**Online Appendix to**

**FUNCTIONAL KNOWLEDGE v.s. STRATEGIC KNOWLEDGE: WHAT TYPE OF KNOWLEDGE MATTERS MOST FOR THE LONG-TERM PERFORMANCE OF STARTUPS**

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APPENDIX 1 List of interviews

| **No.** | **Date of Interview** | **Industrial Tenure** | **Positions** | **Working Experience Related to the Dye Industry** | |
| --- | --- | --- | --- | --- | --- |
| **Enterprise/Affiliation** | **Location** |
| 1 | 30/12/2009 | 1960s-present | Secretary General | China Dyestuff Industry Association | Beijing |
| 2 | 05/01/2010 | 1998-present | Director of Corporate Management Department  Director of Financial Department  Direction of Marketing Department | A top Chinese dye firm | Zhejiang |
| 3 | 07/01/2010 | 1999-present | Engineer in Charge | A top Chinese dye firm | Zhejiang |
| 4 | 08/01/2010 | 1993-present | General Manager of the R&D Subsidiary Company | A top Chinese dye firm | Zhejiang |
| 5 | 10/01/2010 | 1970s-1990s | R&D Consultant | A medium-size Chinese dye firm | Zhejiang |
| Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 6 | 14/01/2010 | 1980s-present | R&D Director | A top Chinese dye firm | Zhejiang |
| Engineer & Workshop Supervisor | A Chinese dye firm | Zhejiang |
| Technician | A small Chinese dye firm | Zhejiang |
| 7 | 15/01/2010 | 1993-present | General Manager of Technology Division and Vice General Manager of the Company | A top Chinese dye firm | Zhejiang |
| 8 | 18/01/2010 |
| 9 | 22/01/2010 | 1990s-present | Deputy R&D Director | A top Chinese dye firm | Zhejiang |
| Engineer | A small Chinese dye mill | Zhejiang |
| 10 | 25/01/2010 | 1970s-present | Deputy Director of Engineering Center | Shanghai Dyestuff Research Institute Co., Ltd. | Shanghai |
| Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 11 | 26/01/2010 | 1970s-present | Secretary General | Shanghai Coatings and Dyestuff Trade Association | Shanghai |
| Director at a subsidiary factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 12 | 29/01/2010 | 1970s-present | Information Director  Editor at *Shanghai Dyestuffs* | Shanghai Coatings and Dyestuff Trade Association | Shanghai |
| 13 | 01/02/2010 | 1963-present | Editor at *Shanghai Dyestuffs* | Shanghai Coatings and Dyestuff Trade Association | Shanghai |
| Senior Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 14 | 08/02/2010 | 1966-retirement | General Engineer at Shanghai Dyestuff Co., Ltd. / Professor | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 15 | 10/02/2010 | 1980s-present | Owner and General Manager | Self-owned dye production company | Shanghai |
| General Engineer & General Manager | A top Chinese dye firm | Zhejiang |
| Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 16 | 25/02/2010 | 1950s-present | Professor of Organic Dyestuffs (taught almost all the later head engineers at Shanghai-based dyestuff factories) | Shanghai Textile Industry University  East China University of Science and Technology | Shanghai |
| 17 | 29/07/2010 | 1950s-present | Engineer/Professor | Shenyang Dyestuff Research Institute | Shenyang |
| 18 | 02/08/2010 | 1960s-present | Technical Consultant | Self-employed | Shanghai & Zhejiang |
| Senior Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 19 | 06/08/2010 | 1950s-present | Technical Consultant | A Swiss company in China |  |
| Engineer at Shanghai No.3 Dyestuff Factory (synthesized the first cationic dye in China) | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 20 | 10/08/2010 |
| 21 | 12/08/2010 | 1970s-present | Engineer at Shanghai No.5 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 22 | 17/08/2010 | 1980s-present | Chairman and General Manager | A medium-sized Chinese dye firm | Zhejiang |
| 23 | 18/08/2010 | 1970s-retirement | Sales Manager at Shanghai No.9 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 24 | 20/08/2010 | 1980s-present | Director of Quality Control Department | A top Chinese dye firm | Jiangsu |
| Manager | A medium-sized Chinese dye firm | Zhejiang |
| Salesperson  Workshop manager | A small Chinese dye firm | Zhejiang |
| 25 | 22/08/2010 | 1980s-present | Vice General Manager | A top Chinese dye firm | Jiangsu |
| Sales Manager | A medium-sized Chinese dye firm | Zhejiang |
| 26 | 24/08/2010 | 1960s-present | Vice Secretary General | China Dyestuff Industry Association | Beijing |
| 27 | 31/08/2010 | 1970s-present | Technical Consultant | Self-owned service company | Shanghai |
| Secretary General in the1980s | Shanghai Coatings and Dyestuff Trade Association | Shanghai |
| Engineer at a subsidiary factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 28 | 31/08/2010 | 1950s-present | General Manager | Self-owned trading company | Shanghai |
| Director at the Planning Division  Director at Shanghai No.8 Dyestuff Factory  Director at Shanghai No.3 Dyestuff Factory  Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 29 | 10/11/2010 |
| 30 | 03/09/2010 | 1960s-present | Director at Shanghai No.8 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 31 | 13/09/2010 | 1961-present | Technical Consultant | Self-owned service company | Shanghai |
| Director at Shanghai No.8 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 32 | 19/09/2010 | 1953-retirement | General Engineer at Shanghai No.10 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 33 | 21/09/2010 | 1950s-present | Professor of Fine Chemistry | Tianjin University | Tianjin |
| 34 | 22/09/2010 | 1980s-present | Vice General Manager at a Chinese dye firm | A top Chinese dye firm | Jiangsu |
| 35 | 24/09/2010 | 1990s-present | R&D Manager | A medium-sized Chinese dye firm | Zhejiang |
| Engineer | A Chinese dye firm | Zhejiang |
| 36 | 28/09/2010 | 1950-present | Technical Consultant | A major Chinese direct dye firm | Jiangsu |
| General Engineer at Shanghai No.9 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 37 | 28/09/2010 | 1980s-present | Manager | A major Chinese dye firm | Jiangsu |
| 38 | 03/11/2010 | Supply Manager | A Chinese dye factory | Jiangsu |
| 39 | 29/09/2010 | 1953-retirement | Director at Shanghai No.9 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 40 | 11/10/2010 | 1970s-retirement | Sales & Supply Manager | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 41 | 12/10/2010 |
| 42 | 20/10/2010 | 1980s-present | General Manager | A top Chinese dye firm | Zhejiang |
| 43 | 26/10/2010 | 1950-present | Technical Consultant | A major Chinese dye firm | Zhejiang |
| Technical Consultant | A division of Everlight Chemical Industrial Co., Ltd. | Jiangsu |
| Director at Shanghai No.4 Dyestuff Factory  Director at Shanghai No.1 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 44 | 30/10/2010 |
| 45 | 26/10/2010 | 1968-present | Technical Consultant | A major Chinese dye firm | Zhejiang |
| Manager in the corporation | Shanghai Dyestuff Co., Ltd. | Shanghai |
| Senior Engineer |
| Workshop Director at Shanghai No.1 Dyestuff Factory |
| 46 | 09/11/2010 | 1960s-present | Technical Consultant & Shareholder | A major Chinese direct dye firm | Jiangsu |
| Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 47 | 23/11/2010 | 1963-retirement | Government Official | The State Chemical Industry Office | Beijing |
| 48 | 01/11/2011 | 1960s-retirement | Technical Consultant | Several private or collectively owned Chinese dye firms | Jiangsu & Zhejiang |
| Engineer at Shanghai No.3 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| Engineer | Shanghai Dyestuff Research Institute | Shanghai |
| 49 | 03/11/2011 | 1980s-1990s | Sales Manager | A chemical trading company | Jiangsu |
| Sales Director  Workshop Supervisor  Worker | A small Chinese dye firm | Zhejiang |
| 50 | 06/11/2011 |
| 51 | 11/11/2011 | 1981-present | Engineer | A large Chinese dye company | Jiangsu |
| Engineer | A Chinese dye trading company | Guangdong |
| Technician | A small Chinese dye firm | Zhejiang |
| Worker | A small Chinese dye firm | Zhejiang |
| 52 | 15/11/2011 | 1983-1990s | General Manager | A small Chinese dye firm | Zhejiang |
| 53 | 18/11/2011 | 1985-2001 | Director | A chemical trading agency | Zhejiang |
| General Manager | A medium-sized Chinese dye firm | Zhejiang |
| 54 | 05/12/2011 | 1970s-present | Technical Consultant & Shareholder | A technical service company | Jiangsu |
| Technical Consultant | Several private or collectively owned Chinese dye firms | Jiangsu & Zhejiang |
| Workshop Director | Shanghai Dyestuff Co., Ltd. | Shanghai |
| Workshop Supervisor | A state-owned dye enterprise | Jiangsu |
| 55 | 12/12/2011 | 1980s-1999 | Consultant | A foreign chemical company | Zhejiang |
| Workshop Director | A medium-sized Chinese dye firm | Zhejiang |
| 56 | 14/12/2011 | 1960s-retirement | Technical Consultant | Several private or collectively owned Chinese dye firms | Jiangsu & Zhejiang |
| Senior Manager  Workshop Director  Technician at Shanghai No.3 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 57 | 16/12/2011 | 1970s-retirement | Workshop Director at Shanghai No.10 Dyestuff Factory  Worker at Shanghai No.10 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 58 | 18/12/2011 | 1950s-retirement | Worker at Shanghai No.3 Dyestuff Factory | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 59 | 20/12/2011 | 1980s | Senior Official in Charge of the Chemical Industry | Government of Shaoxing | Zhejiang |
| 60 | 09/04/2014 | 1970s-present | Consultant | A foreign dye trading company | Jiangsu |
| Senior Engineer  Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 61 | 10/04/2014 | 1970s-retirement | Consultant | A dye trading company | Zhejiang |
| Sales Manager | A state-owned dye enterprise | Jiangsu |
| 62 | 11/04/2014 | 1970s-2000s | Sales Manager | A dye trading company | Zhejiang |
| Salesman | A state-owned dye enterprise | Shanghai |
| 63 | 12/04/2014 | 1960s-retirement | Consultant | A medium-sized Chinese dye firm | Zhejiang |
| Workshop Director  Worker | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 64 | 09/06/2017 | 1983-1990s | General Manager | A small Chinese dye firm | Zhejiang |
| 65 | 10/06/2017 | 1980s-present | Owner and General Manager | Self-owned dye production company | Shanghai |
| General Engineer & General Manager | A top Chinese dye firm | Zhejiang |
| Engineer | Shanghai Dyestuff Co., Ltd. | Shanghai |
| 66 | 12/06/2017 | 1985-2001 | Director | A chemical trading agency | Zhejiang |
| General Manager | A medium-size Chinese dye firm | Zhejiang |
| 67 | 12/06/2017 | 1980s-present | Chairman and General Manager | A small Chinese dye firm | Zhejiang |
| 68 | 14/06/2017 | 1980s-present | R&D Director | A top Chinese dye firm | Zhejiang |
| Engineer & Workshop Supervisor | A Chinese dye firm | Zhejiang |
| Technician | A small Chinese dye firm | Zhejiang |
| 69 | 01/07/2017 | 1980s-present | General Manager | A top Chinese dye firm | Zhejiang |
| 70 | 05/07/2017 | 1970s-present | Former General Manager of Company | A top Chinese dye firm | Zhejiang |
| 71 | 16/07/2017 | 1980s-present | Chairman and General Manager | A medium-size Chinese dye firm | Zhejiang |

APPENDIX 2: List of documentary sources used[[1]](#footnote-1)

| **No.** | **Year** | **Author** | **Title** |
| --- | --- | --- | --- |
| **Industry journal articles** | | | |
| J.1 | 1970 |  | *Jinianlai Guonei Ranliao Gongye Gaikuang—Pinzhong Bufen* (*General conditions of domestic dyestuff industry in recent years—the part of product variety*,Dyestuff Industry, 1970(5-6), p.49-53) |
| J.2 | 1970 | Changzhou Dongfanghong Dyeing Factory | *Fangcui Liuhuahei Ranliao Ranse Qingkuang* (*Dyeing using brittle resistance sulphur black*,Dyestuff Industry, 1970(4): 32-33) |
| J.3 | 1974 |  | *Guochan Fensan Ranliao Pinzhong Fenlei* (*Categorization of domestic disperse dyes*,Dyestuff Industry, 1974(2), p.41-42) |
| J.4 | 1974 |  | *Ziligengsheng Dagao Fensan Ranliao Qingkuang* (*Developing the production of disperse dyes*,Dyestuff Industry, 1974(2), p.42) |
| J.5 | 1979 | Ma, Fu-Xiang | *Shanghai Ranliao Chanxu Qingkuang Huibao* (*A report on the production and demand of dyes made in Shanghai*,Dyestuff Industry, 1979(4), p.25-28) |
| J.6 | 1979 | Cai, Qiang | *Dui Woguo Ranliao Gongye Fazhan De Jidian Kanfa* (*Several notes on the development of domestic dyestuff industry*,Dyestuff Industry, 1979(6): 25-29) |
| J.7 | 1979 | Yang, Xin-Wei | *Guonei Huoxing Ranliao Fazhan Gikuang* (*General conditions of the development of domestic reactive dyes*,Dyestuff Industry, 1979(1): 9-15) |
| J.8 | 1982 | Lin, Yu-Jia | *80 Niandai Ranliao Shengchan De Jingjixue* (*Economy of dyestuff production in the 1980s*,Dyestuff Industry, 1982(1): 59-62) |
| J.9 | 1983 | Jiang, De-Fu | *Dui Woguo Ranliao Gongye Fazhan De Cuqian Kanfa* (*Perspectives about the development of domestic dye industry*,Dyestuff Industry, 1979(1): 9-15) |
| J.10 | 1983 | Ran, Hua-Wen | *Dangqian Guonei Ranliao Shichang Jianjie* (*Brief introduction of domestic dye market*,Dyestuff Industry, 1979(1): 9-15) |
| J.11 | 1985 | Ji, Quan-Fu | *Huoyue Keji Liutong, Kaifa Jishu Shichang — Dui Shangyuxian Jijia Xiangzhen Qiye De Diaocha* (*Activating the flow of science and technology, exploiting the market of technology*, Science and Technology of Today, 1985(4): 8-9) |
| J.12 | 1985 | Zhao, Lei | *Ranliao Jiegou Yu Jiage.* (*Chemical structure and price of dyes*,Prices Monthly, 1985(11), p.12-14) |
| J.13 | 1985 | Ding, Zhong-Chuan | *Raliao Keji Gongguan Jinzhan Qingkuang* (*Progress in tackling key scientific and technological problems in domestic dye industry*,Dyestuff Industry, 1985(3), p.61-62) |
| J.14 | 1985 | Li, Jin-Cu | *Guonei Huoxing Ranliao Fazhan Gaikuang* (*Development of domestically produced reactive dyes*,Dyestuff Industry, 1985(3), p.61-62) |
| J.15 | 1985 | Zhu, Ling-Ling | *Cong Shanghai Ranliao Huagong Bachang 25 Nian Lai De Chanpin Kaifa Kan Guochan Huoxing Ranliao De Fazhan* (*Development of domestically produced reactive dyes*,Dyestuff Industry, 1985(1): 13-16) |
| J.16 | 1986 | Ji Quan-Fu | *Zhuazhun Qingbao Xinxi, Yi Chanpin Youzhi Qusheng—Shangyuxian Zhuji Zongchang De Yitiao Chenggong Jingyan* (*Making use of information and winning by good product quality—Success experiences of Shangyu Auxiliary Factory*, Science and Technology of Today, 1986(2): 15.) |
| J.17 | 1986 | Zhu, Ling-Ling | *Liuhuahei Shichang Yuce* (*Prospect of the sulfur black market*,Dyestuff Industry, 1985(1): 13-16) |
| J.18 | 1987 | Reporter | *Shibawanjian Xinchanpin Tongguo Shengji Pingshen* (*The new product of domestically manufactured octadecylamine passed province-level evaluation*, Zhejiang Chemical Industry, 1987(6): 65) |
| J.19 | 1988 | Wang, Song-Ze | *Dui Tigao Fensan Ranliao Jingji Xiaoyi De Qianjian* (*Development of domestically produced reactive dyes*,Dyestuffs and Coloration, 1988(3): 13-15) |
| J.20 | 1988 | Ye, Xiao-Mei | *Zouchu Tianye—Ji Jiaojiangshi SB Qiye Gongsi Jingli the Founder of SB* (*Coming out of the fields – On the founder of SB, the general manager of the SB Company*,Qing Ming, 1988(4), p.201-204) |
| J.21 | 1988 | Xi, Wei | *1988 Nian Ranliao Chanxu Xianjie Hui Baodao* (*Report on the annual conference of planning for production and demand of dyes*,Dyestuffs and Coloration, 1988(1), p.61) |
| J.22 | 1989 | You, De-An | *Production of vat dyes in China*,Dyestuffs and Coloration, 1989(6), p.11-16) |
| J.23 | 1990 | Yang, Xin-Wei | *Guonei Ranliao Gongye Fazhan Gaikuang—Zaitan Guonei Ranliao Shengchan He Shichang Qingkuang* (*Development of domestic dye industry—On domestic production and market of dyes*,Dyestuffs and Coloration, 1990(1), p.1-11) |
| J.24 | 1990 | Li, Jin-Cu | *1990 Nian Quanguo Ranliao Shichang Xingshi Fenxi Hui Baodao* (*Report on the 1990 meeting of domestic dye market analysis*,Dyestuffs and Coloration, 1990(4), p.57) |
| J.25 | 1991 | Zhang, Jie | *Shanghai Ranliao Gongye Jishu Jinzhan Jinkuang* (*Recent technological development in the Shanghai-based dye industry*,Dyestuffs and Coloration, 28(1) , p.23-28, 55) |
| J.26 | 1992 |  | *1992 Nian Guonei Ranliao Chanliang Zengjian Jianshu* (*Debrief of the change in the output volume of domestic dyes*,Dyestuffs and Coloration, 30(6), p.56) |
| J.27 | 1993 | The founder of SB &  Zhang, Shao-Qiu | *Yikao Keji Rencai, Cujin Qiye Tengfei* (*Relying on science and technological talents to develop firms*, Zhejiang Economy, 1993(4), p.30-31) |
| J.28 | 1994 |  | *Zhuxue Yangcai Yu Keji Xingye* (*Sponsoring Education and Developing Science and Technology for Firm Growth*, Enterprise World, 1994(5)) |
| J.29 | 1994 | Investigation Group of the Chinese Science and Technology Lecturing Delegation | *Yifu Qingxi De Qiye Fazhan Zhanlue Lantu – SB Gongsi De Jingying Moulue* (*A clear blueprint of firm development strategies – The business strategy of SB Company (Part I)*, Sino Foreign Management, 1994(1), p.22-25) |
| J.30 | 1994 | Investigation Group of the Chinese Science and Technology Lecturing Delegation | *Yifu Qingxi De Qiye Fazhan Zhanlue Lantu – SB Gongsi De Jingying Moulue* (*A clear blueprint of firm development strategies – The business strategy of SB Company (Part II)*, Sino Foreign Management, 1994(2), p.9-13) |
| J.31 | 1995 | Ye, Xiang-Zhou | *Zhongjiao Jingli the Founder of SB* (*The founder of SB, a manager attaching importance to education*, Democracy Monthly, 1995(1), p.44-45) |
| J.32 | 1997 | Yuan, Wei-Zhong & Wang, Bo-Quan | *SA Gongsi De Zhichangjing* (*How SA is managed*, Chinese Township Enterprises, 1997(8): 46) |
| **Archives** | | | |
| A.1 | 1979 | Wu, Guang-Han | *Shanghai Ranliao Gongye Shiliao (Manuscript)* (*Historical Materials of the Shanghai Dyestuff Industry (Manuscript)*, 1979) |
| A.2 | 1986 | Investigation Group of the Chinese Ministry of Chemical Industries | *Ranliao Hangye Diaocha Baogao* (*Investigation report of the Dyestuff Industry*, 1986) |
| A.3 | 1989 | Jin, Guozhen | *1989 Niandu Quanguo Ranliao Hangye Xinxi Qingbao Fabuhui Kaimuci* (*Opening speech on the 1989 annual conference of nation-wide information on the dyestuff industry*,August 25, 1989) |
| A.4 | 1989 |  | *22 documentary materials released on the 1989 annual conference of nation-wide information on the dyestuff industry*,August 25, 1989 (34 documentary materials at the time in total) |
| **Firm releases** | | | |
| F.1 | 1984-1988 | Shanghai No.8 Dyestuff Factory | *Chanpin Jiamu Biao (1984-1988)* (*Price lists, 1984-1988*) |
| F.2 | 1986-1988 | SB | *Chanpin Jiamu Biao (1986-1988)* (*Price lists, 1986-1988*) |
| F.3 | 1988 | MA | *Chanpin Jiage Mulu (1988)* (*Price lists, 1988*) |
| F.4 | 1986-1989 | FA | *Chanpin Jiage Biao (1986-1989)* (*Price lists, 1986-1989*) |
| **Personal notes** | | | |
| P.1 | 1953-1986 | Wang, Peng-Fei | *Personal diaries written by an engineer of the Shanghai No.3 Dyestuff Factory from 1953 to 1986* |
| P.2 | 1981-1993 | The founder of FB | *Notes taken by the founder of FB from 1981 to 1993* |
| **Books** | | | |
| M.1 | 1977 | Shanghai No.1 Dyestuff Factory | *Huoxing Cailan Shengchan De Chengkong* (*The Control of Manufacturing Procedure of Reactive Blue.* Shanghai People Press. 1977) |
| M.2 | 1983 | Shanghai Bureau of Textile Industry | *Ranliao Yingyong Shouce* (*Handbook of Dyestuff Application.* Textile Industry Press. 1983) |
| M.3 | 1991 | Zhejiang Hardware, Electric and Chemical Products Company | *Zhejiang Wujin Jiaodian Huagong Shangyezhi* (*Local History of Hardware, Electric and Chemical Products Businesses.* Zhejiang Science and Technology Press. 1991) |
| M.4 | 1994 | Zhang, Shao-Qiu | *SB Zhi Lu* (*The Road of SB.* Zhejiang University Press. 1994) |
| M.5 | 2009 | Cao Zhen-Yu | *Zhongguo Ranliao Gongyeshi* (*History of the Chinese Dyestuff Industry.* China Light Industry Press. 2009) |
| M.6 | 2015 | Chen, Sheng-Long | *The Founder of SA: Chenggong Juefei Ouran* (*The Founder of SA: Success is not By Chance.* Zhejiang People Press. 2015) |
| **Yearbooks** | | | |
| 58 | 2007-2014 | China Dyestuff Industry Association | *Zhongguo Ranliao Gongye Nianjian* (*Yearbook of the Chinese Dyestuff Industry*, 2007-2015) |
| **Reports** | | | |
| T.1 | 1992 |  | *Huagong Ranliao Youqi Shangpin Gongqiu Toushi* (*Supply and demand of dyes and paintings*, The Economic Daily, Oct 5, 1992) |
| T.2 | 1992 |  | *Huagongbu Dui Bazhong Chanpin Chushi “Huangpai”* (*The Ministry of Chemical Industry put restrictions on the production of eight products*, The Information Daily, Oct 5, 1992) |
| T.3 | 1992 | Ma, Zheng-Xiang | *Ranliao Chanpin Xuqiu Huisheng* (*Recovery of dye products*, The Economic Daily, Oct 5, 1992) |
| T.4 | 1992 |  | *Ranliaoye Xingcheng Dajiya* (*Serious overstock in the dye industry*, The Economic Daily, Dec 3, 1992) |
| T.5 | 1992 |  | *Zhejiang Fangkai Qilei 37 Zhong Huagong Chanpin Jiage* (*The Zhejiang government liberalized the prices of 37 chemical products*, The Economic Daily, Feb 11, 1993) |
| T.6 | 1992 |  | *Huagongbu Dui Bazhong Chanpin Shixing Tingchan Xianchan* (*The Ministry of Chemical Industry execute measures to stop or to restrict production of eight chemical products*, The Economic Daily, Mar 14, 1993) |
| T.7 | 2008 | Xia, Fen-Juan | *Xuanduile Jiebanren.* (*Selecting the right successor*. Manager Daily, July 21, 2008) |
| T.8 | 2010 | Zhongtou Consulting Company | *The Founder of SA: Cong Paojianghu Dao Fubusi Fuhao.* (*The founder of SA: from a peddler to a millionaire*,2010) |
| **Internal materials** | | | |
| R.1 | 1970 | Shanghai No.8 Dyestuff Factory | *Xin Chanpin Jieshao: Huoxing Shenlan K-R* (*Introduction to new product: Reactive Blue K-R*) |
| R.2 | 1973 | Shanghai Dyestuff Company | *Liuhualan Gongyi Guicheng* (*Procedure to Make Sulfur Blue*) |
| R.3 | 1973 | Shanghai Dyestuff Company | *Liuhuahei Gongyi Guicheng* (*Procedure to Make Sulfur Black*) |
| R.4 | 1976 | Shanghai Organic Industry Company | *Ranliao Shengchan Gongyi Huibian* (*Collection of manufacturing techniques of dyes*, 1976) |
| R.5 | 1978 | Shenyang Chemical Industry Research Institute | *Ranliao Pinzhong Shouce* (*Handbook of the Varieties of Dyes.* 1978) |
| R.6 | 1979 | Chinese Ministry of Textile Industry | *Jinkou Ranliao Zhuji Mulu* (*List of imported dyes and auxiliaries*,1979) |
| R.7 | 1980 | SA | *Laiwang Xinhan* (*Letters about purchasing second-hand equipment from Shanghai*,1980) |
| R.8 | 1981 | SA | *Niandu Gongzuo Zongjie* (*Internal annual report of SA*) |
| R.9 | 1983 | China Hardware, Electric and Chemical Products Company | *Bufen Huagong, Ranliao, Yuqi Shangpin Chengben Jiage Ziliao* (*Costs and prices of some chemical, dyestuff, and painting products in 1982*,1983) |
| R.10 | 1983 | FA | *Liuhua Hei Gongyi Guicheng* (*Procedure to Make Sulfur Black*)) |
| R.11 | 1984 | FA | *Letters and receipts of purchasing second-hand equipment from a collectively-owned enterprise* |
| R.12 | 1985 | SA | *Niandu Gongzuo Zongjie* (*Internal annual report of SA*) |
| R.13 | 1985 | Chinese Ministry of Textile Industry | *Jinkou Ranliao Zhuji Mulu* (*List of imported dyes and auxiliaries*,1985) |
| R.14 | 1985 | Shanghai No.9 Dyestuff Factory | *Zhijie Huang Gongyi Guicheng* (*Procedures to Make Direct Yellow Dyes*) |
| R.15 | 1986 | SA | *Niandu Gongzuo Zongjie* (*Internal annual report of SA*) |
| R.16 | 1986 | SB | *Benniandu Gongzuo Zongjie* (*Internal annual report of SB*) |
| R.17 | 1986 | Shanghai Dyestuff Company | *Yuanliao Guige Huibian* (*Collection of Raw Material Specifications*) |
| R.18 | 1987 | Shanghai Dyestuff Company | *Yali Rongqi Sheji Zhong De Jidian Tihui* (*Some Know-how Gained in the Design of High-pressure Vessels*) |
| R.19 | 1987 | MB | *Zhijie Ranliao Gongyi Guicheng* (*Procedures to Make New Direct Dyes*) |
| R.20 | 1987 | SB | *Ranliao Shengchan Guimo Kuoda Chubu Sheji De Baogao, Kuoda Chubu Sheji Fang’an Deng* (*Report on Production Expansion Project, Initial Design of Production Expansion Project, etc.*) |
| R.21 | 1992 | SB | *Zhongdian Fazhan Huagong Shengchan, Yinglai Qiye Xinde Zhuanji – 1991 Niandu Gongzuo Zongjie* (*Developing Chemical Production to Promote Firm Growth – Work Summary for 1991*) |

APPENDIX 3 Supplementary case evidence

Incumbent-to-startup flows of technical knowledge

SA produced Resin CPU (a dyeing auxiliary) as its first product in 1979. SA sourced its earliest manufacturing techniques of making Resin CPU all from the subsidiaries of the state-owned Shanghai Dyestuff Co., Ltd. and the Shanghai No.1 Silk Dyeing Factory. The cofounder of SA recalled, ‘*It was March 28th 1979. The director of Shanghai No.1 Silk Dyeing Factory and an engineer met me in Shanghai. They agreed to send engineers and technicians to our small workshop to help with the production of CPU Resin.*’ (I.8; M.6) These incumbent engineers and technicians informed SA of the product formula for CPU Resin and provided continued technical support, enabling the startup ‘*to imitate the existing techniques and to achieve steady production at an unmatched pace*.’ (I.8, 15, 43) According to SA’s internal annual report in 1981 (R.8), trial production of CPU Resin succeeded on May 4th—within a week after the installation of equipment, pilot scale production succeeded in late June, and full scale production started on July 1st. Xiang[[2]](#footnote-2)—the son of SA’s cofounder, a former assistant professor in chemistry, and SA’s president at the time of interview—confirmed that ‘*there was no way we could start to make CPU Resin in such a short time without the strong technical assistance from Shanghai* [Dyestuff Co., Ltd.]’ (I.7)

Besides product formulas and manufacturing procedures necessary to initiate production, the unskilled workers at SA also learned *‘delicate know-how to tailor manufacturing procedures to SA’s specific conditions and to different batches of raw materials.’* (I.7; M.6) Chemical firms that use the same manufacturing procedures to make one product often achieve different yields. SA’s founder said, ‘*Initially, we knew what procedures to follow yet did not know why. So, we stuck exactly to the procedures copied from Shanghai and suffered from low-yield coefficient from time to time.*’ (I.8) The lack of manufacturing know-how did not last in SA, as incumbent employees continued to share ‘*a number of valuable manufacturing skills accumulated throughout their long careers*’ (I.8, 43, 44) with SA’s workers. An engineer who was working in Shanghai Dyestuff Co., Ltd. in the 1980s noted, ‘*A two-second difference in the feeding speed generates significant changes in material waste. Almost every time I visited SA, I observed its production on the site and discussed the timing and speed of feeding with them. Each time I made an adjustment, I explained clearly the underlying reason. This happened many times after 1980.*’ (I.15) According to a Shanghai-based incumbent factory director, ‘*During the first two years after its* [SA’s] *foundation, I invited in total over 50 experienced workers* [from my state-owned factory and other Shanghai-based factories] *to work on weekends for SA. These workers taught SA’s workers how to handle the important processing steps properly hand by hand.*’ (I.43) Thus, SA employees received a lot of manufacturing know-how and improved manufacturing efficiency quickly, even as it ‘*normally takes years to learn if not for the intensive on-the-spot guidance from incumbent employees.*’ (I.8) This was the case for SA not only in the production of CPU Resin but also for a number of other products such as the Softening Agent S-1 (another auxiliary) introduced in 1981 (I.8, 44; J.11, 16).

Incumbent-to-startup flows of marketing & sales knowledge

MA was able to close sufficient sales immediately after establishment because of marketing channels offered by the Shanghai No.9 Dyestuff Factory. The founder recalled, ‘*We had difficulties selling D-Type dyes in large amounts initially. This situation changed in 1987 after we were introduced to several large customers by the Shanghai No.9 Dyestuff Factory. They also reminded us of what product features these large customers wanted.*’ (I.37) The state-owned incumbent employees were willing to share this knowledge with MA because it was a ‘win-win’ choice. As one former engineer of the Shanghai No.9 Dyestuff Factory explained, ‘*In the mid to late 1980s, our factory could not make sufficient D-Type direct dyes* [MA’s initial products] *to meet the increasing demand. Some employees in other factories of Shanghai Dyestuff Co., Ltd. introduced MA to us. We thought it did not harm to share with them the information of some clients who were in urgent need for Direct Blue. Sometimes we asked MA to send their dyes to use and we sold them using our brand.*’ (I.46)

Incumbent-to-startup flows of procurement knowledge

FA replaced its initial primitive equipment with suitable albeit not the most advanced equipment in the second year after foundation, based on knowledge provided by incumbent employees. As the founder remarked, ‘*It was certainly not a good idea to continually use household jars in production. However, what equipment would fit my factory? I wanted to get something sufficiently cheap yet sustainable, but where? An engineer from the Shanghai No.9 Dyestuff Factory accompanied me to a collectively-owned dye factory that was about to install new equipment. They insisted that any buyers must purchase the entire set of their old equipment. The engineer* [from the Shanghai No.9 Dyestuff Factory] *pointed out the defects of their old equipment and used these defects as a bargaining chip to ask the equipment owner to sell the equipment separately. He sounded so persuasive that I was allowed to* *choose only what I needed eventually.*’ (I.52) The original receipts and letters on this deal showed that the final price was almost 30% lower than the founder’s expectation (R.11).

Incumbent-to-startup flows of R&D management knowledge

As the SB founder and its former employees recalled, ‘*Three experienced engineers from the Shanghai No.8 Dyestuff Factory laid the managerial and structural foundation for the entire R&D system in SB*.’ (I.35, 42) From 1985 to 1990, the startup had the three as part-time consultants who were in charge of new product introduction (M.4; J.27). One of these engineers said, ‘*We helped SB introduce* (3-Aminophenyl)*-Urea and meta-ester* [two intermediates]*. In the process of product development, we started to train SB employees how to accomplish R&D projects in a learning-by-doing way so that later they could keep on improving product quality and introducing new products on their own. We also invited technicians and R&D personnel from other incumbent firms to give courses to SB employees.*’ (I.60) All these helped to build the necessary R&D-relevant knowledge base for SB within its first four years. A former SB employee said, ‘*I was recruited by SB in 1987. In the first three months we all attended training courses where some old incumbent firm engineers and workers were invited to teach.* *I was appointed to accompany an engineer from the Shanghai No.8 Dyestuff Factory whenever we needed to launch new products. I saw how he coordinated our efforts—we did not even know where to start, but he tried to find appropriate work for everyone—and how he organized a* [new product development] *project. This was very helpful when we tried to conduct R&D by ourselves in 1989.*’ (I.34) These inward knowledge flows equipped SB’s first Director of the Technology Department and a community of early employees with R&D management knowledge. Hence, SB people were able to ‘*organize the equipment installation, debugging, and procedural improvement for a new product workshop on our own in the second half of 1990. We spent less time than expected and saved more than CNY 200,000.*’ (R.21) Afterwards, SB recruited more R&D employees of its own, organized R&D employees properly, and launched well-controlled R&D projects independently.

Incumbent-to-startup flows of operational knowledge

The experience of SA is illustrative. As confirmed by the founder and secondary materials, ‘*Several directors at Shanghai Dyestuff Co., Ltd. reminded me of the importance to formalize the firm’s operational management in the early 1980s.*’ (I.8; M6) At the request of SA's founders, they further consulted their peers and collectively drafted the earliest operational documents of this new firm. One SA director said, ‘*Our earliest operational documents, such as general operational manuals, safety handbooks, inventory management methods, workshop regulations, and quality control handbooks, were drawn up by engineers from Shanghai Dyestuff Co., Ltd. Before that, we did not have systematic formal operational regulations.*’ (I.2) In addition, the cofounder’s acquaintances at Shanghai Dyestuff Co., Ltd. invited workers at their own factories to ‘*familiarize SA employees with these rules by working together with them.*’ (I.4, 40). The first generation of workers and workshop supervisors in SA grew up quickly in this way. ‘*The startup was able to introduce and implement some TQM* [total quality management] *activities as early as in 1985* [the sixth year after SA’s foundation]*. The three-level quality management system could function because of well-designed criteria and previous training offered by incumbent employees.*’ (M.6)

Incumbent-to-startup flows of the knowledge about the selection of products

In the case of SA, its product lines in the 1990s were to a large extent shaped by the strategic mindset passed from the managers at Shanghai Dyestuff Co., Ltd. during the mid-1980s. As the founder recalled, ‘*We introduced 22 products in the first five years, out of which 18 had yielded profits by the end of 1984. All these products were dyeing auxiliaries. We introduced them as they were lucrative and we could find formulas and technical support. Yet my friends at Shanghai Dyestuff Co., Ltd. and the Shanghai No.1 Silk Dyeing Factory called our attention to whether our growth was sustainable. They warned us against making auxiliaries for so many categories. The auxiliaries we made were of five different categories—too diverse to generate scale advantages. In addition, the technologies to make auxiliaries were not very complex and many small factories entered this segment. The profit margin of auxiliaries would drop.*’ (I.8, 70)

The incumbent employees not only criticized SA’s arbitrary selection of new products but also recommended a more appropriate product portfolio. They made it clear that SA would benefit the most by making products in greatest demand—not those with the highest profit margin—and by minimizing costs through in-house production of key intermediates at the earliest opportunity. The General R&D Manager of SA at the time of the interview, who joined SA in 1993 when the firm started non-auxiliary businesses, remarked: ‘*Our old boss* [the cofounder] *and the current boss* [the son of SA’s cofounder] *told me a lot why the focus of our business shifted from dyeing auxiliaries to disperse dyes. The engineers and managers of Shanghai Dyestuff Co., Ltd. told my old boss* *in 1981 or 1982 that the demand for auxiliaries was not large enough to cultivate strong manufacturers having advantage of scale. Also, the technologies of dyeing auxiliaries were too simple to form an entry barrier. To stay in this business, SA needed to take on the production of dyes and dye-related products that were more technologically complex. They suggested disperse dyes as a promising choice. The output of synthetic fibers was rising quickly in China* [and the demand for disperse dyes to dye synthetic dyes would rise]*.*’(I.4)

The founders and executives of SA absorbed the knowledge regarding future product selection. The startup gradually got prepared for the sequential introduction of disperse dyes and related products through the 1980s, although it did not launch the project of disperse dyes until 1992 because of financial and human resource constraints. The cofounder and his son (the current president of SA) explained, ‘*We added dispersants* [dyeing auxiliaries added to crude disperse dyes to make commercial disperse dyes] *to our product line very early in 1984–1985* [the fifth year after SA’s foundation]*. We made huge, continual efforts improving the quality of dispersants and expanding its production scale. Our intention was to use in-house supplied high-quality dispersants in the production of disperse dyes in the future. In 1993, we successfully improved the qualification ratio of a key dispersant to 100 percent. Only after that were we confident that we could produce acceptable disperse dyes. We started to supply disperse dyes in large amount in 1993, but it was a ten-year adventure in retrospect.*’ (I.8, 70)

Incumbent-to-startup flows of the knowledge about the making of scale-up decisions

SB received valuable advice during its founding years on the overwhelming importance of scaling up, on the products to scale up, and on the minimum production scale for key products. As the founder recalled, ‘*In 1988* [the third year after SB’s foundation]*, my friends working at Shanghai Dyestuff Co., Ltd. told me it was not sustainable to expand by introducing more categories of products and manufacturing each one in small amounts.* […] *The sustainable way to keep the firm growing was to expand the production* of *a limited range of products.*’ (I.42) SB immediately took the advice and started to change its product line.

Meanwhile, incumbent employees also recommended Reactive Blue 19 and related intermediates as promising products that would facilitate scaling up. Furthermore, incumbent employees offered the startup clear insights on the minimum product volumes that were necessary to create a cost advantage. A former senior manager said, when SB started the production of meta-ester (a key intermediate for reactive dyes) in 1990: ‘*I told them it was useless to make only 15-20 tons of meta-ester per month. Such a small scale could not help lowering costs and prices much. They should produce at least 100 tons of meta-ester monthly, or over 1,200 tons a year.*’ (I.27, 28, 30) Taken together, the knowledge SB received about scaling-up decisions made it pursue a low-cost strategy ever since its fourth year and encouraged it to scale up the production of key products at the first chance available.

1. We do not provide the authors of some documents to keep the names of startup founders and other interviewees confidential. For the same purpose, we also replaced the original names of startups and startup founders that appear in the document titles with disguised names. [↑](#footnote-ref-1)
2. All of the names in this study are aliases. [↑](#footnote-ref-2)