

WHITE PAPER

WHY A 1:1 MANUFACTURING TRANSFER IS NEVER 1:1

Lessons from the Transfer and Start-Up of a German Automotive Manufacturing Operation in Mexico

A White Paper on International Manufacturing Transfers, "Known Unknowns," and the Cost of Insufficient Scenario Planning

DIFFERENT ENVIRONMENTS.
GREATER PERSPECTIVES.

LOCAL SOLUTIONS
FOR A GLOBAL
AUTOMOTIVE FUTURE



PEOPLE
PROCESSES
PLACES



REAL-WORLD
EXPERIENCE
REAL IMPACT



TURNING
COMPLEXITY
INTO OPPORTUNITY

A proven factory concept met a different operating reality

The project was engineered as a near-replication. The recovery required treating the Mexican plant as a new operating company.

GZ, a German automotive supplier, received a six-year order linked to localized production in Mexico. The existing production concept was known, approximately EUR 10 million of manufacturing equipment was acquired and transferred, and Mexican employees were trained for six to nine months in Germany. The intended start of production was spring 2017.

Despite detailed engineering, the ramp-up exposed a chain of overlooked dependencies: delayed building infrastructure, an unavailable ERP system, a critical lamination machine that failed under operating temperature, altitude-related changes in material and combustion behavior, insufficient heating, unbalanced warehouse flows, local quality requirements, tax/VAT readiness, employee transportation, and later organizational resistance to ERP implementation.

The project did not suffer from one catastrophic mistake. It suffered from many individually manageable omissions that interacted and multiplied.

WHAT WAS TRANSFERRED	WHAT HAD TO BE CREATED LOCALLY
Equipment and process know-how	Stable operation under local physical conditions
German training	Local operating competence and ownership
Corporate ERP choice	Implementation capability and user adoption
Quality procedures	Local laboratory, team and audit readiness
Legal entity	Invoice, VAT, cash-flow and compliance readiness

Management conclusion. International manufacturing transfer should be governed as a redesign of an operating system, not as the physical replication of a production line. The decisive question is not only “Can we copy the process?” but “Which assumptions behind the original process cease to be valid at the destination?”

From localization decision to industrial recovery

A six-year order created the rationale for Mexico. A compressed recovery window turned the start-up into a cross-functional turnaround.

WHEN	WHAT HAPPENED
2016	New Mexican plant built; manufacturing equipment purchased and shipped; local workforce recruited and trained in Germany.
Early 2017	Infrastructure delays escalate. Planned ramp-up approaches while critical systems and processes remain incomplete.
Spring 2017	DRW arrives after two months of familiarization and training in Germany. Some production has started; ERP is not operational.
Apr-May 2017	Eight-week stabilization: machinery root cause, process trials, altitude/temperature adaptation, warehouse redesign, quality readiness.
End May 2017	First final product leaves GZ-MEX for Tier-1 final assembly; fiscal/VAT readiness immediately becomes a commercial and liquidity issue.
Aug 2017	Major operational problems resolved; production organized substantially as intended, but ERP remains manual/analog.
Feb 2018+	Dedicated IT employee establishes basic ERP functions; internal resistance delays broader rollout by about another year.

The critical insight

The emerging failures were not independent. A late process created excess work-in-progress; excess WIP consumed warehouse space; manual control made inventory visibility harder; production instability increased audit pressure; management attention was pulled from one emergency to the next. The recovery therefore required system-level prioritization rather than isolated technical fixes.

A start-up schedule describes activities. A start-up operating model describes dependencies.

Physics does not relocate 1:1

Altitude, pressure and temperature were not background details. They became production parameters.

The GZ-MEX site was reported at more than 2,600 m elevation. At that altitude, lower atmospheric pressure changed the behavior of materials and LPG-fired melting/drying equipment. Morning factory temperatures in winter could be around 4°C, forcing the retrospective design and installation of a substantial heating system in a largely uninsulated sandwich-panel building.

This was not merely a theoretical concern. Audi publicly describes its San José Chiapa operation as a high-altitude plant at about 2,400 m and notes that significantly lower air pressure affects equipment design; Audi specifically cites the need for larger, more powerful motors in its paint process. This provides independent context for why altitude must be treated as an engineering input in the Puebla manufacturing environment. [1]

GERMAN REFERENCE	MEXICAN HIGH-ALTITUDE CONDITION	PROCESS CONSEQUENCE
Higher atmospheric pressure	Approx. 25% lower pressure in case conditions	Foam expansion / geometry changes
Higher oxygen partial pressure	Reduced oxygen partial pressure	Burner tuning and combustion behavior change
Controlled thermal assumptions	Cold morning factory conditions	Heating becomes process infrastructure

Design implication

Destination validation must cover environmental boundary conditions before equipment acceptance: altitude, temperature, humidity, utility quality, combustion, cooling capacity, material conditioning and process windows. A proven machine is only proven inside the conditions under which it was proven.

Transfer the process - then revalidate the boundary conditions.

Commissioned does not always mean production-capable

A lamination line had been cleared for commissioning, yet repeatedly failed at operating temperature.

Initial explanations focused on operator capability: the Mexican team was new, and its training in Germany had not fully reproduced production modus operandi. That hypothesis was plausible - but it risked becoming an excuse.

DRW ran extensive trials and, after roughly two weeks, dismantled a substantial part of the machine. The root cause was mechanical: Teflon guide rails differed between the two sides. At the lamination temperature of about 160°C, the large transport chain bound on the guide system and stopped.

SYMPTOM	INITIAL HYPOTHESIS	ROOT CAUSE	LESSON
Line jams at production temperature	Local operators lack experience	Non-identical guide rails create thermal binding	Challenge attribution; reproduce failure and inspect the system

A transferable diagnostic discipline

- **Separate people from process.** Do not label a failure as a training issue until equipment and process are independently validated.
- **Test at operating extremes.** Acceptance at ambient or partial-load conditions is not equivalent to production capability.
- **Preserve local authority.** The on-site leader must be able to stop, dismantle, retest and challenge supplier or headquarters conclusions.
- **Close the learning loop.** Root causes discovered during start-up should modify future specifications and commissioning checklists.

The expensive error was not the wrong rail. The expensive error was accepting the wrong explanation for too long.

Small omissions become system-level costs

The risk is not the size of the first error. It is the number of downstream systems that depend on the assumption.

1

Partial process start

Different commissioning dates create uneven flow.

2

WIP accumulation

Semi-finished inventory grows faster than planned.

3

Warehouse saturation

Storage sections fill; layout assumptions fail.

4

Manual visibility

ERP absence increases dependence on spreadsheets and paper.

5

Quality pressure

Unstable flows and incomplete systems complicate audit readiness.

6

Management overload

Leaders spend time firefighting instead of completing start-up.

International Transfer Multiplication Effect: the cost of an overlooked assumption rises with the number of systems dependent on that assumption.

This explains how seemingly small planning errors can produce seven-digit opportunity costs without any single failure appearing catastrophic. The cost is generated by delay, management distraction, temporary workarounds, re-engineering, idle or constrained capacity, expedited support, inventory, customer exposure and lost schedule resilience.

Production readiness is not business readiness

A plant can make a conforming part and still be unable to operate as a functioning supplier.

DOMAIN	CASE GAP	OPERATIONAL CONSEQUENCE
Tax & VAT	Required legal/fiscal basis not ready when deliveries began	Tier-1 payment processing blocked; liquidity and customer concern
Quality	Local laboratory and quality organization not adequately planned	Facilities and experienced quality leadership had to be established rapidly
Workforce mobility	Remote site lacked adequate public transport	Company shuttle required for ~70 employees across two shifts

Quality infrastructure is part of industrialization

IATF 16949:2016 includes explicit requirements for internal laboratory scope, technical procedures, personnel competence, product testing, traceability to relevant standards, customer requirements and record review. [2] The practical lesson is broader than the standard itself: quality capability must be designed into the destination operating model rather than treated as a remote headquarters service.

The Day-One commercial test

- Can the entity legally invoice the customer?
- Can the customer pay the entity under the intended tax structure?
- Can VAT/customs cash effects be financed without disrupting operations?
- Can the site release product locally under required quality controls?
- Can employees physically reach the plant reliably for every shift?

A factory is not ready when it can produce. It is ready when it can produce, release, deliver, invoice, collect cash and repeat.

ERP failure was first technical - then organizational

Corporate standardization did not guarantee local implementation capability or adoption.

GZ selected the same ERP system used in Germany. The decision was rational: common data, common processes and group transparency. But local implementation capability had not been validated. Available consulting firms were unable to make the system operate reliably in the GZ-MEX environment, leaving the plant dependent on spreadsheets, paper and manual controls.

In February 2018, DRW recruited a dedicated full-time IT employee who established basic functionality. The remaining barrier was behavioral: the Operations Manager opposed the new ERP and repeatedly obstructed implementation. Because replacing the role with someone possessing the necessary manufacturing knowledge and German training was difficult, broader rollout was delayed by about another year.

RISK	QUESTION MANAGEMENT SHOULD ASK
Capability	Do qualified implementation partners and internal owners exist locally?
Data	Are master data, routings, BOMs, inventory rules and interfaces ready before SOP?
Fallback	Can the plant operate safely and traceably for 30-90 days without ERP?
Adoption	Who can resist the change, and what governance prevents sabotage or shadow systems?

Software standardization is not implementation standardization. The missing layer is the local ecosystem: people, partners, data, governance and adoption.

The 8-dimension Transfer Risk Review

Use the framework before investment approval, before equipment shipment, and again before Start of Production.

1	Physical environment Altitude, pressure, temperature, humidity, dust, seismic exposure.
2	Technical infrastructure Power quality, gas, compressed air, water, HVAC, telecoms, emergency systems.
3	Process & materials Destination trials, conditioning, combustion, tolerances, process windows.
4	Regulatory & fiscal Entity setup, permits, customs, VAT, invoicing, working-capital effects.
5	Quality & customer Laboratory, metrology, traceability, audit plan, customer-specific requirements.
6	Human infrastructure Recruitment, training, transport, shifts, retention, language, local leadership.
7	Digital infrastructure ERP/MES, network, cybersecurity, master data, local support, fallback controls.
8	Governance Named owners, authority, escalation, scenario triggers, decision rights.

Governance rule: Every red or amber item needs a named owner, a deadline, a quantified consequence, a fallback scenario and an escalation threshold. A risk register without decision rights is only a list.

Ten questions before approving an international manufacturing transfer

The purpose is not to eliminate uncertainty. It is to expose assumptions early enough to create alternatives.

1. Which assumptions from the existing factory have been explicitly tested at the destination?
2. Which physical boundary conditions differ - and have critical processes been validated against them?
3. What happens if one major process starts 30, 60 or 90 days late?
4. How much temporary WIP and warehouse capacity is available during asymmetric ramp-up?
5. Can the new entity manufacture, release, invoice, collect cash and handle tax/VAT on Day One?
6. Are local laboratory, quality leadership and customer-specific audit requirements fully resourced?
7. Can employees reliably reach the site for every shift, and what is the retention plan?
8. Who can implement and support ERP/MES locally, and what is the manual fallback?
9. Who owns each critical workstream locally, and do they have authority to challenge headquarters or suppliers?
10. What is the quantified cost of delay - including customer exposure and opportunity cost, not only project overspend?

Organizations that ask 'What will be different?' before SOP perform scenario planning.
Organizations that ask it after SOP perform crisis management.

Sources & methodology

[1] Audi AG, "Profile of location - Audi at the San José Chiapa site," updated 2026. Audi describes the plant at approximately 2,400 m altitude and notes that lower air pressure materially affects equipment design in the paint process. audi.com.

[2] IATF 16949:2016, section 7.1.5.3.1 (Internal laboratory), as reproduced in publicly accessible reference material. The requirement addresses laboratory scope, technical procedures, personnel competence, product testing, traceability, customer requirements and records.

Case methodology: All GZ-MEX operational facts, dates, costs, staffing levels and DRW actions are based on the anonymized first-hand case narrative provided for preparation of this white paper. External sources are used only to corroborate contextual points, not to independently verify confidential case facts.