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Professionalising Tacit Knowledge and Innovation Capacity: Case Studies of Chinese Family SMEs in Malaysia's Rubber Manufacturing Sector

LEE KEAN YEW, JACOB DONALD TAN and HADI CAHYADI

This study examines how the professionalisation of tacit knowledge and innovation capacity affects enterprise development in family businesses experiencing generational change. A conceptual framework is developed to link organisational outcomes with shifts in objective setting that influence innovation and development. Focusing on historical family business profiles from Malaysia's Companies Commission (SSM), the research uses multiple case studies and in-depth interviews to explore the professionalisation of tacit knowledge and innovation capacity in family-owned firms in the rubber industry. As the fifth-largest producer and exporter of natural rubber, Malaysia serves as a relevant context to analyse how the interplay between tacit knowledge and innovation capacity impacts operations, management, and outcomes during generational transitions in a knowledge-based economy.

Keywords: Professionalisation, tacit knowledge, innovation capacity, organisational outcomes, family business, rubber industry

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Lee Kean Yew (corresponding author), Department of Chinese Studies and Malaysian Chinese Research Centre (MCRC), University of Malaya, Kuala Lumpur 52100, Malaysia. E-mail: leekeanyew@um.edu.my

Jacob Donald Tan, Faculty of Economics & Business, Pelita Harapan University, Jakarta, Indonesia. Bissett School of Business, Mount Royal University, Calgary, Canada.

Hadi Cahyadi, Faculty of Economics & Business, Tarumanagara University, Jakarta, Indonesia.

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Introduction

Innovation is crucial for the growth and long-term survival of enterprises, significantly contributing to economic development (Militaru et al., 2024). It drives growth independently of broader economic conditions (Nguyen et al., 2024). Many enduring firms are family-owned and thrive across generations. Schumpeter defines development as a historical process involving four dimensions: invention, innovation, diffusion, and imitation, which create new opportunities for investment and employment (Śledzik, 2013).

In this context, innovation capacity refers to a family firm's ability to leverage its intellectual resources and knowledge (Ratten & Dana, 2022). Learning and knowledge acquisition are critical for competitiveness (Kean Yew, 2023a; Nonaka et al., 2000). A vital aspect of knowledge in family firms is the distinction between explicit and tacit knowledge (Nonaka, 1994), with effective transfer of tacit knowledge being essential for evolution. Networking is a precursor to innovation, while upgrading involves enhancing and adding value to products (Adjei et al., 2018).

Recent years have seen increased interest in formalising technical-economic networks, with innovation becoming a priority on policy agendas in developed nations. Policymakers aim to institutionalise innovation processes to replicate the professionalisation of tacit knowledge at a macro level. The knowledge-based economy emphasises knowledge as the core of competitiveness, shifting government focus from managing business cycles to fostering innovation through policies on industry structure and market expansion.

The first rubber estate in Malaya was established in 1899 by Tan Chay Yan, inspired by Henry Nicholas Ridley's recognition of rubber's profitability. By 1905, rubber estates had proliferated, coinciding with a global rubber boom. Despite historical success, family businesses in the rubber industry face challenges adapting to a changing environment. Younger generations are enhancing their competitiveness by leveraging rubber technology to transform raw materials into valuable products (Drabble, 1972).

Generational evolution influences the professionalisation of tacit knowledge and innovation capacity, impacting organisational outcomes (Kean Yew & Xavier, 2022; Schweiger et al., 2023). Family businesses can secure positions in oligopolies through effective advantages and economies of scale, fostering innovation capabilities (Teece, 2010). This evolution encourages a shift from hierarchical to flattened structures that promote innovative ideas (Upton & Heck, 1997).

Investment in research and development (R&D) and market expansion is essential for family firms to evolve into modern enterprises (Teece, 2010). This study evaluates first, second, and third-generation family-owned rubber firms regarding outcome management, tacit knowledge, and innovation capacity. It also explores the idea that family businesses often do not survive beyond the third-generation, contributing to literature by examining how innovation capacity facilitates technological upgrades and how second and third-generation firms add value and innovate in a globalised market.

Rubber Industry and Family Business in Malaysia

In a knowledge-based economy, the exchange of partially understood knowledge among family firms across generations significantly enhances their innovative capabilities and enterprise development. As these capabilities grow, so does the importance of social capital. When succession occurs in family firms, the entrepreneurial culture influences decisions regarding enterprise development (Graves & Thomas, 2008). However, the third-generation often dissipates the wealth created by the first and maintained by the second (Weidenbaum & Hughes, 1996).

The first rubber plantations in Malaya were established in 1896, and rubber cultivation expanded across Southeast Asia, particularly in Malaysia and Indonesia, driven by global demand for automotive tyres. After the Second World War, natural rubber (NR) consumption declined due to the rise of synthetic rubber. However, since the 1980s, factors like oil shocks and reassessments of NR's qualities have reversed this trend. For over four decades, Malaysia's economic growth has been supported by an open global trading environment, positioning the country as an attractive destination for foreign direct investment (FDI).

In the 1960s, family firms in the rubber industry were predominantly small-scale and managed by ethnic Chinese families, many of whom lacked the capital and technical expertise to compete with foreign entities. Limited government support further constrained their growth, leading these firms to rely on foreign technology (Khor, 1983). Nevertheless, their initial success in rubber plantations and the adoption of European technology enabled diversification into various rubber production activities. By the late 1970s, Chinese family firms had expanded into the financial sector and rubber contract manufacturing (Hara, 1991; Tan, 1982).

United Malayan Banking Corporation (UMBC), established in 1976 by Chang Ming Thien and others, marked a significant milestone as the first commercial bank founded by businessmen from the rubber industry. In the absence of a strong Malay entrepreneurial class in the late 1980s, Chinese family-owned firms played a crucial role in rubber tyre manufacturing and the nationalisation of key economic sectors (Jesudason, 1989; Tan Chin Nam, 2006). However, while founders impart tacit knowledge to successors, they often fail to equip them with the skills needed to identify new opportunities and develop competitive advantages (Drozdown, 1989).

Product innovation is essential for family businesses, reflecting their propensity to engage in creativity and experimentation, leading to new products or modifications to meet market demands (Lumpkin & Dess, 1996, 2001; Zahra & Covin, 1995). The Malaysian rubber industry has seen remarkable progress, with rubber consumption increasing by 209% from 1990 to 2007. Malaysia is now the fifth-largest consumer of NR globally and the largest producer of latex gloves and other latex products. Export earnings from the rubber industry grew by 438.1% during the same period, largely due to the latex sector. In 2022, the rubber industry contributed 0.1% to the gross domestic product (GDP) of Malaysia. The value added of the rubber industry to the GDP was expected to reach 1.79 billion Malaysian

Ringgit in 2022. The rubber industry contributed to 2.3% of the agriculture sector in Malaysia (Ministry of Investment, Trade and Industry, 2023).

The industry has evolved into a more integrated sector, with rapid development in mid- and downstream industries driven by the various diseases such as AIDS and COVID-19 demand for rubber gloves. The introduction of three Industrial Master Plans has further stimulated growth in rubber manufacturing. Malaysia's strength in R&D has also enhanced productivity through new technologies in planting and processing. Despite the increasing research into sustainable development in family firms, there remains insufficient knowledge to improve organisational outcomes (Leonidou et al., 1998).

This study aims to identify the factors that professionalise tacit knowledge and enhance innovation capacity in family businesses, focusing on organisational outcomes and objective setting. This area is under-researched, particularly in the Malaysian rubber industry, which continues to maintain a competitive advantage due to high product quality. The research questions guiding this study are:

1. How have Malaysian family firms professionalised their tacit knowledge during generational evolution to remain competitive in the rubber industry?
2. Is innovation capacity, through improved organisational outcomes, a crucial factor sustaining Malaysian family firms in rubber production?

Defining Organisation Outcomes in Family Business

Organisational outcomes significantly influence values, objectives, structure (Chandler, 1997; Chandler et al., 1999), and innovation capacity (Deshpandé et al., 1993; Siguaw et al., 2006). Research on strategy implementation across generational evolution in family businesses identifies three main streams. The first focuses on human aspects, emphasising people and organisational context as key to innovation and organisational outcomes. The second examines technological aspects, like R&D (Leblanc et al., 1997). The third suggests that family firms are increasingly leveraging global opportunities through partnerships and financial aid to achieve organisational outcomes.

Generational evolution can challenge the family-owned character of a business, potentially leading to unwelcome changes in objectives, values, culture, structure, and strategy. Habbershon and Williams (1999) suggest the Resource-Based View (RBV) allows for investigating the unique family structure as a distinct form of enterprise. Family values and objectives are considered precious, idiosyncratic resources providing a sustainable competitive advantage (Aronoff & Ward, 1995). However, the growing complexity of modern enterprises places responsibility on managers for resource allocation and strategic decisions. The rise of managerial corporations transformed industrial enterprises globally, impacting national competitive advantage and family-owned businesses (Elbaum & Lazonick, 1987), and leading to the emergence of first movers in various markets (Chandler, 1990).

Professionalising Tacit Knowledge in Family Business

In multi-generational family businesses, founders may struggle to develop their enterprise if they cannot transform tacit knowledge (personal experience) into codified knowledge (digitalised information) (Aoki, 2001; Polanyi, 1966). Transforming tacit knowledge to codified knowledge is crucial for enterprise development, with the founder's personal experience and competence becoming assets for subsequent generations to increase competitive power. Commercialising or capitalising tacit knowledge allows family enterprises to control knowledge production, leading to a competitive advantage and growth.

While not all tacit knowledge is social capital, much of it is created through social interactions. Codifying knowledge should be viewed as an investment in utilising existing social capital rather than creating new social capital. Knowledge-producing family enterprises often have more horizontal organisations than traditional hierarchical ones.

Family firms prioritise survival across generations, aiming to pass control to descendants (Zahra, 2005), incentivising effective capital management. Organisational flexibility, such as open communication, is important for strategy implementation. Family involvement can positively relate to strategy implementation towards enterprise development. Unlike non-family firms focused on short-term returns (Craig & Dibrell, 2006), family firms' long-term orientation (Salvato & Moores, 2010) may promote different strategy execution to professionalise organisational outcomes for sustainable enterprise development.

Professionalising Innovation and Enterprise Development in Malaysian Family Firms

Innovation, defined as the adoption of a new idea or behaviour, is crucial for organisations (Damanpour, 1991). Innovation capacity, or innovativeness, is a firm's ability and willingness to introduce new processes, products, or ideas successfully (Hult et al., 2004). Successful innovation requires a well-organised enterprise, with factors like cross-functional cooperation, commitment, leadership, effective processes, customer involvement, expertise, adaptive capacity, networking, and culture as key antecedents (Kean Yew & Xavier, 2022).

Chandler noted that managerial hierarchies can separate professional control from ownership. Transitions in ownership and control significantly impact company development, with stages including partnerships, single-owner/family business, and managerial control. The transition to managerial control often involves generational evolution (Penrose, 1980).

Chandler's analysis highlights that the growth of modern industry depends on upgrading technology/R&D for mass production and enhancing distribution capabilities. Achieving these objectives requires internal organisational adjustments to augment innovation and increase market share (Chandler, 1977).

Many family firms in this study have experience in rubber contract manufacturing and partnerships with MNCs, linking family business literature with tacit

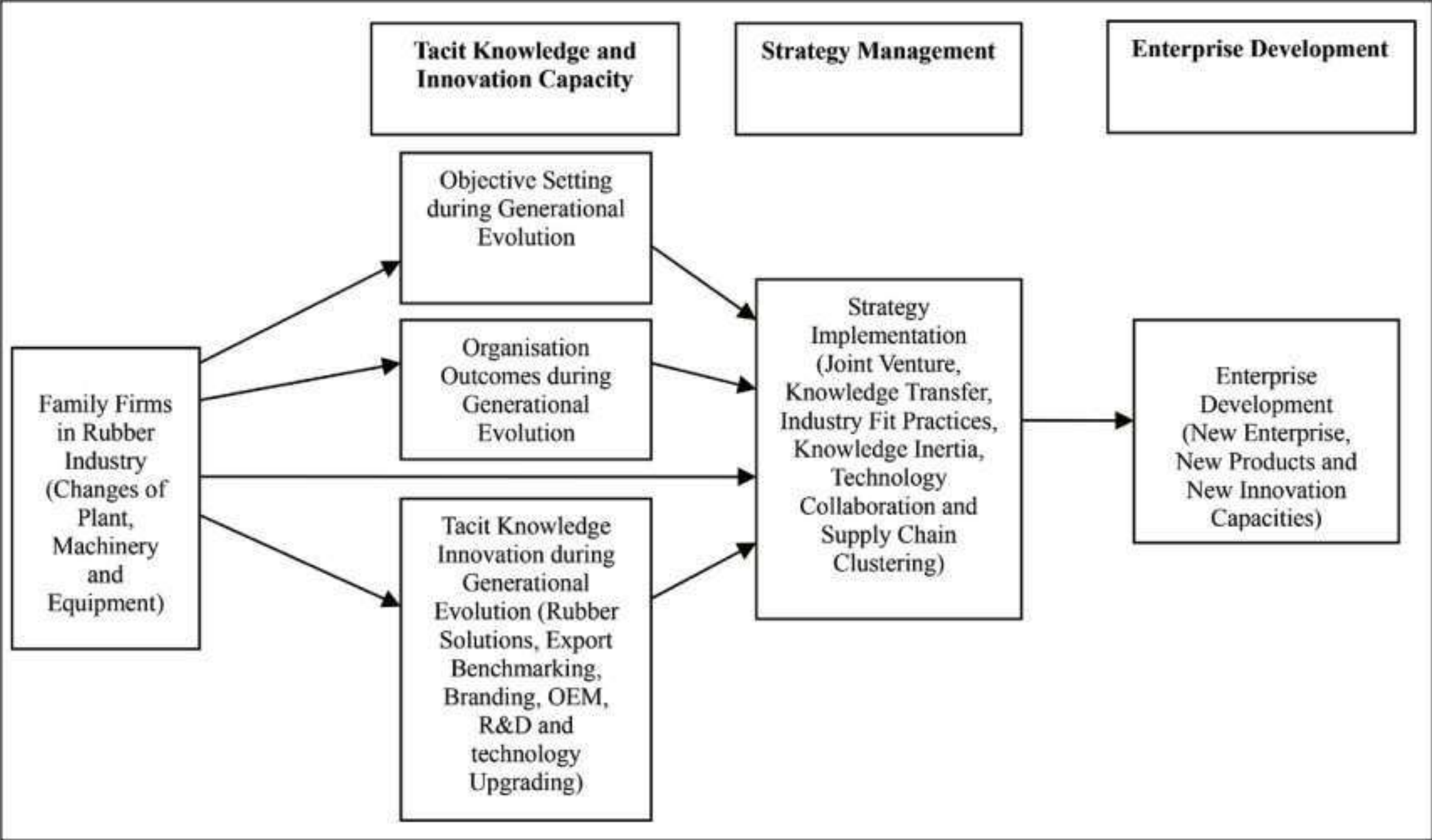
knowledge conversion. A framework merging organisational outcomes, tacit knowledge management, and enterprise development is needed to show the professionalisation of rubber firms during generational evolution in industrialised Malaysia. The Malaysian government has implemented policies to enhance manufacturing sector growth and cluster-based industrial developments for rubber-based SMEs. The rubber products industry is dominated by glove production.

Conceptual Framework

Prior research suggests integrating conceptual frameworks with other disciplines (Leonidou et al., 1998). Consequently, family business characteristics like establishment year, objective setting (Davis & Harveston, 2000), tacit knowledge innovation (Kean Yew, 2023b), antecedents of innovation capacity (Hadjimanolis, 2000), and generational evolution (Gómez-Mejía et al., 2002) influence strategic direction and behaviour between generations. These factors can have positive or negative impacts on organisational outcomes (Morck & Yeung, 2003), promoting strategies like organisational capabilities, joint ventures, knowledge transfer, technology collaboration, and supply chain clustering to foster enterprise development, brand products, new markets, and innovation capacities. Figure 1 illustrates the integration of these ideas to trace the link between objective setting, tacit knowledge, and innovation capacity through suitable strategies for professional organisational outcomes.

The enterprise development process in family businesses is elaborated through the lens of tacit knowledge and innovation capacity, as depicted in Figure 1. Handler (1989) emphasised the importance of focusing on next-generation family members and their perspectives. Research has since focused on desirable

FIGURE 1
Conceptual Framework.



organisational outcomes from leaders' perspectives, performance-enhancing factors, and the significant influence of the older generation on the next generation's performance (Morris et al., 1997). A supportive relationship characterised by mutual respect facilitates the smooth transition of knowledge, professionalism, and innovation capacity across generations (Steier, 2001). This conceptual framework provides preliminary steps to understand factors enhancing firm organisational outcomes and knowledge transfer in Malaysian rubber manufacturing. Future research should explore whether the preparedness of the next generation should also focus on understanding contextual factors that impede or enhance knowledge transfer across generations.

Research Methodology

The case study approach is valuable for family business research (De Massis & Kotlar, 2014), particularly for understanding generational evolution (Vesperi et al., 2023), a dynamic phenomenon (Eisenhardt, 2021). Following Eisenhardt's (2021) recommendation, ten cases were selected from the rubber industry: Four NR latex businesses, three rubber contract manufacturing businesses, and three rubber household production businesses.

Key criteria for case selection included:

1. being a family business in the rubber industry,
2. being owned and operated by a Malaysian, and
3. having experienced generational transitions.

Primary data was collected through in-depth, semi-structured interviews with successors, lasting approximately an hour. Interview data was validated with interviewees. Secondary data included newspaper articles and business information/annual reports from the Companies Commission of Malaysia. Data was triangulated, a pertinent approach in family business studies (De Massis & Kotlar, 2014), using three different data sources for validation and cross-checking, strengthening the study's design. Given the limited research on professionalising tacit knowledge in Malaysian Chinese family businesses, analysis methods were applied to analyse these case studies.

Table 1 presents changes in machinery, plant, and equipment in rubber manufacturing contributing to the growth of the firms. Changes in annual return, subsidiaries, and employees were analysed from annual reports. Table 2 shows changes in family business knowledge transformation contributing to enterprise development, driven by generational changes.

Empirical Case Studies of Malaysian Family Firms in the Rubber Industry

Profile analysis from annual reports (Table 1) indicates a rise in global NR consumption, from 5.4 million tonnes in 1993 to 13 million tonnes in 2015, which rubber manufacturers leveraged in various ways. Table 1 highlights the increasing

TABLE 1
Malaysian Rubber SMEs: A Look at Changing Production Factors
(Employees, Managers, Equipment and Plants).

Rubber Enterprises/Business Nature	Year Incorporated/ Generation	Annual Sales (RM Million)	Number of Employees	Number of Family Members	Number of Managers	Number of Subsidiaries	Number of Equipment	Number of New Products
1. Fung Keong Rubber (Rubber Motorcycle Tyres)	1933–2021 3rd	0.2–250	6–380	3–18	2–40	1–10	3–55	+25
2. Samsoney Group (Rubber Products, Foods & Bricks)	1951–2021 3rd	2–200	12–500	2–10	3–30	1–10	2–22	+125
3. Yap Hoi Kong (Rubber Household Products)	1962–2021 2nd	0.1–5	2–50	1–3	2–5	1–2	1–8	+118
4. Aerofoam Industry 1969 (Rubber Latex Bedding Products)	1965–2021 2nd	5–115	20–200	3–5	3–12	1–5	3–40	+105
5. Dongkuk Techco Rubber (Natural Rubber Latex Condoms)	1969–2021 2nd	0.5–10	10–98	1–2	1–10	1–2	2–12	+65
6. Tan Kor Seng & Sons (Rubber Contract Manufacturer)	1970–2021 2nd	0.2–50	5–48	3–8	2–10	1–4	2–30	+108
7. Selangor Rubber (Rubber Compounds & Products)	1974–2021 2nd	1–60	10–150	2–10	2–20	1–7	4–110	+90
8. Sim Mah Rubber (Automotive Rubber Parts)	1977–2021 2nd	0.3–35	20–110	3–10	1–8	1–5	4–60	+150
9. Perusahaan Getah Amal (Rubber Car Mats and Cushions)	1987–2021 2nd	0.2–25	3–55	2–8	2–10	1–2	4–70	+133
10. Tan Sin Lian Industries (Rubber Latex Gloves)	1990–2021 2nd	0.5–100	10–180	2–7	2–8	1–6	3–10	+60

Source: Annual Company Records from Companies Commission of Malaysia (SSM).

TABLE 2

Generational Change, Knowledge Transformation and Enterprise Development of Family Firms in Plastic Manufacturing.

<i>Rubber Family Firms/ Business Nature</i>	<i>Year of Establishment/ Generation</i>	<i>Organisation Outcome in Family Business (Old Generation)</i>	<i>Organisation Changes in Family Business (New Generation)</i>	<i>Objective Setting in Tacit Knowledge Innovation (Old Generation)</i>	<i>New Objective Setting in Tacit Knowledge Innovation (New Generation)</i>	<i>Enterprise Development and Innovation Capacity (Old Generation)</i>	<i>New Enterprise Development and Innovation Capacity (New Generation)</i>
1. Fung Keong Rubber (Rubber Motorecycle Tyres)	1933 (third generation)	First Outcome To be one of the biggest rubber and canvas shoe manufacturers (made from crepe rubber from Malaysia) in Asia.	Outcome Changes Relocated the entire Canton factory (staff and equipment) to tyre manufacturing in Malaysia.	Old Objective Goal Monopolised the market of rubber shoes with aluminium lasts led by Fung Keong's family during 1920.	New Objective Goal Proposed joint venture and partnership with Inoac of Japan in 1987 and Dutch tyre maker Vredstein in 1995.	(Enterprise Development) From Canton brothers' rubber in China to Fung Keong's Pagoda brand of rubber sole canvas shoes in Hong Kong.	(Enterprise Development) From a rubber sole canvas shoes manufacturer and acquired by General Corporation Berhad.
		Outcome Management Established rubber factories in China, Hong Kong and Malaysia.	Outcome Management Allocated the resources for producing bicycle and motorcycle tyres	Tacit Knowledge Innovation From China to rooting innovations in rubber tyres in Malaysia.	Tacit Knowledge Innovation From rubber shoe manufacturing to a leading FKR's tyre manufacturer in Malaysia.	(Old Innovation Capacity) • Canton brothers rubber • Pagoda brand of rubber footwares	(New Innovation Capacity) • FKS tyres • All America shoes • Pennylane tyres • Fleks tyres.
2. Samsoney Group (Rubber Products, Foods & Bricks)	1951 (third generation)	First Outcome To be one of the most diversified and globalised rubber companies in Malaysia and Southeast Asia.	Outcome Changes Diversified the entire rubber processing industry to plantation, food and printing.	Old Objective Goal Monopolised the market of natural rubber latex and sheet, led by Soh's family before colonial rule.	New Objective Goal Proposed knowledge transfer in a public-private partnership in 1985 in Malaysia.	(Enterprise Development) From family-owned Soh brothers trading to Kian Lee SMR rubber factory in Malaysia.	(Enterprise Development) From SMR rubber processing to venturing into export-based trading and companies.
		Outcome Management Focused on Smart Malaysia Rubber (SMR) and Ribbed Smoke Sheet Rubber (RSS).	Outcome Management Utilised the resources by investing in the agriculture-based trading activities.	Tacit Knowledge Innovation From the colonial economy to the domestic economy, innovations in rubber latex.	Tacit Knowledge Innovation From natural rubber processing to a leading Samsoney Group of companies in Malaysia.	(Old Innovation Capacity) • Soh brothers trading • Kian Lee SMR and RSS rubber processing and trading activities.	(New Innovation Capacity) • Kinabalu rubber • Giti food • Printing & paper:MIK transport • Plantation

(Table 2 continued)

(Table 2 continued)

Rubber Family Firms/ Business Nature	Year of Establishment/ Generation	New Objective Setting			New Enterprise	
		Organisation Outcome in Family Business (Old Generation)	Organisation Changes in Family Business (New Generation)	Objective Setting in Tacit Knowledge Innovation (Old Generation)	Enterprise Development and Innovation Capacity (Old Generation)	Development and Innovation Capacity (New Generation)
3. Yap Hoi Kong (Rubber Household Products)	1962 (second generation)	First Outcome To be one of the centralised households of rubber products in Malaysia and an overseas Chinese rubber merchant.	Outcome Changes Adjusted the entire rubber goods to fit with the industry specifications in Malaysia and overseas.	Old Objective Goal Monopolised the market of rubber household products with customisation orders in Malaysia & Asia.	(Enterprise Development) From a family-owned cottage business to YHK's rubber goods manufacturer and trading.	(Enterprise Development) From rubber household products with custom moulding to an appointed vendor of MNCs Conglomerates.
		Outcome Management Established a light industry rubber household production.	Outcome Management Industrialised the resources by introducing a few types that fit the industry scope.	Tacit Knowledge Innovation From regional business to industry, science, and resource innovations.	(Old Innovation Capacity) • Custom moulded • Extruded rubber • Household products • Fittings	(New Innovation Capacity) • Furniture rubber • Sanitary rubber • Plumbing rubber • Rubber tooling • Rubber parts
					(Enterprise Development) From a local house brand of bedding products to one of the most reputable brands of Aerofoam in Malaysia.	(Enterprise Development) From Aerofoam rubber- based bedding products to export trading with superior brands of Malaysian rubber.
4. Aerofoam Industry 1969 (Rubber Latex Bedding Products)	1965 (second generation)	First Outcome To be one of the leading manufacturers of bedding products by using 100% pure Malaysian rubber.	Outcome Changes Expanded the business by promoting Malaysia rubber-based bedding products to China market.	Old Objective Goal Monopolised the market of Malaysia rubber-based bedding products in the domestic and Asia market.	(Enterprise Development) From a local house brand of bedding products to one of the most reputable brands of Aerofoam in Malaysia.	(Enterprise Development) From Aerofoam rubber- based bedding products to export trading with superior brands of Malaysian rubber.
		Outcome Management Manufactured bedding products under the brand of Aerofoam.	Outcome Management Advancing and reconversion of rubber products in bedding and mattresses.	Tacit Knowledge Innovation From natural rubber latex production to one of Malaysia's branded products.	(Old Innovation Capacity) • Aerofoam beds • Aerofoam pillow • Aerofoam natural latex topper and mattresses.	(New Innovation Capacity) • Mylatex (Malaysia R&D) • Therapeutic (US Patent) • Aerofoam

5. Dongkuk Techco 1969 Rubber (Natural (second generation) and Condoms)	First Outcome To be a premier manufacturer of natural rubber latex-based products with a motto ‘To meet our customers’ since 1979.	Outcome Changes Focused on OEM condoms and latex-based products to meet the requirements of overseas.	Old Objective Goal Monopolised the market of OEM condoms and finger coats in accordance with international standards.	New Objective Goal Proposed knowledge training in producing OEM condoms with Dongkuk Trading from Korea.	(Enterprise Development) From Korean Dongkuk technology in OEM condoms and contraceptives to Malaysia-Korea OEM condoms.	(Enterprise Development) From Malaysia-Korea OEM condom to one of the global supplier in OEM condoms and contraceptives from Asia.
	Outcome Management Manufactured rubber latex products based on OEM specifications.	Outcome Management Fostering supply chain innovations to provide OEMs with branding.	Tacit Knowledge Innovation From rubber latex products to the Korean technology of OEM condoms in Malaysia.	Tacit Knowledge Innovation From Korea-based technology to OEM condoms by using 100% Malaysia latex.	(Old Innovation Capacity) • Protex condom • Oasis condom • Pamitex condom • OEM condom • Finger coat.	(New Innovation Capacity) • Dongkok OEM condom (Korea) • Shadow OEM condom (USA) • Private labelling
6. Tan Kor Seng & Sons (Rubber Contract Manufacturer) 1970 (second generation)	First Outcome To be one of the pioneer industry leaders in rubber hose production in Malaysia, based on industry specifications.	Outcome Changes Upgraded the facilities to become one of the largest custom dry-based rubber manufacturers.	Old Objective Goal Monopolised the rubber works in a custom dry-based rubber manufacturer in Malaysia and Southeast Asia.	New Objective Goal Proposed knowledge inertia with globalised business partners based on past experience in the rubber works.	(Enterprise Development) From rubber hose production to a rubber contract manufacturer based on industry experiences and specifications.	(Enterprise Development) From rubber works solution to one-stop services for engineering design in various industries, oil and gas and marine.
	Outcome Management Produced OEM-based rubber products using the brands of TKSS.	Outcome Management Managing the production line by providing solutions to the rubber works.	Tacit Knowledge Innovation From a rubber hose to one of the rubber contract manufacturers in Malaysia.	Tacit Knowledge Innovation From the TKSS rubber hose to the rubber works solution for the dredging proces.	(Old Innovation Capacity) • Rubber hose • Dock hose • Oil suction hose • Terminal hose • Drilling mud	(New Innovation Capacity) • TKSS (Oil and Gas) • TKSS (Marine) • TKSS (Automobile)

(Table 2 continued)

(Table 2 continued)

<i>Rubber Family Firms/ Business Nature</i>	<i>Year of Establishment/ Generation</i>	<i>Organisation Outcome in Family Business (Old Generation)</i>	<i>Organisation Changes in Family Business (New Generation)</i>	<i>Objective Setting in Tacit Knowledge Innovation (Old Generation)</i>	<i>New Objective Setting in Tacit Knowledge Innovation (New Generation)</i>	<i>Enterprise Development and Innovation Capacity (Old Generation)</i>	<i>New Enterprise Development and Innovation Capacity (New Generation)</i>
7. Selangor Rubber (Rubber Compounds & Products)	1974 (second generation)	First Outcome To be one of the experts in providing industry solutions for synthetic rubber production in Malaysia.	Outcome Changes Participated in R&D to develop manufacturing resources from rubber to the application system.	Old Objective Goal Monopolised the market of synthetic rubber production in pipe seals, diaphragms and washers for the piping system.	New Objective Goal Proposed technological mix by integrating rubber technology with plastic engineering design.	(Enterprise Development) From synthetic rubber production to one of the main suppliers of rubber compounds and pipe seals in Malaysia.	(Enterprise Development) From a rubber compounds supplier to OEM rubber sealing strips to the automobile and electronic sectors.
		Outcome Management Customised orders based on quality downstream product applications.	Outcome Management Promoting state-of- the-art rubber technology and die facilities in Applications.	Tacit Knowledge Innovation From synthetic rubber to OEM rubber parts for supplying to local MNCs.	Tacit Knowledge Innovation From OEM rubber parts to automobile rubber parts, assembly adhesives.	(Old Innovation Capacity) • Pipe seals • Diaphragms • Washers • Gaskets • Weatherstrips	(New Innovation Capacity) • Rubber strip (automobile) • Weatherstrips (electronic) • Technical seals.
		First Outcome To be one of the main suppliers in producing automotive rubber parts and accessories in Malaysia and ASEAN.	Outcome Changes Worked closely with the automotive industry cluster in Malaysia to produce rubber Components.	Old Objective Goal Monopolised the market of automotive rubber components for Japanese automotive standards.	New Objective Goal Proposed supply chain clustering in the automotive industry cluster in Malaysia to penetrate the ASEAN market.	(Enterprise Development) From OEM in automotive rubber parts to partner of automotive-supplier industry in Malaysia and the Japanese market	(Enterprise Development) From OEM automotive rubber parts to online- based custom rubber moulding for overseas automotive plants.
8. Sim Mah Rubber (Automotive Rubber Parts)	1977 (second generation)	Outcome Management Manufactured automotive rubber parts and accessories in Malaysia	Outcome Management Facilitating automation in the manufacturing operations of rubber parts.	Tacit Knowledge Innovation From automotive rubber parts to OEM rubber parts for Japanese automotive plants.	Tacit Knowledge Innovation From OEM rubber parts for Japanese to become partner for overseas automotive plants.	(Old Innovation Capacity) • Engine mounting • Absorber mounting • Bushes and boots • Steering boots	(New Innovation Capacity) • Yaskawa plant • Nissan plant • Audi plant • Daewoo plant • Mazda plant

9. Perusahaan Getah Amal (Rubber Car Mats and Cushions)	1987 (second generation)	First Outcome To be one of the pioneers and leading supplier in rubber car mats and cushions in Malaysia and Southeast Asia. Outcome Changes Enhanced the craftsmanship in producing quality rubber car mats for the specific industries.	Old Objective Goal Monopolised the market of rubber matting and car cushions to fulfil specific requirements from the industry.	New Objective Goal Proposed craftsmanship in advancing rubber technology to produce more customised rubber products.	(Enterprise Development) From the OEM rubber mats and cushions to a craftsmanship centre for rubber technology and rubber moulding capabilities.	(Enterprise Development) From the craftsmanship centre for rubber technology to the high technology of precision rubber production.
10. Tan Sin Lian Industries (Rubber Latex Gloves)	1990 (second generation)	Outcome Management Provided a complete solution for moulded and extruded rubber. Outcome Management Building craftsmanship in rubber matting and rubber components.	Tacit Knowledge Innovation From rubber matting and components to rubber technology craftsmanship.	Tacit Knowledge Innovation From rubber technology craftsmanship to precision rubber technology.	(Old Innovation Capacity) Moulded rubber Rubber matting Extruded rubber Rubber parts and components	(New Innovation Capacity) Precision rubber and polymers Silicone rubber for LED applications
		First Outcome To be one of the big four companies in producing rubber latex gloves in Malaysia and overseas. Outcome Changes Adhered to good manufacturing practice for local business and export trading.	Old Objective Goal Monopolised the market of industrial and non-industrial for 100% Malaysia rubber latex or nitrile gloves.	New Objective Goal Proposed continuous improvement and R&D in producing healthcare and non-healthcare latex gloves.	(Enterprise Development) From local OEM rubber latex glove supplies to export trading by using the Qualatex brand in both healthcare & non-healthcare.	(Enterprise Development) From TSL rubber gloves under Qualatex to certified gloves manufacturing across the US and Europe.
		Outcome Management Customised the rubber latex gloves based on industry specifications. Outcome Management Emphasising stringent quality control in producing latex gloves.	Tacit Knowledge Innovation From local rubber gloves to international accredited latex glove supplies.	Tacit Knowledge Innovation From industrial glove supplies to approved TSL glove supplies during COVID-19.	(Old Innovation Capacity) • Powder-free gloves • Powdered gloves • Surgical gloves (Under Qualatex)	(New Innovation Capacity) • Qualatex gloves (USA grade) • Qualatex gloves (European grade) • Surgical gloves

Source: In-depth interviews.

involvement of family members and managers across generations due to investments in human capital and machinery. It also shows knowledge transformation requiring sophisticated technology during generational change. While Malaysia was the top NR producer/exporter in the twentieth century, it ranked sixth in 2015 (Othman & Yeoh, 1986).

Malaysian exports data (1998–2013) show increased exports of gloves and latex products (from RM 1400 million in 1998 to RM 3400 million in 2013), but stagnant tyre production, reflecting the national car project's struggles. Malaysia has seen growth in rubber-based manufacturing like gloves, capitalising on opportunities from HIV/AIDS and COVID-19. Malaysia holds a 63% share of the global examination glove market.

This has shaped enterprise development and organisational capabilities of the ten rubber manufacturing firms, categorised by employee count in SMEs.¹ Table 1 reveals new rubber products and activities across the rubber value chain (machinery upgrades, infrastructure, human capital management). The next generation processes raw rubber into intermediate products, technically specified rubber (TSR), generally called block or standard rubber, ribbed smoked sheet (RSS) and latex concentrate, through in-house R&D, supported by interviews.² Transferring tacit knowledge across generations presents new operating models for traditional family businesses and start-ups.

Second-generation CEOs from Tan Kor Seng & Sons mentioned a few points during the interview:

Established in 1970, Tan Kor Seng & Sons Sdn. Bhd. designs, manufactures, and exports high-quality OEM rubber products for heavy industries, including hoses, moulded articles, rubber sheeting, and rubber mats under the CROCODILE and TKSS brands. Led by CEO Mr. Tan Kean Beng, the company employs 100 people to support its production lines.

We focus on timely delivery and service, which is why we've invested in manufacturing and warehousing. We've also strategically expanded into markets like Australia, Indonesia, Japan, and others. We achieved ISO 9001:2000 certification in 2008 and now offer over 100 products internationally.

Marketing manager from Tan Sin Lian Industries explained to us during the interview:

Initially, we focused solely on the domestic market. However, over time, we noticed an increasing number of OEM companies approaching us to manufacture industrial latex gloves and medical nitrile gloves for export, particularly to the USA.

Recognising US market as a significant opportunity, we expanded our production capacity from 3 to 10 machines and simultaneously established sales offices to tap into overseas and international markets.

In the rubber sector, foreign firms are unreliable for technological knowledge dissemination. Firms like Fung Keong Rubber, Samsoney Group,³ and Tan Kor Seng & Sons experienced trial and error, requiring large R&D expenditures. With

Malaysia shifting to manufacturing, these firms create niche products like tropical motorcycle tyres and construction/industrial rubber products (Table 1), strengthening public-private linkages and sector business associations for sustainability.

The export manager from Fung Keong Rubber argued a few notes during the interview:

We've ventured into motorcycle tyres because our primary business of rubber shoes, particularly OEM production, has declined due to competition from Vietnam and Thailand. However, we believe that investing in R&D for motorcycle tyres can create a niche market in Southeast Asia, where motorbike ownership is very popular. The market potential is huge!

Third-generation CEOs from Samson Group suggested their views during the interview:

Our ancestors were primarily focused on rubber plantations, but each generation has different industry priorities. Like Dunlop, they've diversified to adapt to changing demands. Starting with SMR rubbers, we've expanded into trading and food, and now have over 150 products from R&D targeted at various industries.

Organisation Outcome, Innovation Capacity and Enterprise Development in Professionalising Family Business in Rubber Manufacturing

Malaysia's rubber glove industry, dominated by Chinese-Malaysian family firms like Dongkuk Techno Rubber⁴ and Tan Sin Lian Industries holds 63% of the global medical examination glove market. These firms, often second-generation businesses, manufacture diverse rubber products (tyres, hoses, gloves, etc.).⁵ Third-generation firms continue producing tyres and construction goods, benefiting from past industrial policies (IMP I & II). The next generation acquired knowledge from OEM businesses (Table 2), innovating tacit knowledge for market dominance. R&D during generational change is marked by entrepreneurial astuteness. Firms like Selangor Rubber, Sim Mah Rubber, and Perusahaan Getah Amal⁶ invested in human resources and in-house R&D. These firms secured niche markets in developing countries, operating as ODMs and OBMs. Sim Mah Rubber became a prominent ODM, targeting Japanese and European rubber OEM firms for automobile assembly plants.

The sales manager from Dongkuk Techco Rubber answered his opinions during the interview:

We've found that collaborating with Korean MNCs has allowed our products to easily penetrate the OEM markets in the condom and finger coat industries. With the increasing number of AIDS patients in Southeast Asia, our high-quality latex products, help us innovate and produce highly durable OEM condoms for the market.

We might not be the most price-competitive, our OEM condom products are gaining popularity in the West. They trust that we follow good manufacturing practices, durable and proudly made in Malaysia!

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Second-generation CEOs from Selangor Rubber discovered a few ideas during the interview:

Over time, more family members joined, some successfully engaging with the government sector. We're proud to have invested in in-house R&D for OEM rubber parts for Toto Japan and rubber sealing parts for the automotive industry.

A director from Sim Mah Rubber confirmed all these points during the interview:

Initially, our rubber production lacked market focus. We shifted our attention to automotive rubber parts, targeting Japanese car assemblers in ASEAN, like Yaskawa and other Japanese OEMs. ASEAN's strong preference for Japanese cars has been a significant factor.

Second-generation CEOs from Perusahaan Getah Amal found out something during the interview:

In the past, our company was hesitant to collaborate with the government sector. As the second-generation, we aim to create new wealth that partnering with the government will foster innovation in precision rubber technology. The more advanced our rubber technology, the more successful our business will become!

Changes of Machinery, Plant and Equipment in Rubber Manufacturing in Malaysia

Rubber manufacturing family firms in Malaysia combined 'catching up' with original development styles, acquiring technological and managerial capacity (Table 2). Business partnerships and OEM processes provided implicit knowledge for innovation. Next-generation leaders at Dongkuk Techco Rubber and Tan Sin Lian industries⁷ demonstrated foresight and independence, improving products and expanding overseas during the international expansion. R&D enhancement focused on higher value-added consumer products. Younger entrepreneurs, like those at Fung Keong Rubber and Aerofoam,⁸ developed rubber consumer products, emulating iconic Chinese-Malaysian

entrepreneurs. Fung Keong, after establishing rubber supply contacts, founded a rubber shoe factory in 1920, becoming a brand leader in canvas shoes and tyres. Emerging countries often lack technological capabilities (Kean Yew, 2023b). To avoid the middle-income trap, essential factors include improved education, infrastructure, R&D (Agénor & Canuto, 2012), strong national innovation systems, and business-government collaboration (Doner & Schneider, 2016), which are often lacking in middle-income countries.

The sales manager from Dongkuk Techco Rubber clarified his views during the interview:

We recognise that expectations vary. By upgrading our machinery with Korean technology, our OEM condoms meet market demands, allowing us to export to the US.

Marketing manager from Tan Sin Lian Industries conveyed her thoughts during the interview:

Without upgrading our machinery, we wouldn't meet the stringent US requirements for the pharmaceutical industry. US and Malaysian approvals have different criteria, so upgrades are essential.

The export manager from Fung Keong Rubber answered us during the interview:

Previously known for OEM Bata shoes, Fun Keong has diversified its machine capabilities, establishing FKS tyres as a well-known brand in Southeast Asia, particularly in Thailand.

The sales manager from Aerofoam pointed out his views during the interview:

Since 1969, Aerofoam has evolved beyond just producing affordable latex mattresses. Recognising the demand for quality sleep among urban consumers, we introduced US Therapedic by Mylatex.

As a pioneering and long-standing brand in Malaysia, we've consistently leveraged proven technology to produce quality latex mattresses, serving not only the Malaysian market but also China and other overseas markets.

*Generational Change, Knowledge Transformation and Enterprise
Development of Family Firms in Plastic Manufacturing*

To compete with low-labour-cost countries, Selangor Rubber and Perusahaan Getah Amal's next generations promoted R&D in the automobile precision rubber sector. Selangor Rubber focused on silicone rubber for automobiles, while Perusahaan Getah Amal conducted R&D in rubber technology for automobile parts. Tan Kor Seng & Sons and Simmah Rubber shifted from OEM to exploit ASEAN industrial clusters. Dongkuk Tehco Rubber's next generation, with Korean technology skills, entered the healthcare industry. Samsoney transitioned from plantation to export trading.

Innovation was encouraged through professional management and outsourcing, aligning with government policies. Aerofoam conducted R&D in high-tech bedding, supporting local industrialisation. Fun Keong Rubber established the FKR tyre brand by adhering to import-substitution industrialisation (ISI) and ventured into All America shoes and Pennylane tyres by following export-oriented industrialisation (EOI). Cooperation with Thai partners promoted knowledge sharing. Yap Hoi Kong's next generation lacked interest in rubber household production.⁹

Second-generation CEOs from Yap Hoi Kong explained the evolutions in family business during the interview:

In the first generation, only household rubber production. In the second-generation, we launched YHK-branded rubber tools for various applications. Thankfully, it was a success!

I believe that YHK-branded rubber tools create new tacit knowledge in emerging industries. Rubber tools as a replacement for metal fabrication in mining industry.

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Table 2 shows that autonomy for family and non-family managers in Samsoney led to new production methods and R&D for export trading. Fun Keong Rubber and Selangor Rubber designed new rubber production concepts for automobiles and motorcycles. Tan Kor Seng & Sons developed a flexible organisation for ODM, establishing a consultative OEM rubber design laboratory. Tan Sin Lian Industries enhanced its knowledge to venture into healthcare and chemical-resistant industries.¹⁰

Marketing manager from Tan Sin Lian Industries explained the new knowledge during the interview:

In the past, we focused solely on industrial-grade rubber latex gloves. However, with diseases like AIDS and Ebola affecting our health, we began developing medical latex gloves to address these challenges.

Descendant-controlled Chinese family firms are more professionally run, effective at tacit knowledge management, and use personal mechanisms for successor training, as seen in Tan Kor Seng & Sons, Samsoney Group, and Selangor Rubber.¹¹ Specialised production processes make it difficult for competitors to copy product features.

The export manager from Fung Keong Rubber introduced new strategies in securing the next generation business during the interview:

With the advent of Industry 3.0 and new rubber moulded products emerging in telecommunications, we recognised the need for skilled professionals.

Third-generation CEOs from Samsoney Group explained that new knowledge is built upon past tacit knowledge, highlighting its importance in driving innovation and growth:

You may not realise that past knowledge in SMR processing can lead to advancements in brick production, paper manufacturing, and even food production.

Rubber technology can diversify from traditional rubber to green rubber production with a viable and innovative option.

Second-generation CEOs from Selangor Rubber discovered new knowledge in rubber production during the interview:

After collaborating with Japanese MNCs, we discovered how to produce durable rubber seals that can withstand harsh weather and are water-resistant.

Managerial Implication

To remain competitive, Malaysian family firms in the rubber industry must prioritise the professionalisation of tacit knowledge during generational transitions. This involves fostering close interpersonal relationships for knowledge transfer (Nonaka, 1994; Turner & Makhija, 2006), granting autonomy to the next generation

to improve and rebrand products, and encouraging R&D activities. While some firms may choose to shift away from traditional tacit knowledge, particularly those involved with MNCs, a structured approach to knowledge transformation through objective setting, outcome management, and innovation is crucial for sustained success. Addressing the challenge of tacit knowledge leakage through protocols is also essential (Liebeskind, 1996).

Conclusion

Innovation capacity, driven by improved organisational outcomes, is a crucial factor sustaining Malaysian family firms in rubber production. While second-generation firms often transfer tacit knowledge, its effective management can be problematic due to rapid changes.

The success of these firms hinges on their ability to adapt and transform knowledge during generational shifts. Unlike previous studies suggesting a decline with less family involvement (Gersick et al., 1997; Gomez, 2007; Harris et al., 1994; Ward, 1987),¹² this analysis highlights the importance of a well-educated second generation actively involved in R&D and professionalised management. The major challenge lies in retaining tacit knowledge in the face of competition and technological advancements. Future research should explore entrepreneurial Chinese companies in other industries and address the problems faced by family firms of different ethnicities to leverage ethnic diversity for enhanced competitiveness.

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NOTES

1. SMEs with <150 employee.
2. Second-generation CEO from Tan Kor Seng & Sons noted equipment upgrades for OEM production (interview on 8 September 2011, 7–9 PM). The marketing manager from Tan Sin Lian Industries mentioned the growth in subsidiaries to cater to international pharmaceutical customers (interview on 11 November 2011, 6–8 PM).
3. The export manager from Fung Keong Rubber clarified that their new venture into motorcycle tyres, utilising Malaysian natural rubber products, could create a niche market in Southeast Asia (interview on 11 November 2011, 4–6 PM). The third-generation CEO from Samsoney Group, a UPM (public university in Malaysia) graduate and director, explained that R&D expenditure, in collaboration with MNCs, will lead to the innovation of more new products (interview on 15-10-2011, 6–8 PM).

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4. Interview conducted (23 June 2012, 3–5 PM) in Dongkuk Techno Rubber, headquarters in Penang.
5. The rubber-based product sector grew under the NEP (New Economic Policy), but at a slower rate than overall manufacturing. IMP I and II (Industrial Master Plan I and II) aimed to boost competitiveness by developing new production methods and materials through R&D involving rubber firms and public institutions. In 1998, the MRB (Malaysia Rubber Board) integrated the RRIM (Rubber Research Institute of Malaysia) and MRDB (Malaysia Rubber Development Board) to coordinate rubber R&D efforts.
6. The second-generation CEO from Selangor Rubber discovered that investing in R&D, particularly in rubber sealing strips, could expand their market from Toto sanitary parts to the automobile industry (interview on 2 March 2012, 2–3 PM). A director from Sim Mah Rubber explained that focusing on automobile rubber production could create more opportunities in ASEAN's Japanese car assembly sector (interview on 5 March 2012, 5–7 PM). The second-generation CEO from Amal Rubber found that investing in human capital through collaboration with the government sector could lead to innovation in precision rubber production (interview on 3 March 2012, 1–2 PM).
7. Interviews were conducted with Dongkuk Techno Rubber in Penang (23 June 2012, 3–5 PM) and Tan Sin Lian in Malacca (12 August 2011, 3–5 PM). Both companies upgraded their machinery to compete with US-based MNCs.
8. Interviews were conducted with Fung Keong Rubber in Klang (11 November 2011, 4–6 PM) and Aerofoam in Klang (15 September 2012, 10–12 PM). Both companies upgraded their manufacturing capabilities from Chinese SMEs to global branding in Malaysia.
9. Interview conducted (21 May 2012, 8–10 PM) in Yap Hoi Kong, Kuala Lumpur Plant.
10. In an interview (12 August 2011, 3–5 PM), Tan's heirs from Tan Sin Lian industries stated that building on their reputation by strengthening knowledge to match niche markets was essential for business efficiency.
11. The interviewees from Tan Kor Seng & Sons, Samsoney Group and Selangor Rubber agreed that sibling partnerships in production enhanced tacit knowledge management, leading to the successful launch of numerous branded products in domestic and international markets.
12. For the study of family involvement in family firms, see Ward (1987), Harris et al. (1994) and Gersick et al. (1997). For the case of Chinese Malaysia, see Gomez (2007).

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