the company checks the major supplier on the spot?
(19) Whether the company has a formal major supplier reward program?
(20) Whether the supplier stock management is utilized?
(21) Whether some of your purchasing transactions processed through E-commerce(Leung, 2000)? If the answer is yes, when is the beginning year?
(22) If your company doesn't purchase through Internet, are you going to utilize it? If yes, when to utilize it?
(23) Please interpret your ideas about the merits, shortcomings, opportunities and obstacles of the purchasing transactions through Internet in some simple words.

Sales Function with 18 questions:
(1) Which market sales information systems does your company use? Such as internal reports list system, market sales information system, market sales inquest system, market sales analysis system, etc.
(2) Which factor is considered in choosing the distributors? Such as the operating years, the scope of the products, finance payment capacity, the corporation years, the quality, the information feedback system, the territory, the custom satisfaction, etc.
(3) How about the scope of your market sales?
(4) Which types of measures are utilized for communication and give feedback on the sales information to distributors? Such as fax, telephone, Internet, etc.
(5) Which types of measures are utilized to promote the sales? Such as marks strategy, corporation image engineering, people promotion, newspapers advertisement, TV advertisement, leaflet, send the samples, prize sales, display for sales, discount, etc.
(6) Which types measures are utilized to survey the custom satisfaction? Such as paper inquiry, Internet inquiry, inquired by the services people, etc.
(7) Who will be responsible for after-sales services?
(8) Which measure is utilized to avoid the venture caused by the changes of the market demands? Such as the redundant manufactory capacity, stock, market prediction, etc.
(9) In your firm, how many salesmen have less than 5 years marketing experience? How many salesmen have 5-10 years marketing experience? How many salesmen have more than 10 years marketing experience?
(10) Whether the agencies/distribution measures are utilized?
(11) How much is the cost of agencies/distributions?
(12) How long can the products stock of the company copy with?
(13) When considering the custom characterized order, how long will it take from signing the contract to delivering the products?
(14) When does your company pay for the purchasing material generally? At the time when the order is sent out, at the time when you receive the goods, or at the time after the goods have been received.
(15) When does your company receive the money generally?
(16) Whether some of your sales transactions have been processed through E-commerce? If the answer is yes, when is the beginning year?
(17) If your company doesn't contract through the Internet, are you going to utilize it? If yes, when ?
(18) What do you think are the merits, shortcomings, opportunities and obstacles of the doing sales transactions through the Internet?

The forms to fill in

All items should include the data from 1996 to 2000.

Purchasing part with 8 forms:
(1) How many employees are there in your company?
(2) What is the number of the employees in the purchasing department? How many of them are professional employees and how many are managers?
(3) What is the educational level of the professional purchaser?

(4) How about the basic information of purchasing department? Such as total purchase by biding, total purchase by contracting, cost of purchasing activity, percent of purchased lots received on or before contracted due day, requirement planning cycle time, cost of material inventory, etc.
(5) What is the number of the active suppliers that year? How many of them are national owned enterprises? Group owned enterprises? Private enterprises? Foreign enterprises?
(6) What is the number of suppliers contracted that year? What is the number of suppliers that purchase over 1 million per year? What is the number of suppliers that purchase by electronic commerce?
(7) Of those rejected lots, how many are rejected at the source? At the coming quality assurance? In process of set up?
(8) How about electronic commerce used in purchasing? Such as total purchase processed through electronic commerce, total payments processed through electronic commerce, transactions that pricing through electronic commerce, total number of suppliers contracted through E-mail, etc?

Sales part with 6 forms:
(1) What is the number of the employees of sales department?
(2) What is the educational level of the professional salesman?
(3) How about the basic information of sales department? Such as total sales per year, profits, taxes, average surplus of active money, time of inventory, cost of product inventory, time span of supply production, cash cycle time, market share of main product, etc.
(4) What is the number of the active distributors that year?
(5) What is the number of distributors contracted that year? What is the number of distributors that sale over 1 million per year? What is the number of distributors that sale by electronic commerce?
(6) How about electronic commerce used in sales process? Such as total sales processed through electronic commerce, total payments processed through electronic commerce, transactions that pricing through electronic commerce, percent of sales requirement that are broadcasting through Internet, etc?

3. Interview Schedule

Eight strategic purchasing and supply chain topics/issues have been chosen to be the focus of the case studies(Stroeken, 2002). Many more topics could be included in the study(Von, 2002 & Zhu, 2001). However, to keep the project manageable, eight key issues have been chosen after extensive deliberations. Understanding the current and changing nature of these eight topics will aid significantly in understanding and achieving "best practices" in the purchasing and supply chain management functions(Paulson, 2001). In addition, there are five dimensions for each of the eight topics/issues.

3.1Eight Key Topics/Issues

1. Purchasing and supply organizational structures, including multi-functional commodity or product teams, centralization/decentralization/shared services mix, current and changing roles/responsibilities of purchasing, and structuring upstream and downstream functions (from purchasing) into an integrated supply chain.
2. Developing, maintaining, and enriching strategic buyer-supplier "partnering" alliances. Balancing the use of alliances with traditional price-oriented competitive bidding, and re-visiting their competitive advantage.
3. Outsourcing trends and strategies for production and services, including all or part of purchasing and supply's traditional functions to outside purchasing specialists, third parties, purchasing consortiums (horizontal buying alliances among independent firms), internal customers, and suppliers.
4. Development of purchasing and supply strategic plans and their value-adding integration into overall corporate strategic plans, including recruitment and development of purchasing and supply professionals who can think and act strategically.
5. Information and decision support systems for purchasing and supply, including electronic data interchange/electronic funds transfer, enterprise systems (such as SAP), Internet/World Wide Web-based industrial procurement, on-line RFP/RFQ/tender announcement, on-line bidding, and "artificially intelligent" computer-based purchasing "agents" for qualified supplier searches and routine purchase transactions.
6. Environmental issues, requirements, constraints, legislation, enforcement that impact (or are expected to impact) purchasing and supply.
7. Global procurement strategies, opportunities, and constraints.
8. E-Commerce used in purchasing and sales process.

3.2 Five Dimensions Of Inquiry

1. Current status, use, structure, level of sophistication of the topic/issue. (What are you doing now? Why? How? Who? Results? Can you share any "sanitized" documents, charts, graphs, pamphlets, flow charts, video tapes, etc. that describe this activity in more detail?)
2. Desired use or changes in status, use, and level of sophistication of the topic/issue. (What do you want to do? What has kept you from doing it? Why? How? Who? Expected Results?)

3 Predicted change (increase, stable, decrease) in status, use, level of sophistication of the topic/issue within the next 3-5 years. (What do you think will happen regarding this topic in the next 3-5 years for your firm? Other firms? Why? How? Who? Expected Results?)
4 Predicted impact of predicted change on purchasing and supply and/or a firm's competitiveness. (How will change impact your firm? Other firms?)
5 Critical factors of success/failure. (Why were you successful? Why did you fail? How could you have been more successful? How could you have avoided failure?)

4 The Analysis of Investigation

4.1 General Situation

According to our investigation, the average number of employees is 2987; some big firms have reached over 12 thousands and the smallest 54.

Of those companies studied , in the purchasing division, average purchases per employee are 15 million yuan; the maximum is 57 million yuan; the minimum is 234 thousand yuan. At the same time, the average purchase per management purchasing employee are 59 millions yuan. In the sample, the educational qualification level of the professional purchaser is as follows: high school or lower occupies 15.69%; college men 33.67%; bachelor 38.89%; master or higher 0.98%; others 10.77%.

For sales, in the sample, the average sales per salesman is 4 million yuan; the maximum is 9 million yuan; the minimum is 24000 yuan. In addition, the average sales per technical salesman is 7.7 million yuan, and the average sales per management salesman is 15 million yuan. In the study, the educational level of the professional salesmen is: high school or lower 7.02%; college man 7.58%; bachelor 84.23%; master or higher 1.17%.

4.2 Purchasing

1) Organizational Structure

For the companies in the sample, most of them utilize centralized and centralized/decentralized as their organizational structure. Only 12 percent of the companies use virtual centralization, and the same number using decentralized only.

2) Factors Influencing the Purchasing

For the companies, price, quality, supplier quality, service and the delivery period are equally important. Over 60 percent of firms attach importance to these factors. However, only 11.77% of the companies consider the CMIS of the supplier as part of purchasing.

3) Purchasing Director

In the sample, about 60% firms make VP/director of materials take charge of the purchasing. At the same time, few firms, ranging from 6% to 12%, let VP/director of administration, VP/director of manufacturing, VP/director of operations or VP/director of supply chain do this job.

4) Department in Charge of Purchasing

Among the companies investigated, purchasing reports are mainly taken charge by materials department, 51% of the firms doing so. 31% companies make the operation department take charge of it. In the other companies, manufacturing, finance or other departments take charge.

5) The Trend of The Organizational Structure

Over the reporting period, more than half of firms in the sample did not change their organizational structure, with 38% of companies making the structure more decentralized. Only 6% firms wants to be more centralized.

6) Purchasing Performance Measures

According to the sample, the majority of purchasing performance measures utilized are internal customer satisfaction surveys, cost reduction targets and price reduction targets. Some firms, about 30%, also take supplier satisfaction survey and cycle-time reduction. Meanwhile, no firm considers supply base reduction targets as purchasing performance measure.

7) Supplier Rating System

When examining formal supplier rating system, all firms response "yes". That is to say that supplier rating has been a key part of purchasing.

8) Supplier Certification Program

In the sample, more than four-fifths of the firms have a formal supplier certification program. Only 13.33% respondents have none.

9) Purchase Transaction

As far as measures utilized to process purchase transaction are concerned, bar code receiving, EDI acknowledgment, electronic funds transfer, electronic invoice matching, Internet and Intranet are often used. The distribution of respondents is fairly normal. Moreover, every firm uses several kinds of measures and different firms use different measures.

10) The Period of Taking Stock

For the firms investigated in the sample, half of the firms take stock once a month and 22% take stock once every half a year. No firm takes stock less than once a week.

11) Multi-company Buying

According to the sample, 43% of the firms participate in multi-company buying, and at the same time 57% of the firms do not do so.

12) E-commerce

Among the firms in the sample, only 31.25% have purchasing transactions processed through E-commerce. The other ones have not done it, but 25% of them are going to utilize it in the near future and 50% of them are going to utilize it in 3 years. Meanwhile, 25% of the firms do not plan to utilize E-commerce to process purchasing transactions. Among the companies that have utilized it, half of the firms began using it in 2001.

4.3 Sale

1) Communication

Although the Internet has developed rapidly, fax and telephone are still playing a very important role to communicate and feedback the sales information with the distributors. Of course, there are alternative ways to communicate, such as face-to-face meetings.

2) Products Stock

Most companies keep the products stock for two or three months. The longest time is within two years and the shortest is seven days. Removing the longest and shortest, the average time is about 2 months and 3 days.

3) Time From Signing Contract to Delivering

Most companies take 1-2 months from signing the contract to delivering the products. The longest time is 3 months, and the shortest is 3-5 days. The average time is 30.5 days.

4) Payment For Purchased Materials

Most companies, up to 64%, pay for the material after they receive it. About one third of them pay when they receive it. Very few would like to pay when they send out order, and the ratio is 14%.

5) Receipt of Payment for Goods Sold

About half of the companies receive payment on receipt of sales order, while the other half receive it when customers receive the goods. Few of them receive it when the goods have been sold.

6) Sales Through E-commerce

About half of the companies sell their products through the Internet. The companies that answered no would not adopt the Internet at once. Half of these companies would use it three years later, and the others would not accept it.

5. Conclusion

Although the Internet has developed rapidly, E-Commerce still not used commonly in purchasing and sales process in China. Fax and telephone are still playing a very important role to communicate and feedback the purchasing and sales information in the air conditioning industries in China. It have not yet developed of the supply chain management in the air conditioning industries in China . There are latent potentialities in the supply chain optimization in China to be brought out.

References

Harrison, A. and New, C. (2002), "The role of coherent supply chain strategy and performance management in achieving competitive advantage: an international survey", *Journal of the Operational Research Society*, Vol.53, No.3, pp: 263-71

Leung, L.C., Waiman, C. and Yer, V.H. (2000), "A framework for a logistics e-commerce community network: the Hong Kong air cargo industry", *IEEE Transactions on Systems, Man & Cybernetics, Part A (Systems & Humans)*, Vol.30, No.4, pp: 446-55

Paulson, L.D. (2001), "Understanding supply chain management", *IT Professional*, Vol.3, No.1, pp: 10-13

Randall, T. and Ulrich, K. (2002), "Product variety, supply chain structure, and firm performance: analysis of the US bicycle industry", *Management Science*, Vol. 47, No.12, pp: 1588-604

Stroeken, J.H.M. (2002), "Information technology, innovation and supply chain structure", *International Journal of Services Technology and Management*, Vol.2, No.3-4, pp: 269-88

Von, L.C.H. and Pilz-Glombik, K. (2002) "Coordinating supply chain decisions: an optimization model", *OR Spektrum*, Vol. 24, No.1, pp: 59-78

Xie, Z.F., Wang, L. and Sun, J.C. (2002), "Web database accessment application for supply chain management", *Computer Integrated Manufacturing Systems*. Vol.7, No.8, pp: 59-63

Xu, X., Ma, S.H. and Chen, R.Q. (2000), "Key performance evaluating index and its optimization in supply chain", *Journal of Huazhong University of Science and Technology*, Vol.28, No.3, pp: 30-32

Zhou, S.Y. and Chen, R.Q. (2002), "A grey decision approach to capacity allocation in supply chain", *Journal of Grey System*, Vol.13, No.4, pp: 369-76

Zhu, C.J., Liu, M. and Wu, C. (2001), "Review of vehicle routing problem in supply chain", *Computer Integrated Manufacturing Systems*, Vol.7, No.11, pp: 1-6

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我国科技经费配置结构与使用效率分析

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摘　要:研究了我国科技经费在科研机构、高等学校和大中型企业三类执行部门中的配置结构和各类执行部门的科技经费支出结构;按照科技活动产出情况,对各类执行部门的科技经费使用效率进行综合评价;指出了我国在科技经费配置和使用中存在的问题,并据此提出了优化我国科技经费配置结构,提高科技经费使用效率的对策建议。

关键词:科技经费;配置结构;使用效率

中图分类号:C931　　**文献标识码**:A

近年来,我国科技经费投入增长较快。1998 年全国 R&D 经费支出 551.12 亿元,1999 年增长到 678.91 亿元,增加了近 25%。这表明全社会日益重视科技投入,"科技投入是高效益生产性投入"的观念已逐步为社会各界所接受。政府科技拨款也有较大幅度增加,1999 年比 1998 年提高了三分之一强。

当然我们也应当看到与世界上其他国家相比,尤其是与发达国家相比,我国在科技经费投入方面还存在着较大的差距。1999 年我国人均科技经费支出为 116 元,人均 R&D 经费为 54 元,而早在 1996 年,美国的人均 R&D 经费就已达到 720 美元,英国的人均 R&D 经费也达到 246 英镑。我们要正视现实,要想利用十分有限的科技投入发展科技事业,不断提高自身的科技实力和科技、经济竞争力,就必须努力实现科技经费的优化配置,不断提高科技经费的使用效益。

1　我国科技经费配置结构

1999 年,全国科技经费筹集总额为 1460.6 亿元,其中政府拨款为 473.0 亿元,自筹资金为 745.9 亿元,银行贷款为 128.8 亿元。科技经费在科研机构、高等学校和大中型企业三类执行部门中的配置情况如表 1 所示。

表 1　1999 年我国科技经费配置结构

项目	单位	总计	科研机构	高等学校	大中型企业
经费总额	亿元	1460.6	542.3	102.9	665.4
结构比例	%	100	37.13	7.05	45.56
政府拨款	亿元	473.0	341.3	49.2	49.7
结构比例	%	100	72.16	10.40	10.51

大中型企业筹集经费占全国科技经费总额 45.56%,这说明随着市场经济体制的建立和发展,在我国,企业已逐步成为科技投入的主体。从政府下拨的 473.0 亿元经费配置情况看,科研机构获得的份额高达 72.16%,这说明虽然经过 18 年科技体制改革,国家先后采取了双放、断奶、企业化改制等一系列措施,但仍未能从根本上改变科研机构依靠政府投入维持生计的局面。

从当年从事科技活动人员人均经费考察,不同执行部门之间也有很大差异(见表 2)。1999 年,全国高等学校科技活动人员人均科技经费为 30[illegible] 元,其中政府拨款为 14400 元,分别是科研机构科技人员人均经费和政府拨款的 30.7% 和 23.3%,是大中型企业科技活动人员人均经费的 65%。如果从事科技活动的科学家与工程师计,科研机构和大中型企业人均经费分别为高等学校的 5 倍和 3 倍

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表 2 1999 年科技活动人员人均经费

项目	单位	总计	科研机构	高等学校	大中型企业
科技活动人员	万人	290.6	55.3	34.2	145.3
人均经费	万元	5.03	9.81	3.01	4.58
人均拨款	万元	1.63	6.17	1.44	0.34
科学家工程师	万人	159.5	34.2	32.9	66.8
人均经费	万元	9.16	15.86	3.12	9.96
人均拨款	万元	2.97	9.98	1.50	0.74

2 各类执行部门科技经费支出结构

将科技活动经费支出项目划分为劳务费、业务费、固定资产投资及仪器设备费、其它费用 4 大类,按单位类型划分的各类执行部门科技活动经费支出结构见表 3。

表 3 1999 年我国科技活动经费支出结构

项目	单位	总计	科研机构	高等学校	大中型企业
合计	亿元	1284.93	496.86	85.10	567.24
劳务费	亿元	270.16	117.65	8.92	110.73
比例	%	21.03	23.68	10.48	19.52
业务费	亿元	434.85	179.55	49.29	166.54
比例	%	33.84	36.14	57.92	29.36
固定资产	亿元	357.43	99.93	17.03	203.90
比例	%	27.82	20.11	20.01	35.95
仪器设备	亿元	147.91	32.15	20.02	95.74
比例	%	11.51	6.47	23.53	16.87
其他	亿元	222.49	99.73	9.86	86.07
比例	%	17.31	20.07	11.59	15.17

在三类执行部门的科技经费支出中,科研机构劳务费支出所占比例最高,达 23.68%,高等学校劳务费支出在总支出中仅占 10.48%。相反,在购买仪器设备支出一项,高等学校支出所占比例最高,达 23.53%,科研机构用于购买仪器设备的支出在总支出中仅占 6.47%。另外,值得指出的是,业务费在三类执行部门的科技经费支出中都占了相当大的比例,高等学校业务费支出甚至接近总支出的 60%,达到 57.92%。

3 科技经费使用效率分析

科技活动产出可以在一定程度上反映出科技经费的使用效率。我们采用发表论文(中文科技期刊刊登的科技论文)、出版著作、授权专利和重大科技成果 4 项指标对各类执行部门科技经费使用效率进行综合评价。

表 4 1998 年各类执行部门科技活动产出

项目	单位	总计	科研机构	高等学校	大中型企业
发表论文	篇	133341	25751	86921	8745
出版著作	种	4772	1306	3466	
授权专利	件	23918	1829	960	20229
重大科技成果	项	22178	6863	7336	7979

按每 100 万元科技经费、R&D 经费和每 100 名科技活动人员、R&D 人员分别计算科技产出,得到如表 5、表 6、表 7、表 8 所示的结果。

从每 100 万元科技经费产出情况看,除授权专利指标外,高等学校各项指标皆高于科研机构和大中型企业。其中发表论文数是科研机构的 21 倍;出版著作是科研机构的 20.5 倍;重大科技成果数分别为科研机构和大中型企业的 6.62 倍和 6.14 倍。每 100 万元 R&D 经费的产出,除授权专利指标外,其余各项指标也是高等学校最高,其中发表论文、出版著作数分别是科研机构的 13.79 倍和 10 倍;重大科技成果数分别为科研机构和大中型企业的 4.41 倍和 3.2 倍。

表 5 每 100 万元科技经费产出

项目	单位	全国	科研机构	高等学校	大中型企业
发表论文	篇	1.03	0.49	10.23	0.16
出版著作	种	0.04	0.02	0.41	
授权专利	件	0.19	0.03	0.10	0.38
重大科技成果	项	0.17	0.13	0.86	0.14

表 6 每 100 万元 R&D 经费产出

项目	单位	全国	科研机构	高等学校	大中型企业
发表论文	篇	2.42	1.10	15.17	0.44
出版著作	种	0.09	0.06	0.60	
授权专利	件	0.43	0.08	0.15	1.08
重大科技成果	项	0.40	0.29	1.28	0.40

表 7 每 100 名科技活动人员产出

项目	单位	全国	科研机构	高等学校	大中型企业
发表论文	篇	4.74	4.24	25.19	0.47
出版著作	种	0.17	0.22	1.00	
授权专利	件	0.85	0.30	0.25	1.14
重大科技成果	项	0.79	1.13	2.13	0.43

如果按每发表 1 篇论文计 1 分,每出版 1 种著作,获 1 项专利或成果奖计 10 分,我们可得到各类

执行部门科技经费和人员投入的综合效率指数(表9)。

表8 每100名R&D人员产出

项目	单位	全国	科研机构	高等学校	大中型企业
发表论文	篇	17.66	11.29	51.43	2.44
出版著作	种	0.63	0.57	2.05	
授权专利	件	3.17	0.80	0.51	5.93
重大科技成果	项	2.94	3.01	4.34	2.23

高等学校的各类综合效率指数皆高于全国平均水平。其中,科技经费投入的综合效率指数为全国平均水平的4.76倍,R&D经费投入的综合效率指数为全国平均水平的3.05倍。与大中型企业相比,高等学校科技经费和科技活动人员产出的综合效率指数分别为前者的4.46倍和3.65倍。科研机构的各类综合效率指数都较低,均未达到全国平均水平,其中科技经费和R&D经费投入两项指数甚至还未达到全国平均水平的二分之一。

表9 1998年我国科技投入综合效率指数

项目	全国	科研机构	高等学校	大中型企业
每100万元科技经费	5.03	2.29	23.93	5.36
每100万元R&D经费	11.62	5.40	35.47	15.24
每100名科技活动人员	22.84	20.74	58.99	16.17
每100名R&D人员	85.06	55.09	120.43	84.04

4 我国科技经费配置结构调整的几点思考与建议

综合考虑我国科技经费的配置结构及各类执行部门的经费支出情况和使用效率,对进一步优化我国科技经费配置结构,提高科技经费使用效率提出如下建议:

(1) 科技经费投入应逐步向高等学校和科研机构倾斜。1999我国高等学校和科研机构科技经费筹集比例分别为7.05%和37.13%,远低于45.56%——同期大中型企业科技经费筹集比例。随着科技投入体制的改革,企业作为科技投入的主体,在主要靠不断增加自身投入提高竞争力的同时,还要逐步成为高等学校和科研机构科技经费的重要来源和渠道之一。因此,政府能够支配的科技经费,应向高等学校和科研机构倾斜。尤其是高等学校,科技经费支出结构最合理、使用效率最高,但高校科技活动人员人均政府拨款仅14400元,还不到科研机构科技活动人员人均拨款的四分之一,勿庸讳言,科技人员相对集中,经费支出合理,使用效率高的高等学校成为我国科技经费投入的盆地,在一定程度上影响了全国科技经费的使用效率。

(2) 科技经费支出结构应适当界定。1999年,我国科研机构劳务费支出占科技经费总支出的比例达到23.68%,全年用于工资、福利等支出的科技经费达117.65亿元。而同期全国高等学校科技经费支出总额仅为85.10亿元。严格科技经费管理制度,在科技项目经费支出中适当界定各类支出项目在总支出中所占的比例,对于节约科技经费,提高科技经费使用效率将会起到一定的作用。

(3) 坚持重大科技项目实施效果评估制度。虽然科学研究具有较大的不可预见性,但对于应用性较强的科技项目,仍可根据其投入产出情况,建立科学的评估指标体系对其实施效果进行综合评估,以加强科技计划项目的中、后期管理、监测,并为下一年度科技计划立项提供依据。这方面我国已经起步,应当认真总结经验,不断完善评估指标和综合评估模型系统,尽量避免专家个人主观意志影响造成的评估偏差,使得评估结果更为科学、可靠。

参考文献:

[1] 路甬祥.21世纪中国科技发展战略与体制改革[J].科研管理,1998,19(2):1-6.

[2] 钱正源.产品开发与研究课题年度绩效测量方法探讨[J].科研管理,2000,21(3):102-105.

[3] 杨光.科研过程质量控制的原理、程序与方法[J].科研管理,2000,21(3):106-112.

[4] 张百水.深化高等学校科技体制改革总体思路建议[J].研究与发展管理,1999,11(9):1-10.

[5] 刘思峰.合理配置科技资源,充分发挥高校在科技创新中的作用[C].'99青年创新论坛,1999(1):87-88.

[6] 刘思峰、李炳军、党耀国等.河南省技术进步贡献率和横向比较[J].河南农业大学学报,1999,33(1):40-43.

[7] 刘思峰、郭天榜、党耀国.灰色系统理论及其应用[M].北京科学出版社,1999.

[8] 刘思峰、党耀国、李炳军.技术进步与科技投入[J].中国管理科学,2000,7(5):764-768.

[9] 国家统计局.中国统计年鉴(1999/2000)[Z].中国统计出版社.

[10] 国家统计局、科学技术部.中国科技统计年鉴(1999/2000)[Z].中国统计出版社.

Analysis on Distribution Structure and Utilization Efficiency of the Funds for Science and Technology in China

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Abstract: The distribution and expenditure structure of the funds for science and technology in 3 executive bodies, colleges and universities, scientific research institutions and large and middle – sized enterprises in China are studied. The Utilization efficiency of the funds for science and technology in every executive body are evaluated synthetically according to their output in scientific and technical activities. The problems in distribution and utilization of the funds for science and technology in China are pointed out. On these grounds, some countermeasure proposal for optimizing the distribution structure and raising the utilization efficiency of the funds for science and technology are put forward.

Key words: funds for science and technology; distribution structure; utilization efficiency

THE TECHNICAL CHANGE AND THE FUNDS FOR SCIENCE AND TECHNOLOGY*

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KEYWORDS Technical change, the funds for science and technology, the G-C-D, the G-E

ABSTRACT (1) A new model, the G-C-D model, which is used to measure the technological advance, is built. The progress with non-technical elements in Solow's "remaining value" is removed by using the idea, method and modeling technique of grey system theory. So the difficult technical problem in measurement of technological advance has been solved to a certain extent.(2) Another new model,the G-E model, which is a kind model combined the Grey model with the Econometrics model, is built. Using the principle of grey incidence to analyse and cluster system factors, adopting the GM(1,1) simulated values of systems variables to build the econometrics model and confirming the predicted values with grey models, some difficult technique in econometrics model building have been solved.(3)The periodic G-C-D model of Henan Province is built in four different periods and the contribution rate of the periodic technological advance of Henan Province is measured.(4)The technical change and the relation between the technical change and the funds for science and technology of Henan Province are analysed with the grey production function (the G-C-D) and the grey-econometrics combined model(the G-E).Some useful outcome for policy-making body are obtained.

1. INTRODUCTION

The scientific proposition, "the investment on science and technology is productive investment", can be naturally deduced from "science and technology is productive forces". In the time of "science and technology is the first productive forces", the investment on science and technology can get very high benefit that any other investment is unparalleled. But there are many people have not realized accepted this fact. Some people are often under illusion about investment. They think that putting money to engineering constructive project, it can produce an immediate effect , but putting money to science and technology, you cannot catch sight of obvious return. This illusion have affected directly the initiative of the people to put money in science and technology. By study on the relation of the contribution rate of technological progress with the investment on S&T, we draw a conclusion that keeping strong investment on S&T in long term is the unique choose for any country or area which want take the leading position in economy and technology.

2. The G-C-D MODEL

The method to measure the contribution portion of technological progress in economic growth usually relies on the improved Cobb-Douglas production function by Tinbergen [1] and with Solow's "remaining value" [2] . Because the method is possessed of some serious defects, it is difficult to obtain a reasonable result in practical study. In fact, Solow's "remaining value" is the contribution of all factors except fund and labor to output growth. It is unreasonable that the contribution is regarded as

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