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Impact of SAP GTS on International Supply Chain Efficiency

S. Lakshmi Narasimma

PhD Research Scholar

Management, Symbiosis International (Deemed University),

Pune, Maharashtra, India- 412115

Orcid Id: https://orcid.org/0009-0006-0713-8274

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Abstract : International supply chains depend on timely trade documentation, regulatory checks, customs processing, and coordination between organizations. SAP Global Trade Services provides functions intended to support these activities, but documented functionality should be distinguished from independently measured business benefits. This assessment examines operational changes associated with SAP GTS implementation using a simulated before-and-after dataset representing 24 matched trade lanes and 2,400 shipments. Each lane contributes 50 shipments before implementation and 50 during a subsequent stable operating period. Documentation preparation time is the primary outcome; customs release time, trade-administration cost, and international delivery lead time are secondary outcomes. Paired comparisons use lane-level means to avoid treating shipments within a lane as independent implementation units. Mean preparation time decreases from 48.0 to 31.0 minutes, a reduction of 35.4% and a paired difference of 17.0 minutes (95% confidence interval: 14.49–19.51; p<0.001). Customs release time decreases by 23.3%, administration cost by 25.0%, and delivery lead time by 9.5%. Shipments requiring documentation corrections decline from 8.0% to 3.5%, while on-time delivery increases from 84.0% to 92.0%. These generated results demonstrate a coherent evaluation framework rather than verified SAP GTS effectiveness. Actual implementation research should account for shipment composition, external border conditions, complementary process changes, and total ownership costs.

Keywords: SAP GTS; international supply chain; trade compliance; customs management; operational efficiency; enterprise systems.

Introduction

International supply chains require coordination across commercial, logistical, and regulatory boundaries. A shipment may be physically ready for dispatch but remain delayed because product classifications are incomplete, transaction partners require review, or declaration information needs correction. Administrative activities therefore influence delivery performance alongside transport capacity and production scheduling.

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SAP Global Trade Services, commonly called SAP GTS, supports international trade operations through functions including compliance management, customs management, and trade-related process integration. Its capabilities can assist organizations in managing checks and documentation, but implementation outcomes

depend on configuration, data quality, interfaces, and operating practices [1,2]. SAP Help Portal

A software deployment should not automatically be interpreted as an efficiency improvement. Some delays originate outside the organization, including inspections, port congestion, carrier disruption, or government-system availability. Other improvements may result from concurrent changes in staffing, broker arrangements, or master-data governance.

This paper examines a measurement framework connecting SAP GTS-supported processes with observable operational outcomes. It prioritizes documentation preparation, an activity relatively close to organizational control, while treating customs release and total delivery time as outcomes influenced by additional conditions.

The title uses "impact" in an evaluative sense. The proposed uncontrolled before-and-after design estimates associated changes and does not establish the software's isolated causal effect.

Literature Review

Time and international trade

Hummels and Schaur examined time as a trade barrier [3]. Their research establishes the economic relevance of shipment timing, particularly where delayed delivery affects sourcing and transport decisions. However, the economic value of transit time does not identify how much delay a particular software system can remove. American Economic Association

Djankov, Freund, and Pham investigated the relationship between trade delays and international trade [4]. Their work supports examining administrative time as a business constraint. It also suggests that trade performance involves processes extending beyond physical movement, making documentation and clearance meaningful operational measures.

These studies provide an economic rationale for reducing avoidable delays. They do not supply a transferable percentage improvement attributable to SAP GTS.

Enterprise systems and business performance

Hitt, Wu, and Zhou investigated enterprise resource planning investment and business productivity [5]. Their study provides a foundation for evaluating enterprise technology through measured outcomes rather than relying exclusively on implementation announcements or managerial expectations. tandfonline.com

Hendricks, Singhal, and Stratman examined ERP, supply chain management, and customer relationship management implementations [6]. Their research highlights the importance of distinguishing different enterprise applications and performance dimensions. Findings about enterprise systems generally should not be presented as direct evidence about SAP GTS specifically. Wiley Online Library

Dehning, Richardson, and Zmud studied financial performance following IT-based supply chain system adoption in manufacturing firms [7]. Their analysis illustrates the difficulty of connecting technology investment with broad financial outcomes affected by many other influences. This supports measuring operational changes near the processes being modified. Wiley Online Library



Integration as an organizational capability

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Rai, Patnayakuni, and Seth examined digitally enabled supply chain integration capabilities [8]. Their work frames information technology as part of an organizational capability, rather than a standalone source of performance. Integration requires information exchange and coordinated processes that convert technical availability into useful action. MIS Quarterly

Flynn, Huo, and Zhao investigated supply chain integration using contingency and configuration perspectives [9]. Their findings support examining internal and external integration together and recognizing that performance relationships depend on context. For SAP GTS, this directs attention to coordination among logistics, compliance, master-data teams, and external service providers. Wiley Online Library

Trade facilitation and measurement

The WTO's World Trade Report 2015 examines the benefits and implementation challenges of trade facilitation [10]. It provides institutional context for process simplification while emphasizing that changes occur within wider administrative systems. Publications

The World Customs Organization's Time Release Study Guide provides a structured basis for defining and measuring release times [11]. Its relevance lies in specifying events and boundaries consistently. A company should not compare declaration-processing time in one period with arrival-to-release time in another. wcoomd.org

SAP GTS functionality and the evidence gap

SAP documentation describes customs-processing capabilities and international trade functions [1,2]. SAP Learning materials also identify compliance, reporting, customs programs, and trade-agreement qualification among relevant capabilities [12]. These are authoritative descriptions of product scope, not independent estimates of realized savings. learning.sap.com

The research gap addressed here is methodological: how to evaluate operational performance while separating documented capabilities, observed changes, external influences, and financial interpretation. This assessment does not claim that no other SAP GTS implementation studies exist.

Aim and Objectives

The aim is to assess changes in international supply chain efficiency associated with SAP GTS implementation.

The objectives are to:

- Compare documentation preparation time before and after implementation.
- Examine customs release time, administration cost, and delivery lead time.
- Describe changes in documentation corrections and on-time delivery.
- Identify conditions affecting interpretation of operational benefits.
- Distinguish gross process savings from net investment returns.

Conceptual Framework

The proposed mechanism is that integrated transaction data, standardized checks, and more consistent documentation reduce avoidable administrative work. Lower preparation effort and fewer corrections may improve shipment readiness and reduce some downstream delays.

The relationship is conditional. Incomplete classifications, outdated partner information, poorly managed exceptions, or interface failures may limit benefits. Customs authorities and carriers retain control over substantial parts of the international delivery process.

Consequently, the framework expects the largest measurable changes in directly supported administrative activities and potentially smaller changes in total delivery time. This is a testable expectation rather than a guaranteed implementation outcome.

Materials and Methods

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Research design

An uncontrolled before-and-after design is proposed, comparing the same 24 trade lanes during two six-month observation windows. A three-month stabilization interval separates the windows.

The numerical analysis is simulated. The observation windows define a study structure and are not claimed as completed company operations.

For an actual evaluation, implementation dates, software edition, enabled functions, feeder-system interfaces, and deployment scope must be documented.

Trade-lane definition and shipment coverage

A lane is defined by a consistent origin–destination corridor and transport mode. Eligibility requires activity in both periods and comparable product and service characteristics.

Each lane contributes 50 shipments per period, producing 1,200 before and 1,200 after implementation. The balanced structure isolates the calculations from changing lane weights, although it does not reproduce natural shipment volumes.

An actual study should document shipment selection and assess whether excluded or unmatched movements differ systematically from included shipments.

Outcomes and definitions

Documentation preparation time is the primary outcome.

Table 1. Operational outcome definitions

Outcome	Definition	Unit
Documentation preparation	Active staff time preparing and checking the trade-document package	Minutes/shipment
Customs release time	Elapsed time from customs acceptance of the declaration to release authorization	Hours/shipment
Trade-administration cost	Allocated labor, routine processing, and administrative overhead	USD/shipment
Delivery lead time	Time from shipment dispatch to confirmed delivery	Days/shipment
Documentation correction	Shipment requiring at least one substantive document correction	Shipments, %
On-time delivery	Delivery by the originally committed date	Shipments, %

Preparation time measures active work rather than elapsed waiting. Release time excludes pre-acceptance waiting and is therefore not a complete border-dwell measure.



Administration cost excludes freight, duties, taxes, software licensing, implementation expenditure, and

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capital costs. It must not be interpreted as total landed cost.

Data sources and quality controls

Actual implementation would require transaction logs, staff time records, broker or customs messages, transport milestones, and consistent costing rules.

Identifiers should link records across systems. Time zones, missing milestones, reopened declarations, and duplicate events require reconciliation. Delivery commitments should be retained as originally recorded rather than retrospectively revised.

These are proposed procedures; no source records were supplied for the simulated analysis.

Statistical analysis

Each lane's mean is calculated separately for each period. Paired t-tests compare the 24 lane means, giving 23 degrees of freedom. Reported standard deviations describe variation between lane means, not shipment-level dispersion.

Documentation time is the prespecified primary outcome. Other comparisons are secondary and exploratory. Confidence intervals describe before-minus-after differences.

Correction and delivery percentages are descriptive pooled shipment measures. No shipment-level significance tests are applied because dependence within lanes is not modeled.

Research governance

Actual company research requires authorization to access operational records, protection of commercially sensitive information, and transparent disclosure of vendor or implementation-partner involvement. No company authorization or independent audit is invented.



Results

Dataset structure

The analysis includes 24 matched lanes and 2,400 shipment records.

Table 2. Simulated analytical coverage

Measure	Before	After
Matched trade lanes	24	24
Shipments per lane	50	50
Total shipments	1,200	1,200
Observation window	Six months	Six months

Continuous operational outcomes

Documentation preparation decreases from 48.0 to 31.0 minutes per shipment. Customs release time decreases from 30.0 to 23.0 hours, while administration cost decreases from USD 42.00 to USD 31.50.

Table 3. Simulated operational performance

Outcome	Before, mean±SD	After, mean±SD	Relative reduction
Preparation time, minutes	48.0±8.0	31.0±6.0	35.4%

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Customs release time, hours	30.0±7.0	23.0±5.5	23.3%
Administration cost, USD	42.00±6.00	31.50±5.00	25.0%
Delivery lead time, days	8.40±1.30	7.60±1.10	9.5%

SDs represent variation across 24 lane means.

Paired comparisons

All four outcomes decrease in the simulated analysis.

Table 4. Simulated paired lane-level comparisons

Outcome	Mean reduction	95% CI	t-value	p-value
Preparation time	17.00 minutes	14.49 – 19.51	14.01	<0.001
Customs release time	7.00 hours	4.81–9.19	6.62	<0.001
Administration cost	USD 10.50	8.48–12.52	10.76	<0.001
Delivery lead time	0.80 days	0.35–1.25	3.69	0.001

These tests describe the generated lane differences and provide no empirical evidence of an actual implementation benefit.

Documentation quality and delivery reliability

Shipments requiring corrections decrease from 96 to 42. On-time deliveries increase from 1,008 to 1,104.

Table 5. Simulated descriptive shipment outcomes

Outcome	Before	After	Absolute change
Documentation corrections	96/1,200 (8.0%)	42/1,200 (3.5%)	−4.5 percentage points
On-time delivery	1,008/1,200 (84.0%)	1,104/1,200 (92.0%)	+8.0 percentage points

The relative reduction in correction frequency is 56.3%. This does not establish that every correction was regulatory noncompliance.

Gross operational implications

At the observed analytical volume, the preparation-time difference represents:

$$1{,}200\times17/60 = 340\text{ staff}-\text{hours}$$

The administration-cost difference represents:

$$1{,}200\times10.50 =\text{USD }12{,}600$$

The time estimate and monetary estimate must not be added together because labor savings are already included in administration cost. Neither estimate represents net return on investment.

Discussion

The largest simulated improvement concerns documentation preparation, while the smallest concerns total delivery lead time. This pattern is consistent with the proposed distinction between directly supported administrative work and outcomes influenced by transport and border conditions.

SAP documentation supports the availability of relevant functionality [1,2,12], but it cannot validate the generated improvement percentages. A company's actual results depend on implementation scope and operating conditions.

The reduction in corrections provides a potentially useful companion measure. Faster preparation accompanied by more corrections could indicate rushed processing. Conversely, fewer corrections alongside reduced effort would support a more favorable

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operational interpretation. However, correction counts require consistent definitions and should distinguish commercial amendments from substantive trade-document errors.

The customs-release finding requires particular caution. Changes could reflect broker performance, inspection selection, government processing, or shipment characteristics. An uncontrolled comparison cannot assign the entire seven-hour difference to SAP GTS.

Likewise, improved on-time delivery may result from several concurrent changes. Delivery reliability should be evaluated using original commitments and comparable service levels. Shortening commitments after implementation would make interpretation different from maintaining commitments while improving execution.

Enterprise-system literature supports examining organizational complements [5–9]. Software may enable standardized information, but ownership of classifications, exception handling, and user training determines whether that information is maintained and acted upon.

Financial interpretation is equally important. Lower administrative effort may release staff capacity without reducing payroll expenditure. Such capacity can still have value, but it should be reported separately from cash savings. Implementation, support, integration, training, and ongoing content costs are required before calculating net benefit.



The absence of a control group remains the main causal limitation. A stronger study could compare phased rollout groups or use an interrupted time series with adequate pre-implementation observations. These approaches would still require attention to lane differences and concurrent organizational changes.

Managerial Implications

Organizations should define baseline measures before deployment and preserve consistent event definitions. Preparation time, exception workload, correction rates, and release milestones should be monitored together.

Master-data governance deserves explicit ownership. Automation cannot reliably compensate for incomplete or inconsistent source information.

Management should also retain compliance safeguards when pursuing efficiency. Fewer blocked transactions may reflect improved data or screening calibration, but can also reflect weakened controls. Operational speed should therefore be evaluated alongside audit evidence and exception resolution quality.

Limitations and Future Research

The numerical results are simulated and cannot establish SAP GTS effectiveness. The balanced shipment sample also simplifies real operating volumes.

In an actual study, lane outcomes may remain correlated through shared ports, brokers, teams, or market disruptions. Paired testing assumes independence between lane differences and requires assessment of their distribution.

Future research should use measured transaction histories, multiple organizations, documented deployment scope, and credible comparison groups. Total ownership costs and compliance outcomes should accompany efficiency measures.

Conclusion

SAP GTS provides functions relevant to international trade administration, but product capability and realized performance are different forms of evidence. The simulated analysis demonstrates a consistent evaluation approach, with larger changes in preparation activities than in total delivery time. Verified operational data and stronger comparative designs are required to determine

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actual benefits and separate software-related changes from external influences.

Declarations

Data availability: Numerical findings are simulated drafting data.

Company authorization: No participating organization or deployment is claimed.

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