



Collection-Level Management as a Primary Unit of Control in Industrial B2B Production Systems

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Abstract

Industrial B2B production systems with seasonal assortments are conventionally managed at the level of the individual stock-keeping unit (SKU). Each item is contracted, costed and shipped on its own technical pack, and the assortment is read as the aggregation of item-level outcomes. The Guangzhou bags and leather goods cluster informs the analysis as a single observational anchor; the argument is positioned at the level of industrial B2B production architecture more broadly. This paper argues that SKU-level management is an architectural mismatch for the cross-border B2B setting, and that the appropriate object of management is the collection: a coherent assortment that shares materials, hardware, price logic and seasonal cadence. Four classes of synergy support the case. Material synergies follow from unified specifications and assortment-level nesting. Balanced costing under a collection-wide price ceiling delivers the cost class. Aggregated freight optimization produces the logistics gains, and a single seasonal release closes the calendar dimension. None of the four is available to SKU-level governance. The paper develops the collection successively as an engineering unit, an economic unit and a logistics unit, showing how the technical pack, the costing exercise and the freight plan are reorganized once the unit of management shifts. It also sets out the collection-level gate logic that synchronises phase transitions across the assortment, and specifies the three conditions under which the principle holds (architectural authority, information flow, executive-layer discipline), with the failure modes that surface when any of them is violated. The paper is the third in an intended series of companion papers formalizing the one-window business architecture.

Keywords: *Collection-Level Governance, Lifecycle Management, One-Window Architecture, Product Architecture, SKU-Level Management.*

INTRODUCTION

The unit at which a production system is managed is not a clerical detail. It is an architectural decision whose consequences run downstream into engineering, costing, logistics and governance. Ulrich (1995) argued that product architecture is a strategic decision rather than an aesthetic one, and the management of distributed production has been read in similar terms by Williamson (1985), Henderson and Clark (1990), Baldwin and Clark (2000), and Sanchez and Mahoney (1996). What the production system can optimize, and what it must leave to chance, depends on which unit is chosen as the object of management.

In cross-border B2B production of bags and leather goods, the conventional object of management is the individual

stock-keeping unit (SKU). A buyer commissions a bag; the bag is designed, costed, prototyped, produced and shipped on its own technical pack; success is measured against the bag's own specification. The assortment that the buyer sells in season is then a statistical aggregation of item-level outcomes. This is the SKU-level frame. It is the default of OEM contract manufacturing under modular global value chains (Gereffi et al., 2005), it sits comfortably with the buyer's commercial sales team, and it has served as the working assumption of most contractual relationships in the industry for several decades. Gawer and Cusumano (2014) characterize an analogous configuration in adjacent industries as an industry-platform regime, in which the integrating logic sits at the platform level even when the contracting takes place at the component level.

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The one-window business architecture, formalized on the basis of practice in the Guangzhou production cluster, replaces the SKU-level frame with a collection-level frame. The unit governed by the architecture is the collection: a coherent assortment of products designed together, sharing materials, hardware and a price logic, and released to a market on a single seasonal cadence. SKU-level outcomes are read off the collection's outcome, not the other way around. The architectural overview paper of this series introduced the choice as one of the five foundational properties of the system; the present paper develops it in depth.

The claim is not that SKU-level management is universally inferior. The one-window architecture is designed for a specific class of conditions: repeated cross-border collections with short seasonal windows, multi-component products, raw-material variability, and a substantial coordination distance between production and consumer market. Within that class, SKU-level management is an architectural mismatch. It yields local rationality at the item level and irrationality at the assortment level, generating the failure modes the architecture exists to prevent. Henderson and Clark (1990) showed long ago that this class of failure originates in architectural knowledge rather than in component knowledge. The collection-level frame brings the architecture inside management rather than leaving it outside.

The paper is organized in six steps. The opening section defines what a collection is and distinguishes it from related notions such as portfolio, product family and SKU bundle. The next analyzes the architectural failure modes generated by SKU-level management. A third section sets out the four classes of synergy that collection-level governance unlocks. The paper then turns to three operational facets in turn — the technical pack, the costing exercise, and the freight plan — and shows how each is reorganized when the unit of management changes. Shorter sections on collection-level gate logic, on the conditions for the principle to hold, and on the contrast with SKU-level OEM management close the paper.

WHAT A COLLECTION IS AND WHAT IT IS NOT

A collection is more than a list of items released together in a season. It is a coherent assortment with four shared substrates. The first is the materials substrate, the family of leathers, linings, threads, hardware and finishes drawn on across the assortment. Sitting alongside it is the construction substrate, which covers pattern logics, edge treatments, stitching standards and assembly sequences. A price substrate runs from entry-level to flagship as a coherent ladder, and a calendar substrate fixes the single release window and the sell-through schedule that follows from it. When all four are aligned, the assortment qualifies as a collection. When they drift apart, with each item carrying its own materials, its own

construction, its own price discipline and its own calendar, the result is a portfolio of unrelated products that happen to be sold by the same brand at the same time.

The distinction matters because every class of synergy that collection-level governance unlocks runs through one of these shared substrates. A common materials book is the precondition for material synergies, and engineering synergies follow in turn from a shared construction discipline. Cost synergies, for their part, are anchored in a shared price ladder. When the calendar substrate is missing, the practical consequence is concrete and visible on the retail floor: items engineered on the same materials and construction still arrive at the buyer staggered across the season, and the logistics gains that would otherwise be available to the assortment are absorbed into individual shipment plans. None of this is available to a portfolio, because in a portfolio the substrates are not shared in the first place.

The relation between a collection and a product family in the modularity sense (Baldwin & Clark, 2000; Sanchez & Mahoney, 1996) requires care, because the engineering-unit treatment below describes a unified bill of materials, a unified construction substrate and a shared hardware book, which together approach what the modularity literature would call a platform. The position taken here is that the collection is best understood as a sub-class of the product family in which the unifying technical core is held at the level of substrates rather than at the level of a configurable engineering module. A product family in the strict sense shares a platform, a common technical core configured into variants. A collection in the present sense shares a substrate, a common materials, construction, price and calendar discipline, but its individual items need not be parametric variants of a single technical core. A leather goods collection may consist of structurally distinct items, such as a tote, a crossbody, a clutch, a wallet and a card holder, whose unifying logic lies in the substrates rather than in a shared engineering module. The distinguishing structural feature is therefore not the absence of a platform. The engineering-unit section will show that a collection-level platform exists at the substrate level. What differs is the locus at which the platform is held. Substrate-level commonality coexists with item-level structural divergence, rather than module-level commonality with item-level parameter variation. The collection-level frame is in this sense narrower in its commonality requirements than a strict product-family frame and broader in the structural divergence it admits among items.

A collection should also not be confused with an SKU bundle. An SKU bundle is a marketing construct, such as a discount package, a starter kit or a co-branded set, assembled from items that were already designed, costed and produced independently. The bundle is a downstream operation on items that have already been manufactured under SKU-

level discipline. A collection is the upstream object that disciplines the items in the first place. Bundling is in that sense compatible with both architectures; the collection is not.

Two boundary cases sharpen the definition. The capsule is a small, tightly themed sub-set of the brand's offer, typically released as a limited drop. A capsule qualifies as a collection in the present sense whenever the four substrates are aligned within it; otherwise it is a portfolio fragment. Capsules are particularly amenable to collection-level management because the constraints on shared substrates are intrinsic to the capsule concept. The carry-over is an item from a prior season that returns alongside a new collection. A carry-over is an item, not a collection. The architectural question for the carry-over is whether it is admitted into the new collection's substrates (in which case its construction may need to be revised) or runs alongside the collection on its own discipline. Both cases illustrate the same point. A collection is not an arbitrary administrative grouping; it is the level at which the four substrates are intentionally aligned.

The product-family literature provides a structurally analogous case in a different industry. Sanderson and Uzumeri's (1995) study of the Sony Walkman documents how Sony governed a multi-decade family of more than 250 models as a single architectural unit, sharing internal modules across the family while differentiating external presentations. The Walkman family is not a leather-goods collection, but it is the same architectural object at one remove. The unity of the Walkman family was held at the level of substrates rather than at the level of any individual product. The collection-level frame in cross-border B2B leather goods plays the same role at seasonal cadence.

WHY SKU-LEVEL MANAGEMENT GENERATES ARCHITECTURAL FAILURE

The SKU-level frame works smoothly when the assortment is small, the lifecycle is short and the buyer holds the integrating knowledge in-house. Once those conditions fall away, a recognizable family of failures appears. The cross-border bags-and-leather-goods literature has documented these failures at the operational level, and the value-chain and product-modularity literatures (Gereffi et al., 2005; Caridi et al., 2012; Pero et al., 2015) have theorized them at the level of chain configuration.

The most visible failure mode is material disorder. When each item is contracted on its own bill of materials, the assortment as a whole accumulates a long tail of leather grades, lining variants, hardware finishes and thread shades that no single party in the chain has been asked to rationalize. Pattern engineers optimize within each item, procurement aggregates orders item by item, and the cutting room runs each item's nesting plan independently. The material book of

the assortment ends up more variable than any single item required. The downstream costs show up as procurement complexity, inventory liability and quality dispersion.

Beyond material disorder, the chain also generates cost imbalance. SKU-level costing demands that every item meet its own price target. Items whose construction is intrinsically more expensive, such as a structured tote with a metal frame or a clutch with sophisticated edge work, are forced into specifications that compromise their commercial fit. At the same time, items whose construction is intrinsically inexpensive surrender margin that the assortment never needed to surrender. The collection's overall margin ends up below the integrated optimum, and its commercial fit is uneven.

Another failure path runs through logistics fragmentation. Items engineered in isolation produce packaging that does not aggregate efficiently. Carton fill becomes item-dependent rather than collection-dependent, container utilization suffers, and freight cost per item lands above what a collection-level optimum would deliver. Under collection-level governance, the assortment can be engineered so that items nest physically inside one another — a wallet fits inside a crossbody, which fits inside a tote, which fits inside a shopper — converting three or four individual units into a single shipping place. This nesting-by-design principle is unavailable under SKU-level management, where each item is packaged independently and the carton dimensions are fixed before any cross-item optimization is considered. The logistics provider cannot recover the loss, because the loss has already been engineered upstream of the freight plan.

The fourth weakness is more subtle and shows up later in the cycle as calendar drift. Items entering the seasonal release on independent calendars create gap-fill problems on the retail floor, with bestsellers arriving late and missing the peak sell-through window while secondary items arrive early and burn shelf space. The buyer's merchandising team ends up managing around the drift rather than managing the assortment.

These failure modes are not failures of effort or competence. They are properties of the SKU-level architecture. Henderson and Clark (1990) characterized this class of failure as architectural rather than component-level. Each item meets its specification, but the assortment fails to integrate. Krishnan and Ulrich (2001) reach the same diagnosis at the level of governance in their review of the product development literature. When product, process and supply-chain decisions are partitioned across actors with no integrating subject, the assortment-level outcome is the responsibility of no one in particular, and is correspondingly not optimized. Figure 1 sets out the contrast between the two frames at the level of the unit of management.

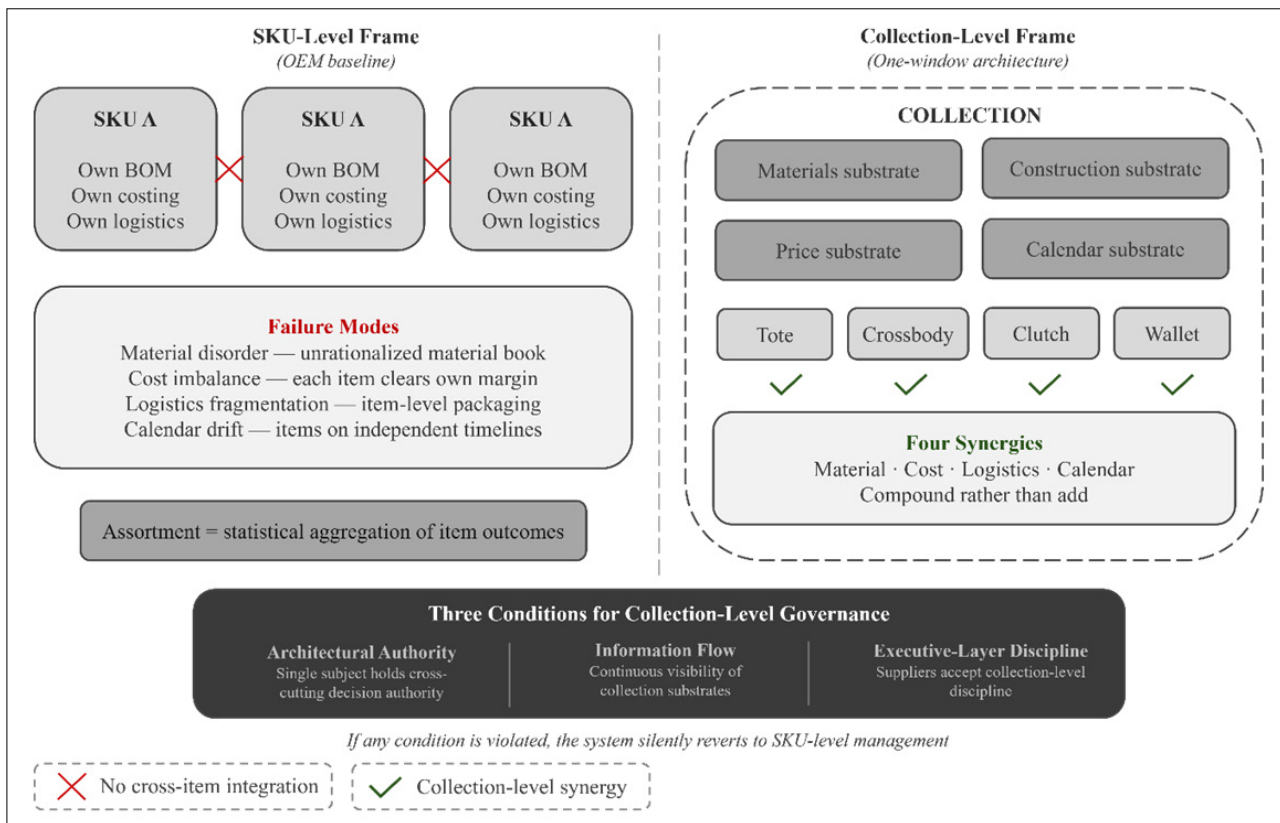


Figure 1. SKU-level frame and collection-level frame compared

FOUR CLASSES OF SYNERGY AT COLLECTION LEVEL

Once the unit of management shifts from the SKU to the collection, four classes of synergy become operational that were inaccessible under SKU-level governance. Table 1 lists the four classes alongside their operational mechanisms.

Table 1. Four classes of synergy unlocked by collection-level governance

Synergy class	Operational mechanism	Effect on the collection
Material	Unified leather, lining, hardware and thread specifications across the assortment; nesting plan computed at assortment level	Lower waste, simpler procurement, stable quality
Cost	Costing exercise at collection level; price ladder enforced; cross-item margin balance	Higher integrated margin, more even commercial fit
Logistics	Packaging engineered for collection-wide nesting (items nested inside one another); freight plan based on aggregated collection volume	Lower freight cost per item, higher carton and container fill
Calendar	Single seasonal release window; coordinated sell-through schedule	Tighter retail merchandising, fewer gap-fill problems

These four synergies are not additive bonuses; they compound. A unified leather book reduces grade variability, which reduces unit cost, so material synergies feed cost synergies. Lower freight cost releases margin, so logistics synergies feed cost synergies. Calendar synergies improve merchandising effectiveness, and that in turn feeds the planning of the next collection. Material and cost synergies are not fully independent — both ultimately route through margin and so partially overlap — but the mechanisms that drive them differ: material synergies operate on unit cost through better hide yield and reduced grade dispersion, whereas cost synergies operate on margin variance through collection-wide pricing logic. The compounded synergies are observable at the collection level. They are not observable at the SKU level.

Schilling (2000) characterized effects of this kind as emergent properties of the interaction structure rather than of the components in isolation. The four classes of synergy are emergent properties of collection-level integration. A buyer who manages SKU by SKU, however attentively, cannot reproduce them, because the level of integration at which they appear sits above the SKU. Figure 2 summarizes the configuration.

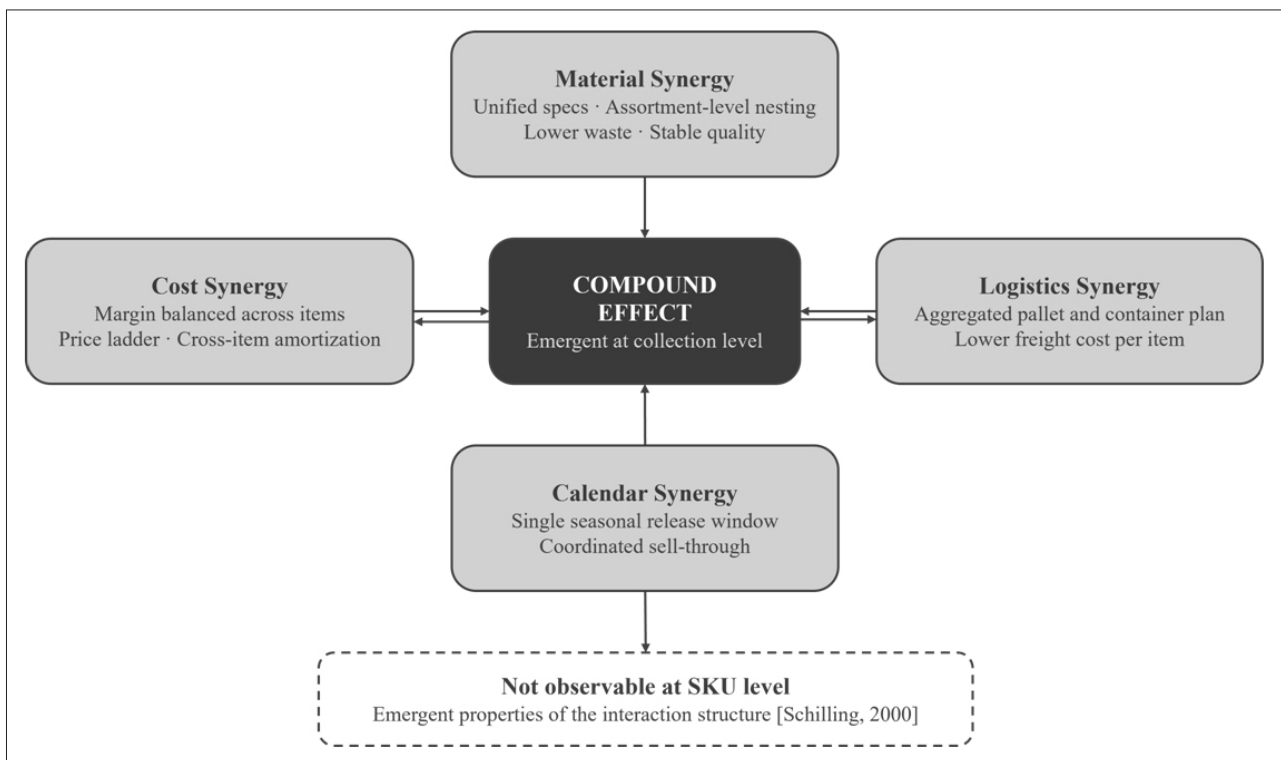


Figure 2. The four synergies unlocked by collection-level governance

THE COLLECTION AS ENGINEERING UNIT

The engineering reorganization produced by the collection-level frame is structural rather than incremental. The technical pack, which is the master engineering document of the production cycle, ceases to be an item-level artifact and becomes a collection-level one. The unified materials substrate, the unified construction substrate and the assortment-level pattern logic are written into a single technical pack that governs every item in the collection, with item-specific exceptions explicitly enumerated.

The reorganization is not cosmetic. Three engineering operations are reorganized in substance. The collection-level bill of materials consolidates leather grades, lining variants, hardware finishes, thread shades and adhesives into one purchasing document with cross-item references; procurement runs against this document rather than against item-level lists, and grade variability is contained at the level the architecture has chosen to contain it. The nesting plan is now computed by pattern engineers at the assortment level rather than item by item, which makes it possible to shift small parts of one item into the leather offcuts of another and so maximise hide utilization. Nesting at the collection level appears to recover hide cost over item-by-item nesting, with the magnitude depending on hide grade, item geometry and assortment composition. The directional effect is reported here on the basis of practitioner observation in the Guangzhou cluster rather than on a derived figure from prior studies; the magnitude is not measured here and remains TBD. The construction standard, finally, is unified across the assortment — edge treatments, stitch densities, skiving angles and hardware specifications all aligned — which

simplifies factory tooling, shortens setup time, and stabilizes the visual signature of the collection on the retail floor.

A technical pack at the collection level is in this sense a vehicle of architectural discipline, not merely a set of instructions. Sanchez and Mahoney's (Sanchez & Mahoney, 1996) account of modularity-with-coupling describes the configuration: a modular product family with disciplined interfaces, governed by an architectural authority that knows what is varied and what is held constant. The same applies, at the assortment level, to Brusoni, Prencipe and Pavitt's (Brusoni et al., 2001) argument about system integrators that "know more than they make". The architectural authority knows the collection's interfaces in a way that no individual contractor does, and the value of the role lies in holding that interface knowledge across the cycle. Cabigiosu and Camuffo (2012) showed empirically, in a study of air-conditioning suppliers, that the link between product modularity and organizational coordination is not automatic. Coordination arrangements adapt to a product's interface design only when an integrating actor enforces the alignment. The collection-level technical pack is what makes that integrating role concrete in cross-border B2B leather goods. Fixson's (2005) product-architecture assessment framework adds an engineering vocabulary for the same artifact: the technical pack records the architecture's allocation of function to component, the specification of interfaces between components, and the cross-item commonality decisions, and so makes them visible to the next cycle.

Two practical consequences follow. Drafting the technical pack becomes substantially more expensive. Cross-item interfaces have to be specified and reconciled before any single item

can be released to engineering. The upfront drafting effort is qualitatively larger than the sum of item-level packs drafted independently; the exact ratio depends on assortment size and substrate complexity, and is not quantified here. Once drafted, however, the pack is much cheaper to revise, because cross-item changes are traced through declared interfaces rather than uncovered piecemeal during prototyping. The economic balance is favorable wherever the same collection-level pack is referenced multiple times — repeat seasons of the same collection, near-variant re-releases, and line extensions that share the substrates — and unfavorable in single-use settings. That asymmetry is part of what positions the collection-level frame for the cross-border B2B setting rather than for one-off bespoke production.

THE COLLECTION AS ECONOMIC UNIT

The economic reorganization runs in parallel. SKU-level costing applies a price ceiling to each item independently and reads the assortment as a sum of items. Collection-level costing applies the price ceiling at the collection level and uses the resulting freedom to balance margins across items. The two practices generate different optima.

Item-level costing cannot capture three economic properties of the collection. The first concerns margin rotation. Items that are intrinsically expensive to construct can be admitted to the collection at the margin level the assortment requires, because items that are intrinsically inexpensive to construct subsidize them; the collection's overall margin is held at the architectural level rather than item by item. Once that rotation is in place, a price ladder becomes operable in its own right. A collection has an entry-level price point, mid-tier price points and a flagship, and the items are designed to occupy positions on this ladder rather than to compete inside it. Item-level costing cannot enforce a ladder, since every item is asked to clear the same price-margin equation. A further property, distinct from both, is cross-item amortization of fixed costs. Tooling, sampling and qualification costs are amortised across the items that share the construction substrate rather than across each item alone, and this in turn changes which items are economically admissible to the collection.

Williamson (1985) (pp. 75–79) anticipated this configuration in the abstract. Hierarchical governance, in his account, localizes residual claims and residual control in a single integrating actor that is positioned to recover integrated economic value which distributed governance leaves on the table. The collection-level architectural layer is exactly such an actor at the assortment level. A buyer working through the architecture obtains the integrated margin without having to assemble the integrating apparatus alone. A detailed treatment of the actor, the System Architect, belongs in the companion paper on the central subject. For present purposes it is enough to note that the collection-level economic unit requires the collection-level decision authority.

THE COLLECTION AS LOGISTICS UNIT

The logistics reorganization closes the loop. Freight cost per item is not a property of the item. It is a property of the container fill and packaging design. SKU-level engineering of packaging produces collections whose packaging's plans are mechanically inefficient even when every individual item's package is well designed. Collection-level engineering treats the freight plan as an output of the collection's design rather than as an after-the-fact transport problem.

Three logistics operations are reorganized under the collection-level frame. Packaging design moves to the assortment level: outer cartons, dust bags, hangtags and inserts are dimensioned with reference to a collection-wide nesting plan. Items are engineered from the design phase to nest physically inside one another — smaller items (wallets, card holders) inside medium items (crossbodies, clutches) inside larger items (totes, shoppers) — so that multiple units occupy a single carton place. Carton dimensions are then standardized across the collection, and container fill is computed for the nested collection volume rather than for individually packaged items. The freight plan follows: container fill is computed for the collection volume rather than for each item shipment, and mode and route choices are made at the collection level. The export-readiness package follows in turn: regulatory compliance, customs documentation and labelling are prepared once for the collection rather than once per item, with item-specific exceptions enumerated. Pero, Stößlein and Cigolini (Pero et al., 2015) showed that linking product modularity decisions to supply-chain integration is what actually delivers the operational gains the modularity literature predicts; Caridi, Pero and Sianesi (Caridi et al., 2012) extend the same logic to product innovativeness. The collection-level frame puts that linkage to work at the scale of an individual buyer's seasonal release.

A further aspect of the logistics reorganization is more subtle. The collection-level frame moves the boundary of negotiability with the freight forwarder upstream. SKU-level packaging fixes the dimensions of every carton before the forwarder is consulted, leaving the forwarder to optimize within fixed envelopes. Collection-level packaging consults the forwarder while the dimensions are still negotiable. The relationship is not richer in volume (the collection volume is the same) but richer in degrees of freedom, and integrated freight cost falls accordingly.

Export readiness deserves a separate observation. Under SKU-level governance, regulatory compliance and customs documentation are usually treated as a final-step formality, prepared by a customs broker on the basis of whatever specifications the items happen to carry. Late surprises can hold the entire shipment at the border: a leather lot that fails CITES inspection, or a label format that the destination customs authority has updated since the previous

shipment. Under collection-level governance, the export-readiness specification enters the technical pack at Concept Validation, the materials book is filtered in advance against the destination market's regulatory profile, and customs documentation is generated as a derivative of the pack rather than along a parallel track. Fewer late surprises follow, and the export calendar becomes more predictable, which in turn feeds back into the collection's seasonal-release reliability.

COLLECTION-LEVEL GATE LOGIC

The architectural overview paper of this series specifies seven gates that govern the lifecycle of a collection. They are Concept Validation, Engineering Feasibility/Design Freeze, Design Validation/Prototype Sign-off, Production Readiness/IQC & Sourcing, In-Process Quality Control/First-Article Approval, Final Production Validation/FQC and Export Readiness. The same gates apply under the collection-level frame, but with two reformulations relative to Cooper's classical Stage-Gate framework (Cooper, 1990).

The first reformulation concerns the level at which gates are evaluated. Concept Validation is closed for the collection as a whole, not item by item. Engineering Feasibility is closed for the collection's technical pack, not for each item's section of it. Production Readiness is closed when raw materials, tooling and supplier qualification are all in place for the assortment, not for individual items. An item that satisfies its own specification but threatens the collection's substrates does not pass, and that is the architectural intent.

A second reformulation, which follows from the first, concerns the decision authority. Cooper's original framework assumed a corporate review committee taking the Go / Rework / Pause decision. The collection-level frame collapses the committee into the architectural layer and into a single decision authority operating at seasonal speed. The reasons for that collapse are developed in the companion paper on the System Architect. Here it is enough to note that the collection-level gate logic and the single-authority decision regime are mutually entailing. A committee cannot operate the collection-level gates at the speed the seasonal release requires; a single authority cannot operate the gates without the cross-cutting visibility the collection level provides.

The combined effect is that the gates synchronise the assortment rather than the items. When the collection reaches Production Readiness, every item in the collection passes through the gate together, and any item that is not ready holds the collection. This reverses the SKU-level baseline, in which items proceed independently and the collection is whatever union of items happens to be ready when the season opens.

CONDITIONS FOR THE PRINCIPLE TO HOLD

Collection-level governance is constitutive of the one-window architecture, but it does not operate by declaration. Whether the principle holds in practice depends on three jointly

necessary conditions. The product-architecture literature (Krishnan & Ulrich, 2001; Cabigiosu & Camuffo, 2012) and the corporate-modularity literature (Galunic & Eisenhardt, 2001) converge on the same shortlist.

Architectural authority. A single subject must hold cross-cutting decision authority over the technical pack, the supplier configuration, the costing and the freight plan at the collection level. Where authority is distributed across an SKU-level set of contractors and the buyer is left to integrate them, the principle quietly reverts to SKU-level management dressed in collection-level vocabulary. Williamson's (Williamson, 1985) transaction-cost framing identifies this condition at the abstract level (pp. 47–50): integration value cannot be realised without the corresponding allocation of residual control.

Information flow. The architectural layer requires continuous visibility of the collection's substrates, including the materials book, the construction logic, the price ladder and the calendar. Where information about any of these is held only at the SKU level (for example, when the materials book is reconstructed item by item from each item's BOM), the architectural layer's effective grip remains at the SKU level even if the language is collection-level. Krishnan and Ulrich's (Krishnan & Ulrich, 2001) review of product development decisions predicts the failure mode. Integration capacity scales with the information held by the integrating subject, so a collection-level architecture without collection-level information is institutionally fragile.

Executive-layer discipline. Suppliers, factories and logistics operators must accept collection-level discipline in place of item-level discipline. When a factory negotiates each item's tooling, a procurement vendor delivers each item's leather grade, or a freight forwarder books each item's freight, the executive layer is operating at the SKU level and the collection-level architecture has no operational counterpart. The discipline is enforced by the architectural layer's authority and by the gate logic, but it cannot be installed unilaterally. It requires the executive layer's working acceptance.

If any of the three conditions is violated, the failure modes outlined earlier in this paper return. Material disorder reappears once the materials book is no longer held centrally. As soon as costing leaves the collection level, cost imbalance follows. The freight plan, when driven by individual items, brings back logistics fragmentation; and calendar drift surfaces whenever items proceed on independent calendars. These conditions are not optional features of the principle; they are part of the principle.

A known critique of this formulation is that a principle which "silently reverts" to SKU-level management whenever any condition is violated risks being near-unfalsifiable. Any apparent counter-instance can then be re-described as a violation of one of the three conditions rather than as

evidence against the principle. The response taken here is that the three conditions are themselves operationally observable rather than stipulative. Architectural authority can be checked by asking whether a single subject signs off the technical pack, the supplier configuration, the costing and the freight plan. Information flow can be checked by asking whether the materials book, the price ladder and the calendar are held in a single artifact at the collection level. Executive-layer discipline can be checked by asking whether suppliers, factories and forwarders contract against the collection or against the items. An instance in which all three checks pass and the four synergies still fail to materialise would falsify the principle as stated; an instance in which any check fails

locates the failure in the named condition rather than in the principle. The propositions set out in the Limitations section below are constructed to be testable in this sense.

CONTRAST WITH SKU-LEVEL OEM MANAGEMENT

A short comparison closes the paper. Under SKU-level OEM management, the unit of contracting and the unit of management coincide at the item; the assortment is downstream. Under the one-window architecture, the unit of management is the collection; the items are downstream. Table 2 summarizes the contrast at the level of the four classes of synergy and the three conditions for collection-level governance.

Table 2. SKU-level OEM management versus collection-level governance

Aspect	SKU-level OEM	Collection-level governance
Object of management	Individual item	Collection (assortment with shared substrates)
Materials	Item-by-item BOM, no cross-item rationalization	Collection-level BOM with item-specific exceptions
Costing	Item meets its own price-margin target	Margin balanced across items; price ladder enforced
Nesting	Item-level nesting plans	Assortment-level nesting; cross-item leather utilization
Logistics	Item packaging optimized independently	Collection-wide nesting plan; aggregated carton and container optimization
Calendar	Items released on independent timelines	Single seasonal release window
Gate decisions	Per-item Stage-Gate, committee-paced	Collection-level gates, single architectural authority
Quality discipline	Inspection at item output	Gate verification at collection transitions
Buyer cognitive load	High — buyer integrates the assortment	Low — architecture integrates the assortment
Failure mode	Architectural failure of integration	Failure of any one of three conditions

The contrast does not amount to a claim that SKU-level OEM management is universally inferior. Where the assortment is small, the seasonal calendar irrelevant, the buyer’s in-house architectural capacity high, or the items genuinely without shared substrates, SKU-level management is efficient and the collection-level frame is overhead. The collection-level principle holds for a specific class of conditions (Gereffi et al., 2005; Pero et al., 2015). Those are the conditions that motivated the one-window architecture in the first place: repeated cross-border collections on seasonal cadence, multi-component products with shared substrates, and raw-material variability requiring cluster-side knowledge. Long coordination distances between production and consumer market complete the picture, since they make the integrated outcome substantively harder to deliver than item-level outputs. Worren, Moore and Cardona (Worren et al., 2002) provide a useful boundary marker in their empirical study of the home-appliance industry. Modular product strategy improves firm performance only when the firm has organized its design and production capabilities to exploit the modularity, not as an automatic consequence of declaring a modular family. The collection-level frame in cross-border

B2B leather goods is the same kind of organized exploitation of the underlying coherence of the assortment.

Calibration of the assortment to the destination market is itself a collection-level operation. In the one-window architecture, calibration is performed at the level of the collection’s substrates, including palette, proportions, tactility and hardware, not at the level of each item’s specification. Gawer and Cusumano (2014) identify the cross-market integrating role with the platform leader in their analysis of industry platforms, and the collection-level architectural layer plays the same role for an individual buyer’s seasonal assortment. MacCormack, Rusnak and Baldwin (MacCormack et al., 2006) showed empirically in the software domain that complex artifacts whose designers have invested in modular structure exhibit measurably different evolution patterns from artifacts whose designers have not. The leather-goods analogue is that collections whose architectural layer has invested in substrate discipline evolve differently across seasons from assortments managed item by item. Galunic and Eisenhardt (2001) document a related phenomenon at the corporate level, namely architectural innovation through

modular corporate forms, which offers a further parallel to the architectural authority structure of the one-window system.

LIMITATIONS AND TESTABLE PROPOSITIONS

The argument has four limitations that should be named explicitly. First, the paper contains no quantitative static data; the synergies, failure modes and conditions are developed conceptually and illustrated qualitatively rather than measured. Second, the operational anchor is a single production cluster, the Guangzhou bags and leather goods cluster, and the structural features of that cluster (geographical concentration of suppliers, mature OEM contracting, short coordination distances within the cluster paired with long distances to consumer markets) may not transfer cleanly to other industrial B2B settings. Third, the underlying observations are practitioner observations from inside the architecture, not independent third-party observations, with the methodological costs that this position entails. Fourth, the cost trade-off central to the engineering-unit section, namely that the collection-level technical pack is more expensive to draft than the sum of item-level packs but cheaper to revise across the cycle, is asserted on operational grounds rather than measured against a controlled comparison.

Three falsifiable propositions follow from the paper and are offered to motivate empirical work. P1: in seasonal cross-border B2B leather-goods production, collection-level nesting plans recover more hide utilization than item-level nesting plans, holding leather grade and assortment size constant; the direction of the effect is anticipated, while the magnitude is untested and remains TBD. P2: collections governed under all three named conditions (architectural authority, information flow, executive-layer discipline) deliver lower coefficient of variation in landed cost per item across the assortment than otherwise comparable assortments managed item by item. P3: collections governed under all three conditions exhibit shorter mean export-readiness lead time and lower variance in border-clearance delays than item-level OEM assortments of comparable volume and destination profile. Each proposition is operationally observable and is therefore in principle decidable against field data, even though such data are not assembled here.

CONCLUSION

The paper has argued that the collection, understood as a coherent assortment with shared materials, construction, price and calendar substrates, is the architectural object of management in the one-window business system, and that SKU-level management is an architectural mismatch for the cross-border B2B bags and leather goods setting. The case rested on four classes of synergy that collection-level governance unlocks (material, cost, logistics and calendar synergies that compound rather than add). On the engineering side, the analysis showed how the technical pack, the nesting

plan and the bill of materials shift to the assortment level. The economic treatment then traced collection-wide costing, margin rotation and a price ladder, and the logistics treatment closed the loop with an aggregated freight plan together with a collection-level export-readiness package. The collection-level reformulation of Stage-Gate logic was traced. The three conditions under which the principle holds (architectural authority, information flow and executive-layer discipline) were set out alongside the failure modes that surface when any of them is violated.

Two implications follow. A buyer who purchases an integrated outcome from the architecture is not purchasing better SKU-level execution but a different unit of management, with different optimization targets and different failure modes. And the architecture is not transferable without the unit of management. A coordination overlay applied to an SKU-level OEM chain reproduces the vocabulary of collection-level governance without its substance, and the four classes of synergy do not appear.

This paper is the third in an intended series of companion papers. The architectural overview is presented in a companion paper, the structural problem the architecture is designed against is the subject of a second, and the central subject who holds the collection-level decision authority is to be treated in a dedicated companion paper. Each paper can be read on its own, but the present paper presupposes the architectural overview and is in turn presupposed by the paper on the System Architect.

MATERIALS AND METHODS

The work is a conceptual paper whose analytical context is cross-border B2B contract manufacturing of bags and leather goods, with the Guangzhou production cluster as the working setting. The analytical method is a literature synthesis cross-referenced with the author's practitioner observation over years of continuous operational practice in the cluster. Three analytical operations were applied. First, a construct-extraction pass identified the collection as the operative unit of management in the one-window architecture by contrasting it with the SKU-level baseline of the OEM model. Second, a synergy-mapping pass traced the four classes of synergy (material, cost, logistics and calendar) that collection-level governance unlocks and that SKU-level management structurally cannot capture. Third, a condition analysis identified the situational and organizational conditions under which collection-level governance holds, together with the failure modes when those conditions are violated. No quantitative data are presented; the argument is positioned at the level of product-architecture theory rather than at the level of statistical generalization.

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