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從硬體轉型至 SaaS：動態能力架構在台灣巴士 GPS 原品牌製造商之應用

From Hardware to SaaS: Applying the Dynamic Capabilities Framework to a Taiwanese OBM in the Bus GPS Industry

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Abstract

Taiwanese companies often create and capture value in manufacturing, but are increasingly looking to also capture value via branding and software applications in the growing software industry. This research aims to demonstrate that applying a commonly cited business strategy framework at the product level can be practical and useful for managers at Taiwanese hardware companies. Using a case study of a bus GPS hardware product utilized by public transportation vehicles, this paper creates a process of applying dynamic capabilities framework to publicly available financial and strategy documents. The paper then uses the dynamic capability framework to analyze the actions the firm is taking that matches with the framework and also suggests additional actions related to capturing value via software products. The paper aims to provide a replicable analysis workflow for publicly listed Taiwanese companies that post financial and strategy documents as per regulatory requirements for the major stock exchanges. This paper's workflow when combined with internal non-public documents, could help managers determine which next-step actions might need to be taken for a hardware product to also create and capture value via software products that complement the company's hardware product.

Keywords: Hardware, Original Brand Manufacturing, Original Equipment Manufacturing, Dynamic Capabilities Framework, SaaS, Software, OBM, OEM

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List of Abbreviations

CM	Contract Manufacturing
OEM	Original Equipment Manufacturing
ODM	Original Design Manufacturing
OBM	Original Brand Manufacturing
SaaS	Software as a Service
GPS	Global Positioning Service
GTFS	General Transit Feed Specification

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Chapter 1. Introduction

1.1 Background and Context

Taiwan is well recognized as a leader in contract manufacturing (CM) in the electronic, industrial hardware, and semiconductor industries. Taiwanese companies use both original equipment manufacturing (OEM) and original design manufacturing (ODM) business models to manufacture products that are then sold under the brands of their clients. In 2024, manufacturing contributed 37.61% to Taiwan's gross domestic product, reflecting the large role this sector plays in the economy (Directorate-General of Budget, Accounting and Statistics, 2024).

OEM is considered to be an entry-level business model where all product specifications and designs are fully provided by the client for the OEM to manufacture. ODM is often assumed to be the next stage of a company's development where the factory can provide value-added product design services to the client. ODM is typically done as a hybrid OEM and ODM business model where the client provides most of the specifications for the unique elements of the product and the factory takes on the value added task of designing the more standard elements of the product (Chu, 2007).

The next stage of value-creation for contract manufacturing companies is original brand manufacturing (OBM), which is when a manufacturer has the resources to design, manufacture, and sell hardware under the manufacturer's own brand name. The transition to the OBM stage was successfully achieved by Taiwanese companies such as Acer, Asus, and Giant, who today all have international brand names worth tens of millions of U.S dollars (Industrial Development Bureau of the Ministry of Economic Affairs, 2025) . However, many Taiwanese companies have stuck to contract manufacturing under a hybrid OEM and ODM business model, and expanded revenue via cross-industry subcontracting (Chu, 2007). This paper's case study of bus GPS

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devices is an example where some devices are sold under a manufacturer's brand name (OBM) and some are done as contract manufacturing under a hybrid OEM and ODM business model.

The below table is a simplified way of defining what makes a company categorized as an OEM, ODM, and OBM. Financial reports showing a company's primary revenue coming from manufacturing the designs of OBMs would categorize the company as an OEM. Financial reports showing a company primarily making money from selling their designs could be classified as an ODM. Financial reports showing a company primarily making money from company branded products could be classified as an OBM, however as many companies do not explicitly categorize their financial reports in this way researchers have to create their own definition mappings.

Table 1: Defining OEM, ODM, and OBM

	Who Designs?	Who Manufactures?	Who owns the design?	Whose brand is on the product?
OEM	Customer	Factory (OEM)	Customer	Customer
ODM	Factory (ODM)	Factory (ODM)	Factory (ODM)	Customer
OBM	Factory (OBM)	Factory (OBM), but sometimes also OEM or ODM	Factory (OBM) but sometimes also ODM	Factory (OBM)

Source: (Lee, Song and Kwak, 2015) and compiled by the author

1.2 Research Motivation and Value of Study

As global competition and political protectionism via tariffs puts pressure on profit margins in hardware, Taiwan's OBMs and CMs face increasing pressure to differentiate

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themselves in many hardware products categories where strong brand reputation and system integration capabilities are not enough to win business over less-known competitors that offer cheaper pricing and quality that rivals incumbent OBMs in certain product categories.

Many Taiwanese hardware companies face the paradox of success, which is defined as inertia towards changing the existing business model or operation due to past positive results (Audia et al., 2000). One potential strategy to address commoditization of hardware products is to transition from solely hardware products to hybrid cloud-hardware products and services. However, this would require changing and/or adding additional business models to a firm and overcoming internal inertia. This thesis focuses on narrowly applying a framework at the product-level, which could be a more actionable and digestable approach for large companies to assess what capabilities are needed to move forward on developing a software product.

The software industry is forecasted to reach 2 trillion dollars in annual revenue by 2029 with infrastructure software forecasted to remain the largest revenue driver. Software is commonly sold as one-off purchases or as subscriptions. Software as a service (SaaS) is a common business model in the growing consumer and enterprise software industry. SaaS as defined by the National Institute of Standards and Technology (NIST) is when a company provides access to an application via a cloud based interface such as a web browser and handles all the underlying cloud infrastructure management for the company's client (Mell and Grance, 2011). Since the software is not just sold as a one-time download, the SaaS business model works by providing software to users on the cloud via recurring subscriptions or usage charges that are typically paid monthly or annually. The SaaS business model is part of the larger category of Everything-as-a-Service (XaaS) which is an organically coined term that describes the explosion in cloud related business models. Other common "as-a-service" models are

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Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) which may be more relevant for Taiwanese hardware companies serving industrial clients.

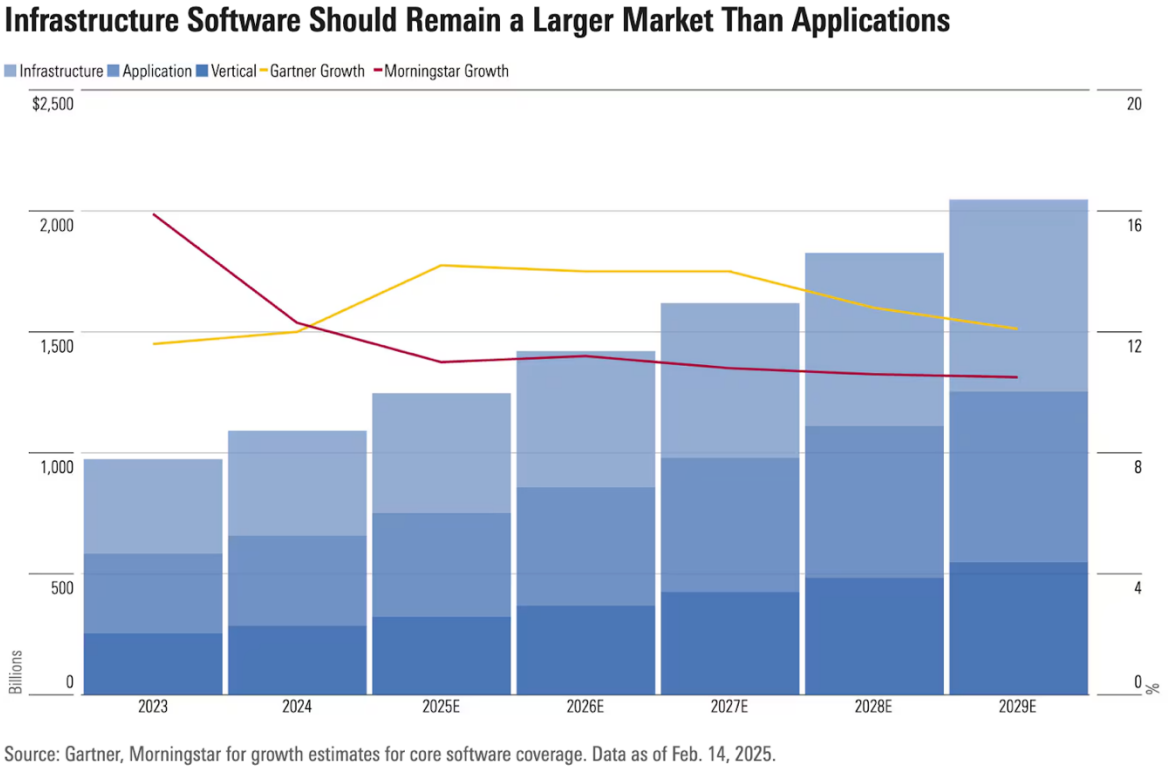

Figure 1: Growth Estimates for Software Industry

Source: Morningstar (2025) https://www.morningstar.com/stocks/future-remains-bright-software-firms

In Taiwan, Gogoro is an example of a hardware company also selling subscriptions. Gogoro is a manufacturer of electric scooters and charging stations that charges users for the scooter purchase and also for continued access to the Gogoro charging network. As part of the subscription (as-a-service) users get access to an app (software) that allows users to see a map of available charged batteries and to go to any battery swap station and swap empty batteries with fully charged batteries (energy platform). Gogoro exemplifies a Taiwanese hardware entity that has successfully added a subscription-based business model that gives users access to both

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software and batteries. Operating as both a manufacturer of electric scooters and the corresponding charging infrastructure, Gogoro generates revenue through the sale of scooters and ongoing subscription fees from 640,000 subscribers (Gogoro Inc, 2025). This subscription grants users access to a dedicated mobile application, providing a real-time map of available battery resources. Subscribers may then utilize any battery swap station to exchange depleted batteries for fully charged replacements, facilitating a seamless energy consumption experience. This multifaceted model integrates elements of Software as a Service (SaaS), Platform as a Service (PaaS), and Energy as a Service (EaaS).

1.3 Research Aims and Objectives

Research Question (RQ): How can the dynamic capabilities framework be used to analyze a Taiwanese hardware company's sensing, seizing, and reconfiguring capabilities for software opportunities at the product level?

This research aims to create a research and analysis workflow for using public product and company information to analyze a firm's current dynamic capabilities and to also recommend areas for further capability improvement. The main research question (RQ) will be developed through three sub-questions that match the three sub-sections of dynamic capability framework (Q):

Q1: *How can dynamic capabilities framework analyze a Taiwanese company's sensing capability for software opportunities at the hardware product-level?*

This investigation will look at the public product information and strategy information available on the company's website to assess which information is useful for assessing the

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company's sensing capability for software opportunities. In the case of products procured by government agencies, procurement portal information will also be checked.

Q2: *How can dynamic capabilities framework analyze a Taiwanese company's seizing capability for software opportunities at the hardware product-level?*

This investigation will look at the public product information and strategy information available on the company's website to assess which information is useful for assessing the company's seizing capability for software opportunities.

Q3: *How can dynamic capabilities framework analyze a Taiwanese company's reconfiguring capability for software opportunities at the hardware product-level?*

This investigation will look at the public product information and strategy information available on the company's website to assess which information is useful for assessing the company's reconfiguring capability for software opportunities.

1.4 Research Methodology

This research uses a qualitative, single-case study approach. The case study focuses on a Taiwanese OBM producing bus GPS hardware for public transportation vehicles, a product chosen for its high degree of commoditization and potential for software products sold under a SaaS business model.

This case study uses primary and secondary data to apply the dynamic capabilities framework at the product-level. Primary data includes company financial and strategy documents posted on the company's website and stock exchange reports. Secondary data includes government procurement documents, and industry reports. The dynamic capabilities framework of sensing, seizing, and reconfiguring, will guide the analysis of these documents.

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1.5 Importance and Significance of the Study

This thesis contributes to strategic management literature by applying the dynamic capabilities framework within Taiwan's OBM transformation challenges. Many of the Taiwan OBM transformation challenges described in the literature review are in-part due to the sprawling nature of the parent companies that serve many different industries and product categories as part of business conglomerates. In the U.S, many business groups focus on an industry within the firm's core competencies, so applying dynamic capabilities framework starting from the organizational level view and still getting actionable next steps is possible. This study shows that the reverse approach of a narrow focus of applying the framework at the product-level view can be helpful for Taiwanese firms that have very diverse business groups so the analysis does not lose focus by excessively analyzing the very diverse array of industries one business group is involved in globally.

This product-level application of the dynamic capabilities framework also addresses a gap in the existing literature, which often assumes that capability-building strategies can be uniformly applied across an organization. In the context of Taiwanese OBMs, where internal resource allocation and strategic focus may vary significantly between product lines, a granular approach enables more tailored insights. By isolating specific product-level cases, this study offers actionable guidance for managers seeking to strengthen sensing, seizing, and reconfiguring capabilities within targeted domains, rather than relying on abstract or overly generalized organizational strategies. This contributes not only to the theoretical development of dynamic capabilities in diversified firms, but also to practical implementation strategies for Taiwanese OBMs navigating the shift from hardware to software-driven value creation.

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Chapter 2. Literature Review

2.1 OBM Transition Challenges in Manufacturing

Taiwanese contract manufacturers struggle to go to the market frontier that "first-movers" occupy and evolve into branded global players due to a lack of dynamic capabilities (Chu, 2009). The OEM-ODM-OBM path is neither linear nor inevitable because branding is a transformation of the contract manufacturing business model that requires sensing and seizing capabilities in R&D innovation, long-term brand building, global marketing, and customer engagement (Chu, 2009). In addition, as a Taiwanese manufacturer gets more successful it gets stronger path dependence by developing capabilities that reinforce competencies that are primarily useful in the contract manufacturing industry but not in building a brand (Chu, 2009). This path dependence can cause a firm to decrease its reconfiguring capabilitiy as the firm will resist changing the structure viewed as responsible for current and past success.

Acer, a Taiwanese manufacturer well-known for its laptop products, is a common case study for demonstrating the significant reconfiguration capability a firm needs as shown by the historical actions it took in reconfiguring innovation systems, managerial structures, and market interfaces to become an OBM. Acer is one of the few Taiwanese brands that overcame path dependence as described by Chu (2009). Kuo argued that in Acer's transition from OEM to OBM all three capabilities needed to be reorganized to increase the firm's dynamic capabilities in seizing the opportunity of having branded products and reconfiguring internal resources to sell directly to consumers. For example, Acer spun off its manufacturing division into a separate company called Wistron to reduce conflict of interest concerns from Acer's original client base and also created a new internal function called Value Lab to house innovation functions (Kuo, 2011).

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Technical and infrastructure challenges for OEMs switching business models are due to the highly commoditized nature of hardware compared to the very value driven nature of software in cloud computing. Wang and Unger (2013) explain and share several examples of the Cloud Appliances for Enterprises (CAFE) strategy being used successfully by Taiwanese ODMs such as ASUS, Delta Electronics, and GIGABYTE. CAFE is a strategy created by the Institute for Information Industry (III) to help OEMs and ODMs transform their business models into higher value cloud computing products.

Similar to the technical hurdles of transitioning from being an OEM to an ODM, for Taiwanese companies to transition to higher value SaaS products there will need to be internal investments in R&D along with collaborations with existing software companies both domestically and internationally. In Korea, SMEs that escaped the "OEM trap" utilized a variety of means to get technical design knowledge from companies all over the world (Lee, Song, and Kwak, 2015). Chu also argues that Korean firms had more government support than Taiwanese firms via a "national champions" strategy that let Korean firms invest more into R&D (Chu, 2009).

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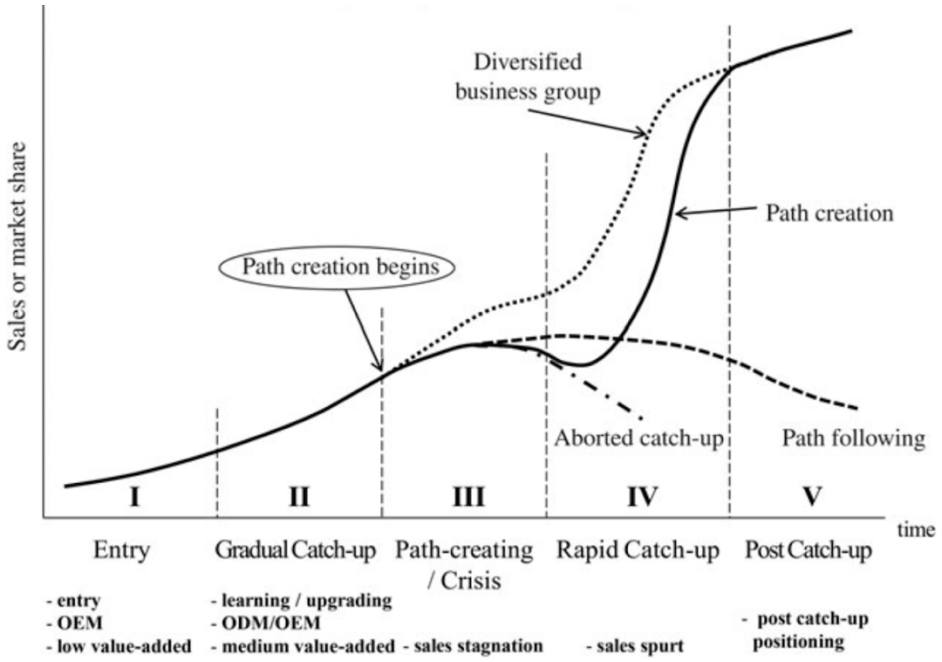

Figure 2: Stages in Dynamics of Catch-Up

Source: An Exploratory Study on the Transition from OEM to OBM: Case Studies of SMEs in Korea (Lee, Song and Kwak, 2015)

2.2 Dynamic Capabilities Framework Relevance to OBMs

The dynamic capabilities framework authored by Teece, Pisano, and Shuen, provides a theoretical framework that can be applied to Taiwanese hardware OBMs navigating the complex shift towards SaaS business models. As these firms try to overcome hardware commoditization, the firms will need to increase their capabilities to sense opportunities, seize them effectively, and reconfigure internal resources to support new forms of value creation (Teece, Pisano, and Shuen, 1997). Chu (2009) and Kuo's (2011) research, used dynamic capabilities framework to help explain the historical actions of OEMs that transitioned to OBM and those that have not. The history analysed by both authors using dynamic capabilities framework, can also be used to guide future competitor analysis and company actions for investing resources into new business

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transformations such as building software products. Building software products requires a change in dynamic capabilities for Taiwanese firms, similar to the historical analysis from Chu (2009) and Kuo (2011) showing that building self-designed hardware products also required a change in dynamic capabilities for the firms in Taiwan and Korea that successfully transitioned out of the OEM stage.

For Taiwanese OBMs, the dynamic capabilities framework can provide a blueprint on which resources are required to move from manufacturing related value creation to software related value creation. Teece et al. (1997) argues that in dynamic environments "narcissistic" organizations will face difficulties in sensing opportunities, which is required for an organization to take any steps toward increasing the reconfiguration capability of the organization. This is related to the paradox of success concept, which is defined as inertia towards changing the existing business model or operation due to past positive results (Audia et al., 2000). The process of sensing can be linked to this challenge by sensing shifts in consumer demand for cloud platforms as mentioned in Wang and Unger's (2013) research. Supporting the urgency of increasing this ability to sense shifts in demand is that Wang and Unger's research was funded by the Ministry of Economic Affairs, a government agency responsible for promoting Taiwan's continued economic development.

In the case of a specific product like bus GPS devices, industry specific trends such as public transit agencies procuring tools for increasing real-time data availability and accuracy to riders would be something the OBM would need the capability to sense in addition to larger trends impacting the wider Taiwanese hardware industry. Sensing capabilities could be via both qualitative means such as reading agency press releases and procurement documents and

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quantitative such as looking at the acquisition prices of software companies providing tools related to the Taiwanese firm's GPS product.

Once the opportunity is sensed, the Taiwanese hardware firm would have to plan on how to allocate resources and the appropriate organizational structure to seizing the sensed opportunity. This planning would then lead to the more significant reconfiguring process of the firm to be able to support competing in both the hardware and software industries.

2.3 Porter's Five Forces and Industry Pressures on OBMs

The five forces framework is used as a way to assess the attractiveness of an industry based on five forces. The framework can also help companies decide actions within their own industry to improve their competitiveness. The five forces are threats of new entrants, threats of competitive rivalry, substitutes, buyer power, and supplier power (Porter, 1980).

In a follow up work, Porter points out many papers use the five forces framework in a shallow way without using quantitative metrics along with the list of qualitative factors (Porter, 2008). Another academic, Dobbs, analyzed all the works that teach managers about the five forces and found that out of the ten leading textbooks only two provided in-depth explanations of practical applications, whereas the rest were all under 11 pages (Dobbs, 2014). Teece, one of the authors of dynamic capabilities framework, views Five Forces as being a more simplistic predecessor to his framework (Teece, 2024).

To improve the practical applicability of Porter's five forces, Dobbs created templates that include sub categories under each force and a sliding scale of high to low for each sub-category. The sliding scale has 11 levels and at the bottom of each template there is a table to highlight what each analyst views as the top two threats and the top two opportunities. These templates make Porter's five forces analysis more quantitative and could address deficiencies in the

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implementation of five forces analysis that Porter, Dobbs, and Teece have all pointed out in various articles and interviews. Dynamic capabilities framework, could also be modified to have a sliding scale or numerical method added to it similar to what Dobbs proposes for Porter's Five Forces.

This paper will focus on using dynamic capability framework on the case study, but will also include the Five Forces analysis, SWOT, and PESTLE, as a supplementary analysis. While Teece argues that the five forces models are less relevant in today's innovation marketplace (Teece, 2024), the five forces model is still highly used as a strategy tool for managers. The modifications of the five forces by Dobbs into a more manager usable template, also serves as an inspiration for this thesis to utilize the dynamic capability framework in a way that is easy for other researchers and managers to apply at the product level first and to encourage action after using the framework.

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Chapter 3. Method

3.1 Research Design and Theoretical Justification

This research uses a qualitative single case study approach to explore how a bus GPS product manufactured by a Taiwanese OBM can transition from a hardware business model to one that incorporates SaaS. This approach allows for an in-depth contextual analysis, which will make this application of theory more realistic for practical use for Taiwanese hardware firms.

The theoretical framework guiding this study is the dynamic capabilities framework, originally developed by Teece, Pisano, and Shuen (1997). This framework was created based on the experiences of the authors interacting with companies in Silicon Valley, a major innovation hub home to many leading software companies. The framework is well-suited for analyzing the current competitive landscape that Taiwanese hardware companies find themselves in as they navigate both software companies capturing more of the end-customer value and competing hardware companies becoming more cost-effective capturing more of the market share. The theory focuses on three core capabilities: sensing opportunities, seizing opportunities, and reconfiguring organizational structures and resources to support long-term competitive advantage. This study does not develop new theory, but works to operationalize an existing framework at the product level in a Taiwanese hardware OBM context.

3.2 Case Selection: Bus GPS OBM in Taiwan

The case study focuses on a Taiwanese hardware OBM that produces bus GPS hardware for public transport vehicles.. This product category was selected for several reasons: High commoditization: hardware margins and production differentiation in GPS devices are low.

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- Relevance to SaaS: public transportation agencies internationally have a growing demand for real-time tracking accuracy and coverage, fleet management, and predictive analytics that require constantly improving software to complement data coming from GPS hardware. There is an open standard called General Transit Feed Specification (GTFS) that makes the barriers lower for potential market entrants to create a new combined hardware-SaaS offering.
- Public procurement visibility: countries part of the World Trade Organization's Government Procurement Agreement list procurement data, allowing for clearer analysis of buyer behavior and technology adoption trends.
- Author familiarity: The researcher has industry-specific knowledge that supports deeper contextual interpretation on the software opportunities for vehicle tracking.

This product selection aligns with the goal of demonstrating how dynamic capabilities can be applied to a narrowly defined product use case within a broader transformation strategy.

3.3 Data Collection and Analytics Methods

This study relies on primary and secondary data, collected from a variety of public company documents, government documents, and academic sources:

- Taiwan External Trade Development Council (TAITRA) data on government procurement records for GPS and related fleet management technologies
- The company website's product page to analyze bus GPS hardware product capabilities and potential for SaaS product expansion
- The company website's investor relations page to analyze financial reports, company strategy, and company structure
- Academic research on OBM transitions, SaaS adoption, and industry strategy

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- Press releases for acquisitions of bus data related software companies

The analysis will be thematically organized under the three categories of dynamic capabilities:

- Sensing: Identifying demand shifts, such as global city government interest in cloud-based bus systems and acquisition trends of bus data related software providers
- Seizing: Assessing company financial reports on investment decisions, R&D structuring, and project initiatives.
- Reconfiguring: Evaluating changes in staffing, software development capacity, and revenue model design.

The below search terms will be used on the TAITRA government procurement data website service.meettaiwan.com to identify a suitable case product:

- Bus GPS
- Public transit vehicle tracking
- Fleet tracking
- Public transit

The below criteria will be used to select a product for this case study:

- The hardware is sold by a Taiwanese company under its own brand name
- The hardware is for tracking vehicle positions for public transport vehicles
- The company has publicly available financial documents

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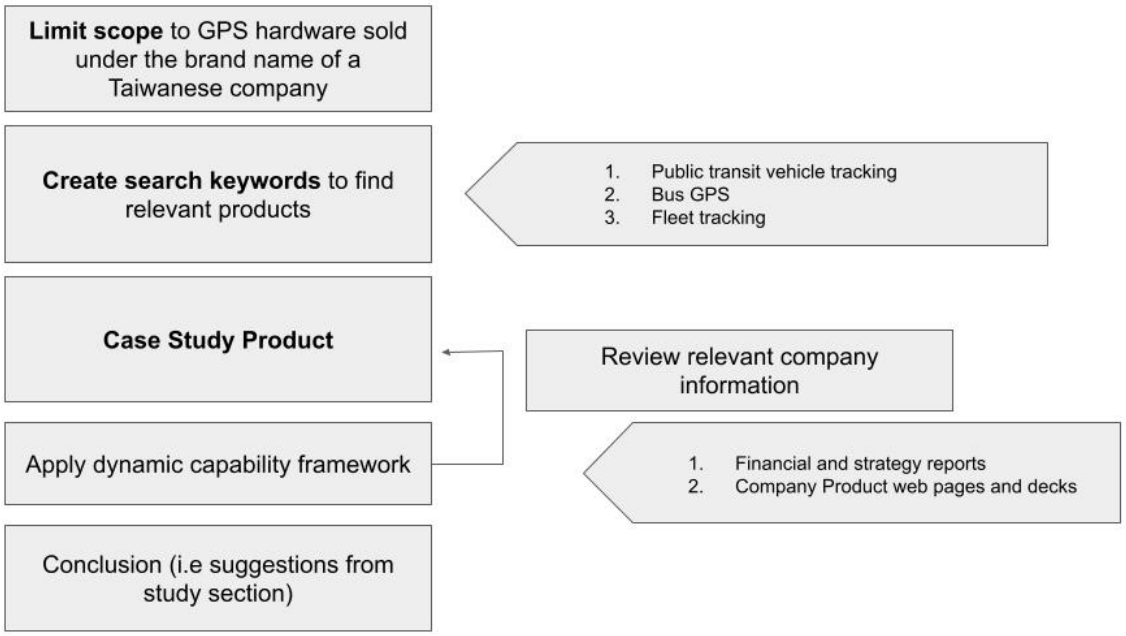

Figure 3: Research Flow Chart for Sensing Capability of Competitor Products

Additionally, a five forces analysis will be used to assess external competitive pressures, and compared with dynamic capabilities framework analysis in-terms of actionable steps a company could derive from the five forces analysis compared with the dynamic capabilities framework analysis.

3.4 Research Limitation and Delimitations

The below are the limitations of this research study:

- No primary interviews: To make this study usable by companies that can only use public information about competitors, this study follows a realistic approach given that the focus industry of hardware is highly competitive and secretive.
- Single product focus: This study analyzes only one product (bus GPS) within one firm, which limits the generalizability of the findings

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- Geographic limitation: The focus is on a Taiwanese firm and public procurement ecosystem of signatories of the World Trade Organization's Government Procurement Agreement

Despite these limitations, the depth of the case study and application of the dynamic capabilities framework will create actionable insights and methodological guidance for applying business transformation theory at a product level.

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Chapter 4. Discussion and Analysis

4.1 Industry and Product Context: Taiwan's Bus GPS Sector

Taipei City was the pioneer in Taiwan for using GPS devices on buses to collect data for bus arrival times and then displaying the information at electronic bus stop signs and also via an online portal. The system launched in 2004 with a subset of routes and only had full route coverage in 2009 (Taipei City Public Transportation Office, 2021).

Buses in Taiwan use GPS hardware made by Taiwanese OBMs and the data system is handled by software vendors contracted by the government in collaboration with a few in-house government IT specialists. Globally, many public transportation operators also have GPS hardware on their bus fleets and a system for providing bus arrival times. Government agencies are typically involved in coordinating the procurement for the hardware and software alongside the public transport operators.

In 2009 Taiwan became the 41st signatory of the world trade organization's Agreement on Government Procurement (GPA), which opened the doors for hardware manufacturing companies in Taiwan to win contracting and subcontracting opportunities for public tenders in countries around the world (World Trade Organization, 2009). In the case of bus GPS solutions, that means a successful solution in Taiwan that meets international standards could now have a better chance of also expanding globally.

The Taiwan External Trade Development Council (TAITRA) is a publicly funded organization that is in charge of promoting Taiwanese hardware companies abroad. TAITRA has a project called the Global Procurement Project (GPA) that is hosted on the website service.meettaiwan.com which includes search and keyword functions for finding various

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products from Taiwanese hardware companies. The products that win government sponsored awards or have won tenders have this highlighted on the TAITRA website.

Antzer Tech, a subsidiary of Innodisk Corporation, is a hardware company founded in Taiwan in 2015 that specializes in vehicle tracking hardware, software, and system integration services (Antzer Tech, n.d.). Antzer Tech's bus GPS product is marketed as a "Multifunctional GNSS Tracking Device" and could be found on TAITRA's Meet Taiwan website using this study's specified keyword terms. This bus GPS product also met the study's inclusion criteria of being sold under a Taiwanese company's own brand name (OBM), serving the purpose of public transit vehicle location tracking, and having publicly available financial documents. All other results found on TAITRA's website using the study's keywords did not meet the study inclusion criteria as a case study product. The company's self-reported employee count on the Taiwan Job-posting site 104, is 14 employees as of 2025 (104 Corporation, n.d.).

Innodisk is a Taiwanese hardware company founded in 2005 and currently listed on the Taipei Exchange (TPEx) as 5289 (Taipei Exchange, n.d.) with 2024 revenues of NT8.92 billion (Innodisk Letter to Shareholders, 2024). The company primarily manufactures and sells industrial storage devices and memory modules and has four branded subsidiaries under the names Aetina, Militronic, Sysinno, and Antzer Tech (Innodisk Financial Report, 2024). The company's website categorizes products based on nine categories called "intelligence cubes" which are applied intelligence, sensing intelligence, data intelligence, connecting intelligence, extended intelligence, computing intelligence, machine-learning intelligence, and collective intelligence (Innodisk, n.d.). The below table are the definitions assigned by this author based on analyzing the content of each intelligence cube webpage.

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Table 2: Cube Category Implied Definitions

Cube Category	Implied Definition
Applied Intelligence	Real-world AI deployments in verticals such as smart factories, transportation, law enforcement, retail, and healthcare.
Sensing Intelligence	Acquisition of environmental or physical data via sensors.
Data Intelligence	Efficient capture, aggregation, and analysis of data generated from connected devices.
Connecting Intelligence	Networking technologies that enable communications in real-time among devices, modules, or platforms.
Extended Intelligence	Improving hardware or device functions by adding intelligent peripheral modules.
Computing Intelligence	Focused on high-performance processing at the edge using CPUs, GPUs, or SoCs.
Machine-Learning Intelligence	Tools that improve the training and deployment of machine learning models.
Collective Intelligence	Aggregated insights from distributed sensor networks or connected devices.

Source: Innodisk (n.d.) and compiled by author.

https://www.innodisk.com/en/group-intro

The below table summarizes the focus area for each subsidiary and which intelligence cubes the products fall under as implied by Innodisk's published strategy.

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Table 3: Innodisk Subsidiary Focus Areas

Subsidiary	Focus Area	Intelligence Cube
Aetina	Edge AI and industrial GPUs	-Computing Intelligence -Machine-learning Intelligence -Applied Intelligence
Millitronic	Wireless high-speed data transfer	-Connecting Intelligence -Extended Intelligence
Sysinno	Environmental monitoring	-Sensing Intelligence -Collective Intelligence -Applied Intelligence
Antzer Tech	Vehicle telematics	-Data Intelligence -Connecting Intelligence -Applied Intelligence

Source: Innodisk (n.d.), and compiled and Categorized by Author.

https://www.innodisk.com/en/group-intro

A SaaS product that met the needs of both the internal and external users of the vehicle data the offering would no longer be a pure hardware offering in a very commoditized industry, but a differentiated plug and play and vertically integrated solution for public transport systems around the world. Similar to the spirit of the CAFÉ framework proposed by Wang and Unger (2013), a vertically integrated hardware and SaaS solution could create new value for Antzer Tech's customers and increase switching costs after Antzer Tech has acquired a customer.

The value of the software portion of bus vehicle data management is seen in commercial transactions involving software companies that have created solutions for internal and external data use cases. For internal use cases, bus route planning software Remix was acquired by Via for 100 million USD in 2021. Remix created a SaaS map product that allowed transit agency operators to visually plan new routes and get input from the public for bus route changes on a commentable map. The product is able to take in information from bus GPS systems and also is

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able to export data in common formats such as GTFS used by consumer map applications and bus scheduling systems. For external use cases, NextBus created a software product that converted GPS data into bus arrival time information and was acquired by Cubic Transportation Systems for $20.6 million USD in 2013.

Table 4: Acquired Transit Data Software Companies

Software	Solution	Acquisition Price	Acquisition Year	Acquirer
Hopthru	Analyze bus operational data by comparing static GTFS and GPS data	Undisclosed	2024	Swiftly
Remix	Plan, modify, and get public feedback on bus routes and also export static GTFS	100 million USD	2023	Via
NextBus	Share predicted arrival times with bus passengers via GTFS real-time	20.6 million USD	2013	Cubic

Sources: Mass Transit (2024); Korosec (2021); Metro Magazine (2021) and Compiled by Author

4.2 Sensing Capabilties

Antzer Tech already demonstrates emerging sensing capabilities through its alignment with the strategic direction of its parent company, Innodisk. In its 2024 shareholder report, Innodisk emphasized “smart empowerment” and “data intelligence” as key strategic priorities—both of which suggest a growing awareness of market opportunities in connected systems and software-enhanced solutions. Additionally, Antzer Tech fits under Innodisk’s “intelligence cube” framework—particularly in Data Intelligence and Connecting Intelligence. This indicates internal recognition of the importance of real-time data and cloud-enabled hardware. This positioning provides a conceptual foundation for sensing SaaS-related trends, even if the product page currently is primarily focused on the hardware capabilities.

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Antzer Tech's status as a focused subsidiary within a larger multi-brand group structure may also give it an advantage in refining its sensing mechanisms. The structure allows it to monitor developments in a specific product category (vehicle tracking), while still leveraging cross-subsidiary insights and centralized R&D knowledge from Innodisk. This setup could potentially allow Antzer Tech to identify software integration opportunities more quickly than competitors operating in more siloed environments.

Despite these strengths, several improvements can be made to formalize and expand sensing capabilities, especially at the product level. Key areas for development include:

- Tracking global public sector tenders and press releases for transit solutions that emphasize real-time data, cloud integration, or compliance with GTFS and GTFS-RT standards
- Monitoring acquisition and partnership trends in the GPS and fleet SaaS space (e.g., Remix's acquisition by Via or Cubic's acquisition of NextBus), which signal shifts in how transit data is being monetized
- Recognizing specific technology gaps in national systems—such as Taiwan's GTFS beta API that currently supports only static data—so that Antzer Tech can proactively develop products to close these gaps
- Benchmarking competitors not only on hardware performance but also on their bundled offerings, including SaaS capabilities, analytics dashboards, and integration partnerships

To institutionalize these capabilities, Antzer Tech and Innodisk should consider developing a clear division of sensing responsibilities. Certain functions like global market monitoring and

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competitive intelligence—may be best centralized within Innodisk's strategic planning or marketing divisions, while product-specific trend analysis (e.g., GTFS-related procurement) could be handled by Antzer Tech's internal teams. Once this allocation is defined, standard operating procedures (SOPs) should be created to determine which roles will gather, review, and act on sensing data, at what frequency, and through which decision-making processes.

In summary, while Antzer Tech benefits from early sensing signals and group-level strategic alignment, it still lacks an operationalized system for consistently identifying software-layer opportunities at the product level. Addressing this gap will strengthen its ability to compete in a converging hardware-SaaS landscape.

4.3 Seizing Capabilties

Antzer Tech, through its parent company Innodisk, has already demonstrated preliminary seizing capabilities in both strategic vision and organizational infrastructure. Public documents such as Innodisk's 2024 shareholder report outline three key strategic priorities: Extreme Integration, Sprouting & Integration, and Smart Empowerment (Innodisk, 2023). These terms reflect a corporate-level intention to invest in connected platforms and hybrid hardware-software ecosystems. This signals a readiness to mobilize resources around new business opportunities, such as SaaS.

The company's goal of achieving "comprehensive brand upgrading" further suggests an internal mandate to go beyond component-level innovation and toward more complete, value-added offerings. For a subsidiary like Antzer Tech, this alignment presents a favorable environment in which to propose and resource initiatives tied to software development. This is

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particularly true if they are positioned within existing strategic categories like the Data Intelligence cube or the Applied Intelligence framework.

That said, Antzer Tech's ability to seize specific SaaS opportunities remains partially developed, and several gaps in public disclosure suggest room for further capability building.

For example, current product materials emphasize the technical specifications of the GPS hardware but do not reference cloud integration, GTFS real-time (RT) compatibility, or partnerships with public transit software ecosystems. As many major transit markets now require both GTFS static and GTFS real-time compliance, failure to proactively invest in bridging these data layers may limit Antzer Tech's ability to respond to tenders or RFPs from cities seeking integrated fleet management systems.

This challenge is particularly evident in the Taiwanese market, where GTFS static data is available, but GTFS-RT has not been fully implemented. In such cases, "ghost buses"—phantom arrivals shown in map apps due to data mismatches—undermine passenger trust and system credibility. A firm like Antzer Tech, with hardware control, could address this by developing firmware or edge-cloud software that aligns GPS data output with GTFS-RT formatting standards. Doing so would seize a clear and underserved need, not just in Taiwan but across many global cities with fragmented transit data systems.

To move from sensing to seizing, Antzer Tech's leadership could take a series of practical steps to formalize and fund product expansion into SaaS:

- Allocate internal budgets toward cloud-based product testing, software prototyping, and pilot deployments with municipal transit clients

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- Hire or reorganize talent in key technical areas such as cloud engineering, software development, and UI/UX design to create user-facing dashboards or developer APIs
- Build city partnerships or integrator collaborations to co-develop real-time fleet tools and GTFS compliance modules
- Experiment with bundled pricing models, offering GPS hardware plus software as a service (e.g., a monthly or annual plan that includes both hardware rental and ongoing access to fleet management analytics or GTFS RT feeds)

In short, while the company's strategic documents show a clear willingness to seize innovation opportunities, the execution of this capability, especially at the product level for bus GPS, requires more visible resourcing, team deployment, and market experimentation. With strong alignment already in place at the group level, Antzer Tech is in a favorable position to expand its seizing capability.

4.4 Reconfiguring Capabilties

Reconfiguring refers to a firm's ability to realign its internal structures, systems, and business processes to support new business models (Teece, Pisano, and Shuen 1997). particularly those that differ significantly from legacy operations. In the case of SaaS, this transformation often includes changes to product development, customer support, revenue models, and IT infrastructure.

Innodisk's public strategy statements already point to an emerging reconfiguring mindset. Through its 2024 shareholder communications, the company has highlighted priorities such as "extreme integration" and "brand upgrading," which imply a shift toward vertically integrated,

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customer-centric offerings. The company also promotes subsidiary-level autonomy within a broader “intelligence cube” strategy, enabling specialized business units like Antzer Tech to take on new roles—such as value-added software delivery—while remaining aligned with group-level innovation goals.

From a structural standpoint, Antzer Tech benefits from being a niche, product-focused subsidiary under a diversified holding company. This setup makes it possible to isolate and pilot SaaS workflows without disrupting the larger hardware operations. Additionally, Innodisk’s push into “Data Intelligence” and “Applied Intelligence” signals conceptual openness to shifting from traditional bulk hardware sales toward platform-based and analytics-enhanced models.

Despite these encouraging signals, there is limited public evidence that Antzer Tech has yet undergone the operational reconfiguration necessary to support a true SaaS offering. To evolve from hardware manufacturer to hybrid service provider, several internal areas would require transformation:

- Restructuring product development workflows so that hardware and software teams collaborate closely, whether within Antzer, across other subsidiaries, or jointly with Innodisk’s central R&D. For example, firmware engineers and software product managers should coordinate on data formatting, security protocols, and API readiness.
- Establishing new functions such as customer success, onboarding, and post-sale technical support tailored to recurring-service clients. These roles are essential in SaaS contexts, where user satisfaction, churn management, and contract renewals are core revenue drivers—especially in public-sector fleet management scenarios.

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- Adjusting financial systems and reporting structures to accommodate subscription-based revenue recognition, monthly recurring revenue (MRR) tracking, and longer-term customer lifetime value (LTV) forecasting. This would mark a significant shift from the transactional logic of bulk hardware sales.

- Investing in internal IT and cloud infrastructure to host real-time analytics tools, dashboards, or compliance-based data processing. Partnering with global cloud platforms such as AWS, Google Cloud Platform (GCP), or Microsoft Azure would provide scalability, compliance support, and ease of integration for public clients—particularly in countries that require GTFS-compliant SaaS tools.

Currently, these elements are not detailed in Innodisk or Antzer Tech's public disclosures, which suggests that while the strategic foundation for reconfiguring is present, the operational build-out is still pending.

In conclusion, Antzer Tech has access to the structural and strategic conditions necessary to reconfigure itself into a SaaS-ready business unit—but must still implement changes in team composition, financial processes, customer management, and infrastructure to realize that potential. These internal shifts would mark the company's evolution from a component supplier to a full-service mobility technology provider.

4.5 Scoring Antzer Tech's Dynamic Capabilties for Pursuing Software

The above three sections on Antzer Tech's sensing, seizing, and reconfiguring capabilities can be visualized in the following tables that link the capability to recommended actions.

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Table 5: Dynamic Capability Reccomendations

Capability	Strategic Focus	Recommended Tactical Actions
Sensing	Identify SaaS opportunities in public transit	Track GTFS-RT adoption, competitor SaaS acquistions, procurement specs, and cloud data trends
Seizing	Allocate resources to viable SaaS inititiatives	Budget for pilots, shift R&D to software, hire cloud staff, structure SaaS go-to-market
Reconfiguring	Transform internal structure to support SaaS	Create customer success, align finance for SaaS business model, build cloud ops, train product teams.

The next table will assign scores from 1-5 (lowest to highest) based on the author's analysis of the firm's dynamic capabilities. This numbering approach along with a descriptive rationale is inspired by Dobbs' sliding scale templates of Porter's Five Forces whose goal is to make the framework more actionable to managers (Dobbs, 2014). The dynamic capabilities frameowrk already categorizes the capabilities by three categories, so unlike Dobbs' approach there is no need to add new sub-categories to this table.

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Table 6: Dyanmic Capability Maturity Level Scoring and Rationale

Capability	Maturity Level (1-5)	Rationale
Sensing	3	Conceptual awareness exists with public documents showing alignment with pursuing software and vertical integration, but no SaaS specific metrics
Seizing	2	Strategic direction is clear and subsidiaries setup for product line focus, but not clear software piloting competency is fully developed
Reconfiguring	2	SaaS related configuring not clear

4.6 Cross-Referencing Porter's Five Forces SWOT, and PESTLE

While the Dynamic Capabilities Framework provides a deep, internal perspective on how firms adapt and reconfigure themselves in response to changing environments, it is also useful to cross-reference other strategic frameworks after conducting the dynamic frameworks workflow to further contextualize these transformations within broader market dynamics. Frameworks such as Porter's Five Forces**,** SWOT**,** and PESTLE offer industry-level, structural, and environmental perspectives that can help firms understand external pressures, resource dependencies, and macro trends. Although these tools are not as action-oriented as the dynamic capabilities framework when it comes to organizational transformation, they are still widely used in management practice. These three other frameworks can provide a complementary, high-level snapshot of the risks and opportunities facing a firm like Antzer Tech. By comparing a hardware-only model with a SaaS-enabled solution, and by outlining key political, economic, and technological

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considerations, this section supports the thesis objective of identifying both internal readiness and external drivers for business model innovation.

Table 7: Porter's Five Forces: Bus OBM (Hardware-Only vs. Solution Provider)

Force	Hardware-Only Product	Hardware + SaaS Hybrid Solution
Threat of New Entrants	Hardware manufacturing is capital intensive, but competitors in cheaper manufacturing countries can enter.	Higher barriers since it requires domain expertise, software development, cloud infrastructure, and integration ability. SaaS models increase lock-in.
Bargaining Power of Suppliers	Dependence on electronic components (chips, displays, modules). Suppliers of semiconductors or GPS modules have leverage.	Still reliant on components, but the software side reduces BOM dependency. Cloud and server costs can be better managed over time.
Bargaining Power of Buyers	Buyers (bus operators, governments) often run tenders and pick the lowest bidder. Products seen as interchangeable.	SaaS models offer ongoing value (analytics, uptime), increasing stickiness and reducing price sensitivity. Switching costs are higher since staff have to be trained in new systems.
Threat of Substitutes	Hardware-only solutions face pressure from lower-cost alternatives.	Integrated platforms are harder to replace, and analytics reduce the appeal of basic alternatives.
Industry Rivalry	Competes on price and durability. Little room for differentiation. Margins are thin.	Competes on innovation, data services, and support. Recurring revenue from SaaS softens direct price wars. Players can differentiate more easily.

The above five forces table can give a high level view of the industry, but compared to the dynamic capabilities framework it is much less actionable for company leadership since it does not specifically mention what in the organization needs to change to improve competitive advantage.

Another common framework used in business strategy is the SWOT and PESTLE analysis, which are similar to the five forces table in that it provides a high level view of the opportunities

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in an industry. SWOT stands for strengths, weaknesses, opportunities, and threats, and PESTLE stands for political, economic, social, technological, legal, and environmental. However, like five forces, both SWOT and PESTLE also lack related actions on what management or leadership should do next after summarizing the industry based on these acronyms. Therefore, these are useful in conjunction with dynamic capabilities analysis, but are not comprehensive enough as a standalone analysis.

Table 8: SWOT Analysis of Bus GPS OBM Adding SaaS Offerings

Strengths	**Weaknesses**
Good hardware reputation Existing customers Manufacturing capability	Lack of software development expertise Lack of SaaS pricing expertise Risks impacting hardware sales efficiency
Opportunities	**Threats**
Growing SaaS industry Greater public sector acceptance of SaaS Recurring revenue creation	Existing SaaS providers Faster pace of change in SaaS Distributor/system integrator resistance

Table 9: PESTLE Considerations for a Bus GPS OBM Adding SaaS Offerings

Factor	Consideration
Political	Procurement policies of city and country transport departments
Economic	Growth of cloud and SaaS tech globally
Social	Greater acceptance of recurring subscription costs in all industries
Technological	Advances in AI reducing barriers for a hardware company to develop custom software solutions
Legal	Data rules from city and country public transport departments
Environmental	Public transport technology a positive contributor towards increasing green transportation use

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4.7 Summary

This chapter applied the Dynamic Capabilities Framework to assess how Antzer Tech, a Taiwanese OBM specializing in bus GPS hardware, can transition toward a hybrid business model that includes SaaS-based fleet management and transit data solutions. The analysis addressed the core research question: how public product and company information can be used to evaluate a firm's sensing, seizing, and reconfiguring capabilities. This demonstrated how this framework can be operationalized at the product level.

Drawing from public product descriptions, strategy statements, and financial disclosures from parent company Innodisk, the analysis showed that Antzer Tech possesses partial dynamic capabilities that can serve as a foundation for business model transformation.

- Sensing Capabilities: Antzer Tech benefits from Innodisk's strategic emphasis on "smart empowerment" and "data intelligence," which suggest group-level awareness of industry shifts. However, product-level disclosures reveal a gap in articulating readiness for cloud-based integration or GTFS-RT support. Improvements are needed in competitive benchmarking, procurement monitoring, and industry-specific SaaS trend analysis.
- Seizing Capabilities: Innodisk's publicly stated initiatives such as "sprouting and integration" reflect an openness to resource allocation for innovation. Antzer Tech has strategic alignment and structural access to group-level funding, but has not yet demonstrated evidence of budget deployment, hiring initiatives, or SaaS-specific pilot programs needed to act on sensed opportunities.
- Reconfiguring Capabilities: The company's existing hardware-centric structure lacks visible SaaS-enabling functions such as customer success, recurring revenue models, or

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internal cloud infrastructure. While Innodisk's strategic language implies flexibility, Antzer Tech must still make targeted internal changes across product development, finance, and IT to support a subscription-based software delivery model.

To supplement the dynamic capabilities analysis, the chapter included Porter's Five Forces, SWOT, and PESTLE analysis tables. These provided structural and environmental context, illustrating that SaaS integration raises barriers to entry, increases customer lock-in, and aligns with global public-sector digitization trends. However, they were also shown to lack the internal diagnostic and action-guiding specificity of the Dynamic Capabilities Framework.

In conclusion, this chapter demonstrates that product-level strategic transformation driven by clear capability assessment using public-facing information is both feasible and replicable. The case of Antzer Tech provides a grounded template for how other Taiwanese OBMs can evaluate and operationalize dynamic capabilities to move beyond commoditized hardware and into higher-value, software-driven ecosystems.

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5. Conclusions and Recommendations

5.1 Practical Implications for Taiwanese OBMs

This study applied the Dynamic Capabilities Framework to a real-world product case of Antzer Tech's bus GPS hardware to examine how a Taiwanese OBM could evolve its business model to include SaaS offerings. The analysis highlights several practical implications for Taiwanese OBMs navigating similar transitions:

- **Product-Level Transformation as a Starting Point:** Instead of attempting a full-scale organizational pivot, Taiwanese OBMs can apply strategic transformation frameworks at the product level. This focused approach allows firms to test SaaS integration and internal restructuring on a manageable scale before expanding to all product lines.
- **Dynamic Capabilities Must Be Intentional and Operationalized:** The ability to sense, seize, and reconfigure cannot remain conceptual. Firms must assign teams and responsibilities to continuously track customer needs, procurement signals, and technology shifts. These activities must be routine and evaluated regularly.
- **Subsidiary Structures Can Enable Agility:** As demonstrated by Antzer Tech's position within Innodisk, a subsidiary model may allow for more focused experimentation and agile resource allocation. When backed by a parent company with broader strategic goals, subsidiaries can more effectively develop, test, and scale software-enabled solutions to complement existing hardware products.
- **Hardware Alone Is Not a Competitive Moat:** With commoditization continuing to shrink hardware product margins, OBMs must look beyond product durability and price

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competitiveness. Integrating software and services—especially those that drive recurring revenue—can create long-term differentiation and improve customer lock-in.

- **Public Sector Trends Are Strategic Signals:** Public transportation procurement practices provide valuable insights for sensing capability development. Government demand for real-time data, cloud-based fleet management tools, and GTFS compliance are not only procurement preferences but also directional signals for future product development for hardware companies that compete for government contracts.

In summary, dynamic capabilities theory can be applied on a product level to gain useful insights on how a firm can improve sensing, seizing, and reconfiguring capabilities. This paper shows that concepts outlined in the framework can be found in the strategy documents and current corporate structure of Taiwanese companies such as Innodisk.

5.2 Recommendations for Future Research

While this study provides a focused application of the Dynamic Capabilities Framework, it also opens several pathways for future research:

- **Cross-Product Comparative Studies:** Future research could compare multiple products within the same firm or across different Taiwanese OBMs to assess how dynamic capabilities vary by product complexity, target market, or maturity stage. This would help further test the usefulness of starting at the product-level versus starting at the organizational level.
- **Longitudinal Studies on Capability Development:** As dynamic capabilities evolve over time, longitudinal case studies could offer deeper insight into how sensing, seizing, and

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reconfiguring unfold across years and what internal or external factors accelerate or hinder progress.

- **Measurement of Dynamic Capability Maturity:** Developing and testing tools to quantify a firm's dynamic capability maturity—at either the organizational or product level—could aid practitioners in benchmarking their transformation readiness.
- **Policy and Ecosystem Role in SaaS Transitions:** Future studies could explore how government policy, trade associations, and public funding influence or enable OBM transitions into software-integrated offerings, especially within the industrial and transportation sectors.

These research directions would build on the insights of this study and further clarify how Taiwanese OBMs can successfully navigate the shift from hardware-centric models to service-augmented, software-driven business strategies.

doi:10.6342/NTU202501020

References

Audia, P. G., Locke, E. A., & Smith, K. G. (2000). The paradox of success: An archival and laboratory study of strategic persistence following a radical environmental change. *Academy of Management Journal, 43*(5), 837–853. https://www.proquest.com/scholarly-journals/paradox-success-archival-laboratory-study/docview/199795021/se-2?accountid=14229

Chu, W.-W. (2009). Can Taiwan's second movers upgrade via branding? *Research Policy, 38*(6), 1054–1065. https://doi.org/10.1016/j.respol.2008.12.014

Directorate-General of Budget, Accounting and Statistics. (2024). *Statistical Abstract of National Income, 2024*. Executive Yuan, Republic of China (Taiwan). Retrieved from https://eng.stat.gov.tw

Dobbs, M. E. (2014). Guidelines for applying Porter's five forces framework: A set of industry analysis templates. *Competitiveness Review, 24*(1), 32–45. https://doi.org/10.1108/CR-06-2013-0059

Innodisk Corporation. (2024). *2023 Annual Report*. https://www.innodisk.com/upload/file/20240531_shareholders_annual_report_en.pdf

Innodisk Corporation. (2022). *Innodisk Group Solution Guide* (June 2022). https://www.antzer-tech.com/_files/ugd/20ee34_b2a1399c59b1456d9952859b096f78a2.pdf?index=true

doi:10.6342/NTU202501020

Kuo, T.-K. (2011). How contract manufacturers compete with their clients: A case study on innovation capability reconfiguration. In *First International Technology Management Conference* (pp. 522–531). IEEE. https://ieeexplore.ieee.org/document/5996022

Lee, K., Song, J., & Kwak, J. (2020). An exploratory study on the transition from OEM to OBM: Case studies of SMEs in Korea. *Asian Journal of Technology Innovation, 28*(1), 1–19. https://doi.org/10.1080/13662716.2015.1064257

Mass Transit. (2024, April 9). *Swiftly acquires transportation data platform Hopthru*. https://www.masstransitmag.com/management/press-release/55135974/swiftly-inc-swiftly-acquires-hopthru

Mell, P., & Grance, T. (2011). *The NIST definition of cloud computing* (NIST Special Publication 800-145). National Institute of Standards and Technology. https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

Metro Magazine. (2021, January 26). *Cubic acquires NextBus*. https://www.metro-magazine.com/10021186/cubic-acquires-nextbus

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. Free Press.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Teece, D. J. (2024, December). *David Teece on dynamic capabilities and strategic management* [Video]. YouTube. https://www.youtube.com/watch?v=WEgjlwFTOAc

doi:10.6342/NTU202501020

Wang, G., & Unger, J. (2013). A strategy to move Taiwan's IT industry from commodity hardware manufacturing to competitive cloud solutions. *IEEE Access*. https://doi.org/10.1109/ACCESS.2013.2260793

Industrial Development Bureau, Ministry of Economic Affairs. (2025). *Taiwan's best international brands* [Data set]. Data.Gov.TW. https://data.gov.tw/en/datasets/16396

Gogoro Inc. (2025). *Form 20-F: Annual report for the fiscal year ended December 31, 2024* [SEC filing]. U.S. Securities and Exchange Commission. https://www.sec.gov/Archives/edgar/data/1886190/000188619025000017/GOGORO-0001886190-25-000017.pdf

Korosec, K. (2021, March 9). *Via buys mapping startup Remix for $100 million*. TechCrunch. https://techcrunch.com/2021/03/09/via-buys-mapping-startup-remix-for-100-million/

doi:10.6342/NTU202501020