

DIGITAL TRANSFORMATION OF EMERGING MARKET FIRMS

Evidence from Three Chinese Manufacturing Company Cases

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SUMMARY: This study explores the impact of internationalization activities, including exporting, international original equipment manufacturing (OEM) and foreign direct investment (FDI), on the digital transformation of emerging market firms. A multi-case comparison method is applied to illustrate the propositions. The case studies show that knowledge-seeking FDI directly contributes to digital transformation without mediations while exporting and industry linkages with foreign MNEs lead to digital transformation through dynamic capabilities development of the emerging market firm. Our findings highlight to the managers how various forms of internationalization can affect emerging market firms' catching up process differently in the current digital economy.

Introduction

Traditionally, emerging market firms (EMFs) are understood as organizations subject to a shortfall of firm-specific advantages such as key technologies, global brand awareness, and managerial capabilities (Wang, Luo, Lu, Sun, and Maksimov, 2014). Nevertheless, as of the end of 2021, 176 firms in the Global Fortune 500 list are from BRICS (Brazil, Russia, India, China, and South Africa) countries, with China alone surpassing the runner-up United States for the second consecutive year. EMFs have shown leadership in automobiles, banking, solar panel, computer electronics, etc. More interestingly, EMFs are moving with the same pace, if not faster, in digitalization as most of the developed country firms. The Netflix documentary “Fuyao Glass America,” sponsored by Barack Obama, captured a scene of Fuyao’s CEO, Mr. Cao talking about using robotic arms to combat the labor union problem: “Now it is the time to use automation to replace human workers.” A central research question to this study is what enables historically weak firms to rapidly incorporate advanced technologies and outcompete major world players in the era of Industry 4.0 which refers to the Fourth Industrial Revolution where rapid changes to technology, industries, and societal patterns and processes emerge due to increasing interconnectivity via internet and smart automation.

Based on UNCTAD (2017) distinction, digital technologies, relying heavily on Internet connections, are the new generation of information, computing, communication, and connectivity technologies, including blockchain, the Internet of Things (IoT), cloud space, big data, and artificial intelligence. Sometimes, digitalization is referred to as the 4th industrial revolution (Verbeke & Hutzschenreuter, 2020). Adopting the burgeoning digital technologies enable enterprises' long-term capability upgrading. In particular, digitalization has been identified as a solution to tackle global competition, including elevated consumer expectations and a new competitive dynamic in the marketplace (Vial, 2019). Monaghan, Tippmann, & Coviello (2020) identify six properties of digital technologies, direct engagement with stakeholders, including customers and employees, automation, network effects, flexibility, and

scalability, which allow digitalized firms to uncover new paths of value capturing and value creation. For example, a blockchain-based enterprise resource planning system (ERP) empowers the firm to conduct make-to-order mass production, satisfying customer personalization while leveraging economies of scale. More importantly, this blockchain-enabled ERP makes simultaneous tracking and correction possible, allowing plants to turn in quality products on schedule. Building these digital platforms usually requires dynamic capabilities, defined as "higher-level competencies that determine the firm's ability to integrate, build and reconfigure internal and external resources/competencies to address, and possibly shape, rapidly changing business environments (Teece, 2012, p. 1395)."

Aiming to understand EMFs' digital transformation process along with their globalization path, which is an inevitable component of EMFs' development, this study distinguishes three forms of international business activities, namely export, international original equipment manufacturing (OEM), and foreign direct investment. The selected case studies below explain how internationalization builds EMFs' dynamic capabilities in handling complex customer demands and eventually upgrades their capabilities when digital technology opportunities emerge.

Case Selection

The study uses three company cases from China to explore the research question on manufacturing firms' "go digital" process. Given that industrial enterprises' digital transformation is relatively new and under-researched, case studies allow us to understand the processes that large data analysis cannot substitute.

Our case study sample is selected from 2005-2019 Fortune 500 industrial firms in China, as many EMF studies (e.g., Luo and Tung, 2007, 2018; Özcan, Mondragon, & Harindranath, 2018) have shown that the internationalized EMFs are often the national champions. The selection criterion is to search for firms that have both internationalization experience and have undergone a digital transformation because our case studies aim to explore the relationship between internationalization and digitalization. We adopt Contractor (2013) archival multi-case comparison approach by reviewing extant case literature, documentaries, corporate presentations, and company annual reports and supplementing with trade journals, internet-based information, and newspapers. Considering all the criteria above and data availability, Luthai Textile, Fuyao Glass, and Huawei Technologies are selected. These three companies represent a diverse range of the manufacturing sector and are the leaders of their primary business industry.

Case Findings and Propositions

The following section reports the case findings and propositions. Table 1 synthesizes the digital transformation process of the three selected companies, each representing one of internationalization channels.

Table 1

Case finding summaries

		Luthai (exporting)	Fuyao (OEM)	Huawei (FDI)
Company profile	Year of inception	1987	1987	1987
	Corporate location	Zibo City, Shandong Province, China	Fuqing City, Fujian Province, China	Shenzhen City, China
	Ownership structure	80% domestic private ownership, 20% foreign ownership	100 % domestic private ownership	100 % domestic private ownership
	Market position (nationwide)	Top 10, based on annual sales revenue, among 9,908 firms in the same industry	Number 1, based on annual sales revenue, among 798 firms in the same industry	Number 1, based on annual sales revenue, among 1098 firms in the same industry
	Industry	Processed textile products	Industrial glass manufacturing	Communication equipment
	Products	Yarn-dyed fabric, cotton yarn, undergarments	Auto glass	Device for telecommunication
Internationalization	Type of internationalization, entry modes, and starting year	Exporting, 1993	International OEM, 1989	Knowledge-seeking FDI (greenfield)
	% of foreign sales	70%-85%	50%-65%	50%-60%
	Main Foreign markets (partners)	United States (Philips-Van-Heusen), Japan (UNIQLO), United Kingdom (Burberry), Italy (Armani, Gucci)	United States (General Motors), Europe (Volkswagen), Japan (Toyota)	Europe, Africa, Southeast Asia
Dynamic capability	Relation to internationalization	Idiosyncratic demands require constant product updates; cost and time pressure urge Luthai to adopt up-to-date management tools and production techniques such as ERP and automation.	Technology spillover from foreign MNEs; High-quality requirement from foreign MNEs urges Fuyao to update techniques frequently.	Know-seeking in the host country, mainly through hiring
	Activities related to the building of dynamic capabilities	Luthai senses changing customer demands and new technologies	Fuyao learns from big industry plays and applies new tools and techniques	Huawei integrates and coordinates global operations
	Manifestation of dynamic capabilities	289 utility patents, 57 design patents 46 domestic industry awards	710 utility patents, 9 international awards and more than 100 domestic awards	146596 utility patents, 590 copyrighted software applications

Digitalization	Digital tools adopted	Big data, cloud computing, APS, CDA, APR, 3D measure	AI, robots, cloud computing, 5G network	AI, 5G, Cloud computing
	Functions of digital technologies	Shorten delivery time; stabilize output quality	Enables flexible production	Lessen bureaucracy; understand demand
	Year of digital transformation	2015	2015	2014

Sources: Company profile information and internationalization are gathered from the business census database 2013, published by the Statistical Bureau of China. Company dynamic capabilities and digitalization information are synthesized from company annual reports 2015-2019.

Case 1. Luthai Textile (exporting and digital transformation)

China has been the world factory for apparel and textile, occupying 39% of the global garment market (Su, Qiu, Sun, and Zhang, 2019). Luthai is one of these textile exporting firms, whose export revenue is between 70% and 85% of the company's annual total revenue. While exporting brings Luthai growth opportunities, it also presents challenges as overseas buyers are strict on delivery time and costs. With the increasing competition from Southeast Asian producers, Luthai gradually abandoned the low-end market and switched to serving high-end and even luxury brands. Nevertheless, these high-quality and luxury brands, such as UNIQLO and Gucci, emphasize quality and customization.

Jianxiang Zhang, the deputy manager of Luthai, recalled that one of the challenges was matching colors exactly to the foreign purchasers' samples. High-end customers cared about small differences. What made the situation worse was each color has more than 100 subcategories. Zhang reflected that serving idiosyncratic customers worldwide made Luthai sensitive to market trends and technology development in the industry. Top and middle-level managers frequently visited Milan, Tokyo, and New York for trade fairs and meeting with clients, making Zhang and other managers noticed the trend of Industry 4.0 becoming a hot topic. Following The Internet Plus Initiative (IPI) of China, Luthai's research team and its collaborations with local universities led to more than 300 patents, which tackled industry-specific challenges, including color matching and efficiency management. As of 2015, Luthai has been using self-designed computer-aided design (CAD), which is compatible with Pantone Standards color matching, advanced planning and scheduling (APS), and Automatic Placement and Routing (APR) systems. According to Zhang, the company has saved at least 10% of operating costs due to digital transformation since 2015. The time between customer sample submissions to final product delivery has shrunk 19 days, largely due to the accuracy of color matching and the minimization of the warehouse waitlist. The output pass rate has increased from 80% to 95%. Many concerns expressed by Luthai's clients years ago are now successfully resolved by Luthai's digital ecosystem. Luthai has transformed its factory and workshops from labor-intensive to technology-intensive operations based on digital technologies and smart manufacturing (Luthai, 2019).

The experience of Luthai informs us that the exposure to a diverse set of customer needs and technology trends internationally urges the company to devote itself to R&D and learning,

which later leads to its digital transformation.

Proposition 1 Exporting activities promote EMF's development in dynamic capabilities, then digital transformation.

Case 2. Fuyao Glass (OEM and digital transformation)

Fuyao Glass is the world's largest auto glass supplier in annual revenue, occupying 20% of the global auto glass market. The main channel for Fuyao to participate in international markets was being an OEM supplier to global flagship automakers (Hertenstein, Sutherland, & Anderson, 2017). In the early 2000s, Fuyao was still a small glass manufacturer offering inexpensive flat glass to automakers in China. Volkswagen acknowledged that Fuyao delivered good quality glasses with high efficiency. In 2006, Fuyao was requested that Volkswagen supply its EU factories and form a partnership with Audi and BMW. The same year, Fuyao became the exclusive OEM supplier to General Motors in Shanghai. These OEM experiences allow Fuyao to (1) receive blueprints from industry leaders (direct learning); (2) observe big players' technology-intensive operations at home and abroad (indirect learning). Fuyao leveraged General Motors' international supplier network to license float glass manufacturing techniques from Pittsburgh Plate Glass. Fuyao's CEO Cao recalled that having the float glass technique was a turning point for Fuyao's quality output.

After the global financial crisis, Fuyao has faced cost reduction and labor shortage dilemmas. Company chairman Cao reflected that getting young generations to work in manufacturing is very difficult as the old employees retire. Meanwhile, OEM buyers want to reduce inventory costs by storing minimal parts, so they require suppliers like Fuyao to deliver on a tight schedule (Hsu, Thomas, Wang, & Wu, 2019). These external pressures urged Fuyao to search for automation and smart management tools.

In 2015, Fuyao identified a digital technology provider Seeyon Corp. and started to work with Seeyon to develop systems that function for Fuyao. Fuyao adopted a cloud-based ERP system from Seeyon Corp., which allowed the elimination of Information Island and connects all departments in the corporation. With Seeyon's V5 system, the whole process from customer pre-order, product development, process and resource planning to the final delivery is automated in the blockchain. Nowadays, switching between product lines only requires 1 hour, which largely eliminates the time management issue of producing multiple auto glass types with different specifications. 2000 pieces of glass can be finished in 24 hours.

According to Cao, the digitalization pressure was from being an OEM supplier, but the digital transformation decision was not made to cater to OEM needs. China has the world's largest auto market now. Cao sees the current 59% foreign sales fall in a few years as the United States and European markets have been saturated (Shih, 2020). Therefore, upgrading digital capabilities is extremely important for success in the domestic market.

We, therefore, learn from Fuyao's case that being a supplier to flagship MNEs allows EMFs to tap into industry big players' global network. The stringent needs of flagship MNEs push EMFs to advance operation methods and work with IT solution firms for better enterprise management.

Proposition 2 OEM activities promote EMF's development in dynamic capabilities, then digital transformation.

Case 3. Huawei Technologies (FDI and digital transformation)

Established in 1987, Huawei is the world's leading provider of information and communication technology (ICT) solutions, focusing on the ICT field and insisting on stable operations, continuous innovation, and open cooperation. It is headquartered in Longgang District, Shenzhen, Guangdong Province, the country's technology cluster. Huawei's products and solutions have been applied in more than 170 countries worldwide, serving 45 of the top 50 global operators and 1/3 of the world's population (Huawei, 2019). It laid a solid foundation for Huawei's advanced digital knowledge and technology acquisition from the host countries.

Extensive international experience has facilitated Huawei's internal development. In 1999, an R&D center Huawei was established in Bangalore, India, and became the main supplier of China Mobile's national CAMEL Phase II intelligent network. This network was the world's largest and most advanced intelligent network and helped Huawei build digital networking. Although the acquisition was not the smoothest path for Huawei's international journey, Huawei was able to open fourteen R&D centers through greenfield in Western Europe and seven in the U.S. (Schaefer, 2020).

There are two possible avenues for Huawei to adopt digital transformation after FDI. First, the parent firm of Huawei acquires digital assets directly from Huawei's overseas subsidiaries. Through acquisitions, learning or developing new technologies with local partners, these subsidiaries obtained digital assets (e.g., CAMEL Phase II intelligent network) in the host country and directly transferred them to the parent firm. Several R&D centers collaborate closely with local universities, with graduate students working in Huawei's innovation lab. These labs focus on Artificial Intelligence, Deep Learning in NLP, Internet of Things and so on. The parent firm then leverages these digital assets to facilitate digital transformation at the corporate level. Second, like exporting and OEM channels, FDI exposes EMFs to stringent customer or partner requirements and urges the parent firm to catch up with technology trends. Therefore, EMFs are motivated to improve their survival in a fast-changing external environment (dynamic capabilities). This effort has also enabled the parent firm to move closer to digital transformation. In 2017, Huawei released Huawei Cloud EI, an artificial intelligence service platform for enterprises and governments. In 2018, Huawei released HiAI, an artificial intelligence engine for intelligent terminals. In 2019, Huawei integrated "Huawei Cloud" and "5G + Cloud + AI", a unique digital business model. In summary, Huawei has leveraged knowledge in the international market and applied that successively to its digitization at the corporate level, creating a virtuous circle between internationalization and digitalization.

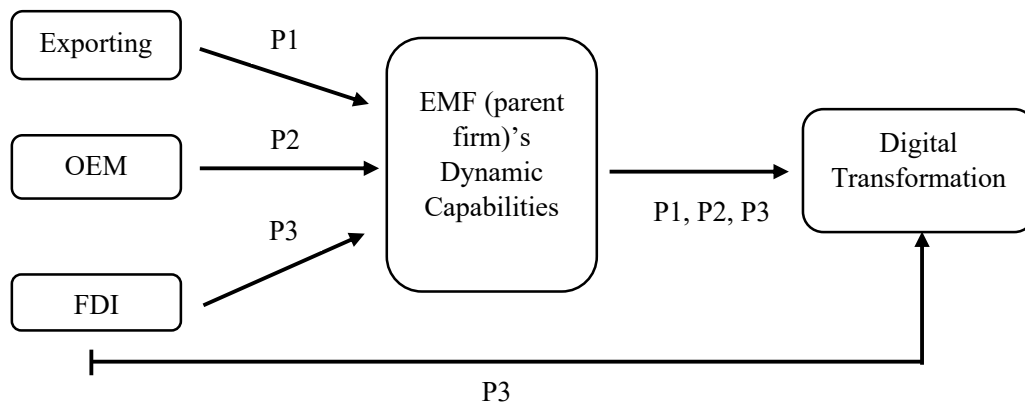
Proposition 3 Knowledge-seeking FDI has two possible avenues to promote EMFs adopting digital technologies, namely (1) direct digital asset acquisition from subsidiaries and (2) dynamic capabilities development (to create digital assets) as other internationalization channels.

Conclusion

Our case findings support a springboard process of internationalization (Luo and Tung, 2007, 2018) in which EMFs leverage internationalization to realize capability improvement. As shown in Figure 1, each of the three company cases in the study represents a different internationalization channel, namely exporting, OEM, and FDI. While all three entry modes contribute to digital transformation via dynamic capability building, FDI presents a second avenue and is thus considered more direct and efficient in facilitating the digital transformation process of EMFs.

Figure 1

EMF digital transformation via internationalization



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