

From Productive Transitions to Capability Accumulation: Evidence from Advanced Manufacturing in Thailand and Vietnam

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Abstract

Increasingly advanced production does not by itself establish capability accumulation, particularly when public documents reveal productive outcomes more clearly than the processes connecting them. This study examines how selected manufacturers respond to changing productive requirements and what documentary evidence permits researchers to infer about the retention and subsequent use of productive resources. A comparative longitudinal documentary analysis informed by process tracing examines five productive-transition episodes involving TLB, Meiko, SVI, and KCE in Thailand and Vietnam. The procedure separates documented transition states from the epistemic status of individual claims and assesses resource connections between distinct episodes.

The cases document operation of selected transferred processes, planned expansion, reported mass production, cross-site knowledge coordination, and investment postponement. The examined sources do not sufficiently establish the temporal connections required to substantiate capability accumulation. This result identifies an evidentiary limit rather than an absence of accumulation. In particular, knowledge deployment across sites within one programme does not by itself establish resource continuity between distinct episodes.

The study contributes an evidence-bounded procedure distinguishing production presence, productive transition, capability accumulation, and cumulative productive transformation. Stronger accumulation claims require evidence that resources associated with an earlier transition remained available and contributed to a later one. The approach supports assessment of specific documentary claims without treating differences in disclosure as differences in capability or ranking national productive systems.

Keywords: Productive Transition; Technological Capability; Capability Accumulation; Industrial Upgrading; Advanced Manufacturing; Thailand; Vietnam; Documentary Evidence

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1. Introduction

The technological-capability literature distinguishes the resources required to operate production from those required to generate and manage technological change. Research on latecomer firms shows that capability accumulation depends on knowledge acquisition, socialisation, and codification, with different rates of accumulation across technological functions (Figueiredo, 2002, 2003). It is therefore a temporal and organisational process rather than an automatic consequence of investment.

An observational problem arises where researchers lack detailed access to firms' internal processes. Documents may establish that a plant entered production, qualified a product, or adopted a more demanding function without identifying how the transition became possible. They may also leave unresolved whether knowledge, routines, or technical solutions associated with an earlier transition contributed to a later one. Increasingly advanced production and cumulative capability formation consequently require distinct evidence.

This distinction matters for Thailand and Vietnam's advanced-electronics and semiconductor strategies. Thailand seeks to deepen existing activities, develop upstream production, and strengthen domestic industry participants (Thailand Board of Investment [BOI], 2026). Vietnam's strategy targets design, fabrication, packaging, and testing, including at least 100 design enterprises, one small-scale fabrication plant, and ten packaging and testing plants by 2030

(Prime Minister of Vietnam, 2024). Monitoring these objectives requires distinguishing productive expansion from accumulation of the resources supporting subsequent technological change.

The study examines five episodes involving TLB, Meiko, SVI, and KCE through public documentary evidence. Its observational unit is the productive transition episode: a bounded response to changed productive requirements, including planned, operationalised, and delayed outcomes. The guiding question is: how do the selected producers respond to changed requirements, and what does the documentary record permit researchers to infer about resource retention and capability accumulation?

The analysis distinguishes requirement change, reconfiguration, qualification, and operationalisation from evidence connecting resources across episodes. It treats retention, recombination, or redeployment as temporal bridging only where an identifiable resource associated with an earlier episode contributes to a subsequent one.

The empirical contribution is a reconstruction of selected productive responses and their evidentiary limits. Analytically, the study specifies the connection needed to distinguish successive transitions from accumulation. Methodologically, it separates implementation state from the epistemic status of individual claims. Neither successful production nor delay independently establishes capability status, and differences in disclosure do not support national capability rankings. The broader question is whether one productive transition becomes part of the productive basis for the next.

2. Literature Review: From Industrial Upgrading to Observable Capability Accumulation

2.1 Industrial Upgrading and the Problem of What Changes

Industrial-upgrading research examines changes in what firms produce, how they produce it, and which functions they perform within production networks. Humphrey and Schmitz (2002) distinguish opportunities for upgrading from the constraints associated with particular forms of global value-chain governance. Participation may support improvements in products and processes while limiting access to other functions. Gereffi et al. (2005) further identify supplier capabilities, transaction complexity, and codifiability as determinants of governance arrangements.

These approaches move analysis beyond manufacturing presence toward changes in productive activity and inter-firm relationships. However, observing a new product, process, or value-chain function does not necessarily identify how the resources supporting that change were acquired or developed. Nor does it establish whether knowledge and routines exercised during one transition remain available for subsequent productive change. An observed upgrading outcome and a claim about capability accumulation therefore require related but distinct evidence.

Conventional indicators—including investment, exports, productivity, domestic value added, and technological intensity—remain useful for assessing structural change. The issue is not their validity for those purposes, but the additional inference required when they are used to substantiate organisational learning or capability accumulation. A sequence of more sophisticated outputs may establish changes in production without revealing the resource connections between them. Research on product relatedness also addresses the cumulative character of structural change.

Hidalgo et al. (2007) show that countries tend to diversify towards products related to their existing specialisations, reflecting differences in the resources required to enter new activities. This provides an aggregate perspective on how an existing productive base conditions subsequent development. The present study examines a different observational level: whether documents identify specific resources connecting productive transitions within firms. Product relatedness and episode-level resource tracing therefore address complementary questions.

The question pursued here is consequently narrower than whether upgrading occurs. It concerns what evidence establishes that resources associated with an earlier productive transition contributed to a later one. Addressing this question requires connecting the upgrading literature to research on technological capabilities and learning processes.

2.2 From Production Capacity to Technological Capability

The technological-capability literature provides a foundation for distinguishing productive outcomes from the resources supporting technical change. Bell and Pavitt (1992, 1993) distinguish production capacity—the resources required to operate existing production—from technological capabilities, understood as the resources required to generate and manage technical change. Capacity may expand through investment and imported technology without equivalent development of the knowledge, experience, organisational arrangements, and linkages required for subsequent change.

Lall (1992) similarly treats technological capability as developing through interactions among firm-level effort, incentives, and institutions. Investment in facilities and equipment therefore provides part of the productive basis, but does not automatically establish the capabilities needed to select, adapt, improve, or develop technology.

Figueiredo (2002, 2003) examines the relationship between learning processes and differing rates of technological-capability accumulation in latecomer firms. External and internal knowledge acquisition, knowledge socialisation, and knowledge codification help explain how knowledge becomes available beyond individual experience. This directs attention to the organisational processes through which resources for technical change are acquired, shared, and maintained over time. Absorptive capacity provides a further explanation of why access to external knowledge does not automatically produce learning. Cohen and Levinthal (1990) emphasise the role of prior related knowledge in recognising, assimilating, and applying new knowledge. Nelson and Winter's (1982) account of organisational routines likewise directs attention to the organisational basis of recurrent productive activity. Together, these perspectives suggest that accumulation depends on how knowledge becomes usable within an organisation, rather than on its acquisition alone.

Evidence from East Asian electronics reinforces the importance of tracing learning processes. Hobday (1995) examines how latecomer firms developed technological competence through assimilation, adaptation, and innovation, with export customers shaping learning requirements. Such research establishes substantive processes through which catch-up can occur.

The documentary approach developed here asks what evidence is sufficient to identify continuity in those resources across particular productive transitions.

These studies establish that capability accumulation is a process requiring empirical reconstruction, rather than an attribute that can be inferred directly from production sophistication. Detailed longitudinal access can reveal learning activities, technical problem-solving, and changes in organisational knowledge. Public documentary evidence, however, may provide more precise records of facilities, equipment, qualification, and production milestones than of the learning processes associated with them.

The observational problem becomes particularly acute when analysis connects successive transitions. Documents may establish that two productive functions became operational while leaving unresolved whether knowledge, routines, or technical solutions associated with the first contributed to the second. Evidence of productive continuity is therefore insufficient, on its own, to establish continuity in the resources supporting technical change.

The gap addressed here concerns this evidentiary relationship. The distinction between production capacity and technological capability, and the importance of cumulative learning, are established contributions of the literature. The present study asks how claims about accumulation can be bounded when the retention and subsequent use of productive resources are only partly observable.

2.3 Global Production Networks and Distributed Capability

Advanced manufacturing frequently distributes productive functions and their supporting resources across organisations and locations. Plants, headquarters, customers, equipment suppliers, and engineering teams may contribute to the same transition. GVC research explains coordination through relationships among transaction complexity, codifiability, and supplier capabilities (Gereffi et al., 2005). It therefore provides a basis for examining productive activity as part of inter-organisational arrangements rather than attributing all supporting resources to the production site. Global production-network research extends this discussion to knowledge diffusion and the organisational and territorial relationships supporting production. Ernst and Kim (2002) examine connections between global production networks, knowledge transfer, and local capability formation. Coe et al. (2008) develop the GPN framework as an approach to understanding interconnected production and development processes. These contributions support examination of capability formation within network relationships while leaving the retention and subsequent use of particular resources as empirical questions.

This distribution creates an attribution problem. Qualification of a new product may depend on local engineering, transferred procedures, supplier intervention, customer assistance, or combinations of these contributions. Evidence of qualification or production alone may not distinguish among them. It consequently cannot establish where the relevant knowledge originated, which actors control it, or whether it remains available locally for subsequent use.

Research on Southeast Asian industrialisation highlights the developmental importance of these distinctions. Angelino and Masina (2014) examine constraints on Malaysia's industrial catching-up, including limitations in domestic technological development. Masina and Cerimele (2018) question whether expansion of foreign-dominated export manufacturing in Vietnam constitutes a deeper process of national industrialisation. These studies caution against treating manufacturing expansion as sufficient evidence of domestic capability formation.

External participation nevertheless provides possible channels for acquiring and adapting productive knowledge. Assistance from headquarters, customers, or suppliers may contribute to local learning where knowledge is absorbed, retained, and subsequently used. Continued external involvement does not establish that such learning is absent. Conversely, participation in a production network does not establish that these processes have occurred.

Capability attribution therefore requires evidence appropriate to the organisational level of the claim. A documented arrangement may establish that a plant performs a function, that a firm coordinates resources across sites, or that knowledge passes between organisations. Claims about national accumulation additionally require evidence that relevant resources become available within the wider productive system. These levels cannot be substituted for one another.

The question for the present study is how documentary evidence identifies the actors and resource connections supporting productive transitions, and whether those connections extend beyond an immediate programme to subsequent productive change.

2.4 From Capability Accumulation to the Problem of Observation

The preceding literature connects upgrading opportunities to governance arrangements, distinguishes production capacity from technological capability, and explains accumulation through organisational learning (Humphrey & Schmitz, 2002; Gereffi et al., 2005; Bell & Pavitt, 1992, 1993; Lall, 1992; Figueiredo, 2002, 2003). The remaining question concerns how the connections underlying accumulation can be observed through public documents.

Records of two successive operational functions may establish upgrading without showing whether resources associated with the earlier transition contributed to the later one. Retained knowledge, adapted routines, and reused technical solutions may operate alongside new equipment, external assistance, and recruited personnel. The task is to identify the contribution of earlier resources, rather than infer accumulation from productive success or exclude it because external inputs were involved.

Evidentiary resolution depends on what a source can establish about these connections. Organisational histories may expose knowledge acquisition and reuse, while public records may identify production milestones more clearly. Neither source type guarantees sufficient support; provenance, specificity, and unresolved interpretations remain relevant.

The gap therefore concerns the evidence required to connect productive change with cumulative learning when internal processes are partly observable. The guiding question is: how can capability accumulation be distinguished from successive productive outcomes when their resource connections are incompletely documented?

The following section develops the productive transition episode to address this question, separating implementation state from the epistemic status of claims and assessing resource connections across distinct episodes.

3. Research Design and Methods

3.1 Research Design

This study employs a comparative longitudinal documentary design to examine five productive-transition episodes involving four manufacturers operating in Thailand and Vietnam. Comparison is conducted across episodes to assess variation in productive responses, implementation states, and evidentiary coverage. The design does not support a national comparison of technological capability.

The analysis addresses two connected questions. First, what responses to changed productive requirements are documented, and how does their implementation develop over time? Second, what does that evidence permit the researcher to establish about the retention, recombination, and subsequent use of productive resources? Separating these questions prevents an observed outcome from substituting for evidence of the process supporting it.

The study combines dated event reconstruction with claim-level assessment informed by process tracing. It draws on attention to temporal sequence, diagnostic observations, and alternative explanations (Collier, 2011; Bennett & Checkel, 2015). These principles guide evaluation of the documentary record without presuming that a complete causal mechanism can be reconstructed for every episode.

The analysis distinguishes productive processes from their representation in documents. Learning or resource retention may occur without public disclosure, while a corporate description may report an arrangement without independently establishing its implementation. Documentary visibility is therefore treated as a condition of observation, rather than a direct measure of capability.

Inference is bounded by the discriminatory value of the evidence. Where several explanations remain compatible with an observed outcome, the analysis specifies what is documented and leaves the unresolved relationship undetermined. It also allows retained resources and newly acquired inputs to contribute jointly to a transition. The purpose is to assess the support for particular claims, including their organisational and temporal scope, rather than select a single explanation solely from theoretical expectations.

3.2 Unit of Analysis: The Productive Transition Episode

The productive transition episode is an empirically bounded period initiated by a documented change in productive requirements and encompassing responses intended to operationalise the required function. Outcomes may be operational, partial, ongoing, delayed, or abandoned. Each episode specifies the requirement, productive function, organisational location, and documented trajectory. The latest record provides an observation point rather than necessarily establishing completion. A firm may contribute multiple distinct episodes.

Changed requirements may involve a new specification, a more demanding process, transfer to another site, or expansion requiring a distinct productive configuration. Investment,

floor space, or output growth alone is insufficient. TLB Plant 2 and KCE Rojana qualify because their documents connect planned factory configurations to production constraints or additional business and HDI requirements (TLB Co., Ltd., 2026; KCE Electronics Public Company Limited, 2024, p. 21). Neither is treated as demonstrated first acquisition of the relevant capability.

The observational scaffold comprises requirement change (R), reconfiguration (C), qualification or validation (Q), and operationalisation (F). Reconfiguration concerns equipment, processes, engineering arrangements, or production organisation; qualification concerns a relevant technical or customer gate; operationalisation concerns entry into an identifiable productive state.

These elements guide reconstruction without prescribing a universal causal sequence. Observed requirements, qualification, and production do not establish undocumented reconfiguration. Missing evidence is distinguished from an inapplicable element.

Function scope is assessed separately from implementation state. Selected transferred processes may operate without reproducing the source facility's complete configuration. Partial transfer therefore does not establish incomplete implementation. Where intended scope is unclear, completion relative to a broader target remains unresolved. Later records may update the state, but episode boundaries are not narrowed retrospectively to match an outcome. Operation of specified functions is distinguished from completion of all planned lines.

3.3 Episode Identification and Case Selection

Document collection began in approximately August 2026 and was completed in September 2026.

The cited sources were checked again during manuscript revision in October 2026.

Episodes were identified where documents described a bounded change in productive requirements and a corresponding response. Inclusion required evidence identifying the function and at least part of its temporal trajectory. Investment or output growth without an identifiable requirement and response was insufficient.

Selection was purposive and based on documentary observability rather than successful implementation. Five episodes involving four firms provide contrasting evidence of process transfer, planned expansion, reported mass production, cross-site coordination, and postponement. TLB contributes two episodes because its documents distinguish transferred processes operating at Plant 1 from the subsequent planned configuration of Plant 2.

The cases were retained for their relevance to distinguishing productive transition from capability accumulation. TLB permits examination of transfer scope and planned expansion. Meiko's May 2026 presentation reports production initiation and mass production of identified functions alongside continuing line expansion. SVI describes coordination within a distributed programme, while KCE documents a delayed expansion.

The sectoral scope covers advanced electronics and semiconductor-related manufacturing, without treating the activities as technologically interchangeable or representative of the semiconductor industry. Geographical scope identifies operations in Thailand and Vietnam rather

than the origin of all supporting resources. The SVI episode includes US operations because the documented programme spans both locations.

The sample is not statistically representative. Selection by documentary observability may favour firms with accessible disclosures. Including planned and delayed episodes broadens outcome coverage but does not eliminate disclosure-related selection bias. Comparison concerns the selected episodes and the claims their evidence supports.

3.4 Documentary Evidence and Triangulation

The analysis reconstructs dated productive responses from TLB's securities registration statement, Meiko's FY2025 financial results presentation published in May 2026, SVI's corporate accounts, and KCE's AGM minutes. Government and investment-agency documents provide policy context rather than independent verification of firm-level processes.

Sources are assessed for purpose, provenance, completeness, and relationships to other evidence (Bowen, 2009). Scott's (1990) criteria add attention to authenticity, credibility, representativeness, and meaning. Official publication identifies provenance without independently confirming reported processes; selective disclosure limits coverage, while reporting context affects interpretation.

Filings, AGM minutes, and presentations document reported plans, decisions, and production milestones. Their formal setting does not verify every technical claim or management explanation. Corporate programme accounts may provide process detail while serving

promotional purposes. Generic procedures are not attributed to a particular episode without a documented connection, and group-level capabilities are not automatically assigned to individual plants.

Triangulation distinguishes independent-source corroboration from longitudinal comparison. Reproductions of one announcement share an evidentiary origin. Successive company records may reveal changing trajectories or inconsistencies but remain dependent on that organisation. Independent corroboration is not presumed where unavailable.

Plans are distinguished from implementation. Later records are examined for operation, modification, postponement, or discontinuation without filling gaps through assumption. The findings identify supporting sources and available page or section locators, retaining corporate attribution and distinguishing direct reports from analytical inference.

3.5 Transition State and Epistemic Status

Transition state describes implementation of a specified function at a dated observation point. Epistemic status describes the support for an individual claim. The two dimensions are assessed separately.

Planned denotes an announced transition without established implementation; Ongoing, implementation without established productive operation; Partial, operation of only part of the specified function; Operationalised, entry of that function into its relevant productive state; Delayed, postponement relative to the documented trajectory; Abandoned, discontinuation; and Outcome Unknown, insufficient evidence of subsequent status.

Operationalisation does not require full capacity utilisation or completion of every planned line. Reported mass or recurring production may establish operation of identified functions while wider expansion continues. Partial transfer from another facility likewise does not establish incomplete implementation. Scope and remaining work are reported separately, and episode boundaries are not narrowed retrospectively to fit outcomes.

Claims receive O, documented observation; I, evidence-bounded inference; or U, undetermined. These describe evidentiary support rather than capability levels.

O identifies what a source directly reports, retaining its attribution and scope; it does not imply independent verification. I identifies an interpretation supported by evidence that discriminates among relevant alternatives, with its organisational and temporal limits specified. U identifies insufficient documentation, specificity, or discrimination to determine a relationship; it does not establish substantive absence.

An operationalised function may therefore coexist with unresolved claims about knowledge origin or reuse, while a plan or delay may be directly documented. Cross-site deployment within one programme does not establish temporal bridging between distinct episodes. Accumulation requires evidence that earlier resources remained available and contributed subsequently, potentially alongside new inputs or external assistance.

3.6 Claim-Level Evidence Assessment and Inferential Rules

The analysis assesses individual claims within each productive-transition episode. Assessment covers requirement change, productive reconfiguration, qualification or validation,

operationalisation, relationship to the prior productive function, retention, recombination, redeployment, cross-episode linkage, and capability accumulation. These categories guide examination of the documents rather than constitute a capability score.

Claims are classified as documented observations (O), evidence-bounded inferences (I), or undetermined relationships (U), following Section 3.5. The findings identify the relevant sources and, where available, the page or section supporting specific claims. They distinguish what a source directly reports from the interpretation advanced by the analysis. Table 1 summarises transition states and the status of cross-episode accumulation claims.

Cross-episode bridging requires evidence connecting an identifiable resource associated with an earlier episode to its subsequent availability and contribution in a later episode. Relevant resources may include process documentation, testing routines, technical solutions, equipment knowledge, engineering teams, or organisational arrangements. Repeated production success or continuity of personnel alone does not establish that connection. Knowledge deployment across sites within one programme is also distinguished from reuse across separate episodes.

Evidence is assessed for its capacity to identify the resource, establish its temporal continuity, specify its subsequent use, and discriminate among relevant interpretations. Provenance, reporting purpose, specificity, and corroboration constrain the support available for each claim. A detailed corporate description may identify a reported arrangement without independently verifying its implementation or effectiveness.

The governing principle is that the scope and specificity of a claim should not exceed the support provided by its evidence. A record establishing production at a plant cannot, without additional evidence, establish local knowledge origin, cross-episode accumulation, or diffusion within a national productive system.

This principle draws on process tracing's attention to diagnostic observations and alternative explanations (Collier, 2011; Bennett & Checkel, 2015). The present approach applies these principles to productive-transition episodes without presuming complete reconstruction of a causal mechanism.

Local engineering, headquarters assistance, supplier involvement, and newly acquired inputs may contribute jointly to a transition. The assessment therefore asks whether the particular contribution of earlier resources is supported, rather than requiring every alternative contribution to be excluded. Where that connection cannot be established, capability accumulation remains undetermined.

Within an episode, documented requirements, qualification, and production do not establish an undocumented reconfiguration. Across episodes, successive operational functions do not establish retention or reuse. The analysis preserves these unresolved relationships rather than filling gaps through theoretical expectation.

The author assessed the documentary evidence and assigned the epistemic classifications. During revision, the cited sources were rechecked against the claims and classifications reported in the manuscript.

4. Findings: Productive Transitions and the Limits of Capability Inference

The five episodes differ in their documented implementation states and in the claims their sources support. The records describe operation of transferred processes, planned reconfiguration, reported mass production alongside continuing production-line expansion, and investment postponement. The analysis distinguishes these reported events and arrangements from inferences concerning resource retention and capability accumulation. Each episode is assessed at a specified observation point and organisational scope, with corporate provenance retained in the interpretation. The findings concern the selected episodes rather than firm or national capability rankings.

4.1 TLB VINA: Partial Transfer and Planned Functional Expansion

TLB VINA illustrates why factory operation must be distinguished from the scope of productive-function transfer. Vietnam Plant No. 1 began operations in October 2024. TLB reports that the facility operated selected production processes transferred from its Ansan headquarters. Reported sales from the Vietnamese subsidiary in 2025 further support the conclusion that the facility had progressed beyond investment and construction into productive operation (TLB Co., Ltd., 2026, sections on subsidiary financial performance and the use of offering proceeds).

The evidence establishes operation of the transferred processes, but not reproduction in Vietnam of the complete productive configuration located in Ansan. Plant No. 1 is therefore classified as Operationalised with respect to the transferred processes, while the scope of transfer is recorded separately as partial. Partial transfer does not itself establish incomplete

implementation: the available documentation does not show that reproducing the entire Ansan configuration was the intended scope of Plant No. 1.

Plant No. 2 represents a subsequent planned reconfiguration. TLB's investment documentation links the expansion to production constraints arising as a larger share of process-intensive products increases processing time and layering requirements. It describes a second factory adjacent to Plant No. 1, designed for a production capacity of approximately 20,000 m² per month, with staged installation of PCB production equipment following building completion (TLB Co., Ltd., 2026, section on the use of offering proceeds). The episode therefore concerns a documented response to changed production requirements, even though the relevant manufacturing activities are not entirely new to the firm.

At the date of the filing, these records establish a planned configuration rather than its implementation or operationalisation. Plant No. 2 is consequently classified as Planned.

The two episodes establish operation of selected transferred processes followed by planned expansion. They do not establish whether resources exercised or developed through Plant No. 1 were retained, recombined, or redeployed in Plant No. 2. Cross-episode bridging evidence therefore remains undetermined, leaving capability accumulation unresolved.

4.2 Meiko Vietnam: Operationalised Transition Without Established Cross-Episode Linkage

Meiko's FY2025 financial results presentation, dated May 21, 2026, reports that Vietnam Plant No. 4 began operations in July 2025 to supplement Plant No. 2's production capacity. It also reports

that mass production of PCBs for satellite and AI applications has commenced, while production lines continue to expand (Meiko Electronics Co., Ltd., 2026, p. 17). At this documented observation point, the identified productive functions are classified as Operationalised. This classification records their reported entry into mass production; it does not establish completion of all planned lines or achievement of full design capacity.

The records thus distinguish operation of identified functions from continuing expansion of the wider facility. The dated classifications describe the documented trajectory without treating transition state as a permanent attribute of the plant.

The cross-episode relationship remains unresolved. Although the documents establish earlier production in Vietnam and subsequent operation of Plant No. 4, they do not establish whether engineering knowledge, routines, technical solutions, or other productive resources associated with an earlier transition contributed to the later one.

Meiko consequently illustrates how documentary evidence can establish a change in productive state without establishing the resource connection required for a capability-accumulation claim. Cross-episode bridging evidence and capability accumulation remain undetermined.

4.3 SVI: Documented Cross-Site Knowledge Coordination and Deployment

SVI's corporate materials describe arrangements for coordinating productive knowledge across sites. Its account of an AI-infrastructure electronics programme reports concurrent NPI activities at SVI Thailand and SVI Electronics USA using a common engineering baseline, aligned process

documentation, standardised test specifications, and a shared traceability framework. It states that process findings from either location were evaluated against the baseline and incorporated into both manufacturing environments before mass production (Nookaew, 2026a, section “Dual-Site NPI”).

The same account reports PCBA mass production in Thailand, followed by transfer to the United States for box-build assembly, system-level integration, final testing, and delivery preparation (Nookaew, 2026a). These statements document the company’s reported allocation of productive functions and deployment of process findings across sites.

A separate corporate account describes group-wide engineering standards and controlled deployment of engineering changes across applicable facilities (Nookaew, 2026b). This provides organisational context, but does not establish application of every described procedure to the specific programme.

Claims directly reported in these sources are coded O with their corporate attribution retained. This classification does not establish independent verification of implementation, effectiveness, or durability.

The documented connection is spatial and organisational within one programme. Concurrent NPI and incorporation of findings across facilities do not establish that resources associated with an earlier, distinct productive-transition episode contributed to a subsequent episode. Cross-site deployment is therefore distinguished from temporal bridging.

The distributed arrangement also limits geographical attribution. Reported production in Thailand does not establish that all supporting knowledge originated or remained available there. The evidence supports analysis of coordination within the Thai-US programme, without resolving exclusive local origin or longer-term availability.

SVI illustrates how corporate documentation can make cross-site knowledge coordination visible while leaving longitudinal resource connections unresolved. Capability accumulation across distinct productive-transition episodes remains undetermined.

4.4 KCE: Delayed Transition Without Established Capability Failure

KCE provides a contrasting outcome because its planned Rojana expansion remained postponed. The company already produced HDI PCBs before the proposed investment. Its 2024 AGM minutes describe Rojana as an expansion intended to accommodate additional business and HDI production, including laser processing for the small holes required in HDI products. The same account reports that management was considering postponing construction, with production then anticipated for late 2025 or early 2026 (KCE Electronics Public Company Limited, 2024, p. 21).

The episode therefore concerns the planned establishment of an additional productive configuration for an existing function, rather than the firm's first acquisition of HDI production. It qualifies as a productive-transition episode because the documented expansion entails a new factory configuration responding to additional production requirements. This does not imply that the intended function is technologically new to the firm.

In its 2026 AGM minutes, KCE reports that the project has been temporarily postponed. Management reports production efficiency of approximately 70% and indicates that construction would be reconsidered when utilisation exceeds 90%. It attributes the postponement to supply-demand conditions and the stronger Thai baht (KCE Electronics Public Company Limited, 2026, p. 19). These statements document management's explanation; they do not independently establish the relative causal importance of those factors.

At the latest documented observation point, the episode is classified as Delayed. The available evidence does not establish technological incapability as the explanation for postponement. The reported existence of HDI production establishes that the firm already performs the function targeted for expansion, but does not establish readiness for every technical and organisational requirement of the proposed configuration.

KCE consequently illustrates why transition outcome and capability status must be assessed separately. Delay does not establish capability failure, while prior production does not establish successful implementation of the proposed expansion. Including delayed episodes avoids restricting the analysis to transitions that culminate in productive operation.

4.5 Cross-Case Findings

The five episodes reveal variation in transition state and in what the documentary record permits the analysis to establish. TLB Plant 1 documents operation of selected transferred processes, whereas Plant 2 remains a planned configuration. Meiko's May 2026 presentation reports mass production of identified functions alongside continuing production-line expansion. SVI's

corporate accounts describe production and knowledge coordination across sites within one programme. KCE documents a postponed expansion and management's explanation for that decision. Table 1 summarises these distinctions.

Table 1

Cross-Case Comparison of Productive Transition States and Evidentiary Resolution

Episode	Documented transition state	Within-episode evidence	Temporal bridging between distinct episodes	Capability accumulation
TLB VINA Plant 1	Operationalised for transferred processes	Selected transferred processes operating; full configuration transfer not established (TLB Co., Ltd., 2026)	U	U
TLB VINA Plant 2	Planned	Factory and production-line configuration planned; implementation not	U	U

Episode	Documented transition state	Within-episode evidence	Temporal bridging between distinct episodes	Capability accumulation
		established at filing date (TLB Co., Ltd., 2026)		
Meiko Vietnam Plant 4	Operationalised for identified functions in 2026	Mass production of PCBs for satellite and AI applications reported; production-line expansion continues (Meiko Electronics Co., Ltd., 2026, p. 17)	U	U
SVI Thailand– USA programme	Operationalised according to corporate reporting	Cross-site NPI, shared baseline, process findings, and production allocation reported; wider procedures described separately (Nookaew, 2026a, 2026b)	U; cross-site coordination concerns one programme	U
KCE Rojana	Delayed	Expansion postponed; management reports	U	U

Episode	Documented transition state	Within-episode evidence	Temporal bridging between distinct episodes	Capability accumulation
		utilisation and commercial explanations (KCE Electronics Public Company Limited, 2024, 2026)		

Note. Author's analysis of TLB Co., Ltd. (2026), Meiko Electronics Co., Ltd. (2026), Nookaew (2026a, 2026b), and KCE Electronics Public Company Limited (2024, 2026). Transition states refer to the specified function and documented observation point. U = undetermined; this classification does not establish the absence of capability accumulation or constitute a capability ranking. Cross-site coordination within one programme is distinguished from temporal bridging between distinct episodes.

First, documentary evidence can establish productive responses at greater resolution than the connections required for capability-accumulation claims. The responses examined include process transfer, planned factory reconfiguration, entry into mass production, cross-site coordination, and investment postponement. Meiko's dated records, for example, establish a change in implementation state without establishing how resources from an earlier episode

contributed to that change. Within-episode reconstruction and cross-episode linkage therefore require different evidence.

Second, the scope of a documented connection constrains its interpretation. SVI's account describes incorporation of process findings across sites within one programme. This supports a claim about reported organisational coordination, but not a temporal bridge between distinct episodes. Likewise, TLB's partial transfer describes the scope of processes transferred from Ansan; it does not by itself establish incomplete implementation of Plant 1's intended function. Both cases demonstrate the importance of matching claims to the organisational, spatial, and temporal boundaries of the evidence.

Third, transition outcome does not determine capability status. KCE's postponement does not establish technological incapability, while productive operation in TLB, Meiko, or SVI does not by itself establish capability accumulation. Management's explanations and corporate descriptions remain identifiable source claims rather than independently verified accounts of all processes producing the observed outcome.

All capability-accumulation entries are consequently coded U. This common classification does not imply that the firms possess equivalent capabilities or that accumulation did not occur. It records that the examined documents do not sufficiently establish the temporal connections required for that claim. The comparison therefore identifies variation in documented productive responses and evidentiary coverage, rather than a national or firm-level capability ranking.

5. Discussion

5.1 From Productive Transitions to Capability Accumulation

The findings develop the observational implications of an established distinction in the technological-capability literature. Production capacity concerns the resources required to operate production, whereas technological capability concerns the resources required to generate and manage technical change (Bell & Pavitt, 1992, 1993). Longitudinal studies further demonstrate that capability accumulation depends on learning processes through which knowledge becomes organisationally available over time (Figueiredo, 2002, 2003). The present study addresses how claims about that accumulation can be assessed when public documents provide uneven access to the processes involved.

The cases document different productive responses while leaving temporal resource connections unresolved. TLB reports operation of selected transferred processes and a subsequent planned expansion. Meiko reports mass production of identified functions alongside continuing production-line expansion. SVI reports knowledge coordination across sites within one programme. KCE documents postponement of a planned expansion. These records support claims about reported events and arrangements, but none sufficiently establishes that resources associated with an earlier, distinct transition contributed to a later one.

The contribution therefore concerns the evidentiary connection between productive episodes. A documented operational outcome supports a claim that a specified productive function was performed at the reported observation point. It does not establish the durability or

wider scope of that performance. A capability-accumulation claim additionally requires evidence concerning which resources remained available and how they contributed when requirements changed. Such resources may have been acquired externally, developed internally, or combined through a production network. Their origin alone does not determine whether accumulation occurred.

A hypothetical example illustrates the distinction between U and I. Suppose dated records from a first episode identify a testing routine developed to resolve a production problem. Records from a later episode identify adaptation of that routine, continued involvement of the responsible engineering team, and successful validation under a new specification. If these observations have sufficiently specific and credible provenance, they could support an evidence-bounded inference that resources from the earlier episode contributed to the later transition. The claim could be coded I even if no single document explicitly describes capability accumulation. The inference would concern the identified routine and transition, rather than the firm's overall capability. Repeated production success or unchanged personnel alone would provide weaker discrimination among alternative explanations.

Evidentiary resolution is consequently judged by a document's capacity to distinguish relevant interpretations. Specific identification of a resource, its timing, organisational location, continuity, and subsequent use provides greater discriminatory resolution than a general statement about advanced production. Detail alone is insufficient: provenance, reporting purpose,

corroboration, and unresolved alternatives also affect what the evidence can support. A detailed corporate account may make a process visible while leaving its implementation or effectiveness independently unverified.

This procedure is compatible with process tracing's assessment of diagnostic evidence and alternative explanations (Collier, 2011; Bennett & Checkel, 2015). Its specific contribution is to organise documentary assessment around productive-transition episodes, separate implementation state from epistemic status, and require an explicit temporal bridge before advancing a capability-accumulation claim. It does not replace established evidential tests or claim a new general theory of inference.

The relevant time horizon is determined by the process being investigated rather than a fixed number of years. Assessing accumulation requires observation extending from an earlier transition through an interval of retention to a subsequent occasion on which the resource is used or adapted. The relatively short documentary window examined here limits that assessment. A longer observation period would improve opportunities to identify such connections, although duration alone would not establish them.

The productive transition episode thus provides an intermediate unit between aggregate industrial indicators and intensive reconstruction of organisational learning. It permits bounded reconstruction of productive responses while keeping unresolved connections visible. Its value lies in specifying the additional evidence needed to move from observing productive change to substantiating accumulation.

5.2 Distributed Production and Capability Attribution

Distributed production complicates the attribution of capability because the location of an operational function need not coincide with the origin or organisational control of the resources supporting it. Engineering, NPI, qualification, manufacturing, and testing may be coordinated across several sites and organisations. GVC research provides a basis for examining these relationships through transaction characteristics, coordination arrangements, and supplier capabilities (Gereffi et al., 2005).

SVI illustrates this issue through its reported coordination of Thai and US operations. The corporate account describes a shared engineering baseline and incorporation of process findings across both sites within one programme (Nookaew, 2026a, section “Dual-Site NPI”). Reported production in Thailand supports a claim about the Thai facility’s operational role, while leaving the origin, distribution, and continued availability of the supporting knowledge only partly resolved. It establishes neither exclusively local capability formation nor an absence of local learning.

Capability attribution therefore requires separate attention to where a function is performed, which actors contribute its supporting resources, and where those resources remain available for subsequent use. These relationships may differ. Knowledge originating outside a country may become locally adapted and retained, while knowledge exercised at a local plant may remain dependent on arrangements controlled elsewhere.

This distinction is relevant to foreign-investment-led industrialisation. Research on Malaysia and Vietnam cautions against equating expansion of foreign-linked manufacturing with deeper domestic capability formation (Angelino & Masina, 2014; Masina & Cerimele, 2018). The present analysis adds an evidentiary requirement: claims about local accumulation must identify resources retained or adapted locally and establish their contribution to subsequent productive change. Foreign participation or continuing external assistance alone cannot determine the result.

Moving from a plant or firm to a national productive system requires additional evidence. A documented resource connection within one firm does not establish diffusion to domestic suppliers, mobility of technical knowledge across organisations, or wider availability of engineering and problem-solving resources. Such processes would require supplier records, workforce trajectories, inter-organisational collaboration, or other evidence appropriate to the national-level claim.

The cases consequently support bounded analysis of reported productive arrangements. They do not permit the location of advanced production, the ownership of a facility, or the visibility of corporate disclosure to serve as a proxy for national capability accumulation.

5.3 Cumulative Productive Transformation and Development

The distinction between productive transition and capability accumulation also clarifies the interpretation of industrial development. Investment, exports, productivity, domestic value added, and technological intensity provide evidence of structural change. Their analytical value remains

substantial, but they do not directly establish whether resources associated with one productive transition contribute to later transitions.

Successive productive upgrading refers here to a sequence in which increasingly demanding productive functions become operational. Cumulative productive transformation refers to a stronger relationship: resources established, acquired, adapted, or exercised through earlier transitions remain available and contribute to subsequent productive change. The distinction concerns the connection between transitions, rather than the sophistication of their outcomes alone.

Cumulativeness does not require technological self-sufficiency. Retained resources may be recombined with new equipment, personnel, customer assistance, supplier expertise, or externally acquired knowledge. The relevant question is whether earlier productive experience contributes demonstrably to later responses, rather than whether every supporting resource originates within the same firm or country.

The cases examined here do not establish cumulative productive transformation. They identify the evidence needed to investigate it. Even a substantiated connection between two firm-level episodes would support a bounded accumulation claim before it could support a broader developmental conclusion. Extending that conclusion would require evidence that resource connections recur across transitions and that the retained resources become available for productive use within a wider system.

This proposition connects the documentary approach to research on middle-income development. Studies of Thailand and technological upgrading emphasise the importance of learning, innovation, and the institutional conditions supporting more advanced capabilities (Intarakumnerd, 2019; Radosevic & Yoruk, 2018). The World Development Report 2024 similarly distinguishes development strategies centred on investment, technology infusion, and innovation (World Bank, 2024). These perspectives establish the developmental importance of capability formation; the episode-based approach specifies one way to assess the continuity of productive resources underlying it.

Cumulative productive transformation is therefore advanced as a relationship to be investigated through longitudinal evidence. The present empirical contribution is narrower: it demonstrates how documented productive change can be distinguished from unresolved claims about the accumulation supporting that change.

5.4 Policy Implications

The distinction between productive expansion and capability accumulation has implications for monitoring the semiconductor and advanced-electronics strategies discussed in the Introduction. Thailand's strategy seeks to expand investment and deepen productive activities, while Vietnam's strategy identifies targets across design, fabrication, packaging, and testing (Thailand Board of Investment, 2026; Prime Minister of Vietnam, 2024). Progress towards these objectives requires monitoring investment and production milestones. However, achieving such milestones does not

by itself establish that resources supporting subsequent technological change have accumulated locally.

Policy monitoring could therefore distinguish implementation outcomes from learning and resource-continuity outcomes. Facility completion, equipment installation, qualification, and production initiation indicate progress in implementing a productive function. Evidence of capability accumulation requires additional attention to which technical resources remain available and how they contribute when products, processes, or customer requirements change.

Investment-promotion agencies could complement existing reporting with proportionate records of technology transfer, engineering responsibilities, process adaptation, and subsequent reuse. For example, a transfer record could identify the function transferred, the personnel and documentation involved, and the recipient organisation's role. Follow-up assessment could examine whether those resources were used or adapted in a later productive transition. Training attendance or receipt of documentation alone would not establish that relationship.

Supplier-development programmes could similarly record changes in suppliers' engineering and problem-solving responsibilities across successive assignments. Participation, sales growth, and qualification are relevant outcomes, but stronger learning claims would require evidence that experience from an earlier assignment contributed to meeting a later requirement. Such records would help distinguish continued production participation from accumulation of resources for productive change.

Reporting should also separate the location of production from the origin, control, and continued availability of supporting knowledge. Cross-site coordination may enable advanced production without establishing that all relevant resources are retained locally. Conversely, external assistance may contribute to local learning. Assessment should examine these relationships rather than use foreign ownership or domestic production as a proxy for capability status.

These proposals do not require unrestricted disclosure of proprietary information. Confidential submissions, verification of selected records, and aggregated reporting could support assessment while protecting commercially sensitive material. The purpose is to improve the evidence available for evaluating learning and continuity, rather than replace investment and capacity indicators.

The selected cases do not establish the effectiveness of either national strategy. They identify an assessment problem relevant to both: productive expansion and capability accumulation should be monitored as distinct outcomes, with evidence appropriate to each.

6. Conclusion

This study examined what public documentary evidence permits researchers to establish about productive transitions and capability accumulation in advanced electronics and semiconductor-related manufacturing. Using five episodes from four firms operating in Thailand and Vietnam, it applied the productive transition episode as an observational unit and distinguished transition state from the epistemic status of individual claims.

The cases document different productive responses: operation of selected transferred processes and planned expansion at TLB, reported mass production of identified functions alongside continuing production-line expansion at Meiko, reported cross-site production and knowledge coordination at SVI, and postponement of an existing-function expansion at KCE. These records support claims about reported events and arrangements, but do not sufficiently establish temporal resource connections between distinct episodes. Capability accumulation is consequently undetermined in the examined cases; this classification does not establish its absence.

The principal contribution is an evidence-bounded procedure for distinguishing production presence, productive transition, capability accumulation, and cumulative productive transformation. Stronger claims require evidence that resources associated with an earlier transition remained available and contributed to a subsequent one. Successful production, investment expansion, spatial knowledge transfer, and delay cannot independently determine that relationship. The procedure therefore supports assessment of specific claims rather than capability rankings of firms or countries.

The study's empirical scope is limited by purposive selection, a relatively short documentary window, and substantial reliance on corporate reporting. Public disclosures provide uneven access to internal learning and may describe organisational procedures without establishing their implementation or effectiveness. Differences in documentary visibility must therefore remain separate from differences in productive capability. The cases support neither a

national comparison of capability accumulation nor a conclusion about cumulative transformation across either economy.

For industrial-policy assessment, the findings suggest that monitoring investment, facilities, capacity, and production milestones should be complemented by records of knowledge retention, adaptation, and subsequent use. Such evidence would help distinguish expansion of advanced production from the accumulation of resources supporting future productive change.

Future research could extend the observation period and combine documentary reconstruction with engineering records, supplier-development evidence, administrative data, and corroborated interviews. Tracing identifiable resources across successive transitions would permit stronger accumulation claims, while evidence of their diffusion across organisations would be necessary for broader developmental conclusions. The resulting research question is whether, and through which documented connections, one productive transition becomes part of the productive basis for the next.

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