HUMAN, ORGANIZATIONAL AND TECHNOLOGICAL FACTORS INFLUENCING HARMONIZED SYSTEM CODE MISCLASSIFICATION IN EXPRESS CUSTOMS CLEARANCE

By

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(Transportation and Logistics Management)

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ABSTRACT

Harmonized System (HS) classification is a core function of customs administration, underpinning tariff assessment, regulatory controls, and trade statistics. In express customs clearance environments, however, HS classification must be performed under time-critical conditions characterized by high shipment volumes, limited documentation quality, strict service-level requirements, and increasing reliance on digital declaration systems. Despite standardized nomenclature and the growing use of automated and technology-assisted classification tools, HS misclassification remains a persistent issue with significant compliance, fiscal, and operational implications. Existing research has predominantly emphasized legal interpretation, enforcement outcomes, or technical system design, while giving comparatively limited attention to the human, organizational, and socio-technical conditions under which classification decisions are made in practice. This study examines the human, organizational, and technology-related factors contributing to HS misclassification in express customs clearance operations using a qualitative research design. Data was collected through semi-structured interviews with six practitioners directly involved in HS classification, supervisory oversight, and operational support roles. deductive thematic analysis reveals that HS misclassification is not solely attributable to technical complexity or individual error. Instead, it emerges from the interaction between uneven depth of HS knowledge (particularly at subheading and national-digit levels), informal onboarding and buddy-session learning, high workload intensity, time pressure driven by cleared-on-arrival (COA) performance targets, constrained opportunities for verification, and organizational practices that prioritize processing speed over analytical depth. The findings further show that technology and system-based classification tools play a dual role. While automated HS suggestions and digital workflows support processing efficiency, they may also reinforce historical classification patterns and reduce critical verification when corrective feedback mechanisms, system governance, and structured learning loops are limited. These socio-technical dynamics amplify misclassification risk, particularly when documentation quality is poor and operational pressure is high. By conceptualizing HS misclassification as a socio-technical and organizational phenomenon rather than a purely legal or technical problem, this study contributes empirical insight into express customs clearance practice and highlights the importance of strengthening competency assurance, workload and process design, verification controls, information quality, and governance of technology-assisted classification to support sustainable compliance alongside trade facilitation objectives.

Keywords: Harmonized System, HS misclassification, Express customs clearance, Human factors, Organizational processes, Technology-assisted classification, Automated decision support

ABSTRAK

Pengelasan Sistem Harmonisasi (HS) merupakan fungsi teras dalam pentadbiran kastam yang menyokong penilaian tarif, kawalan peraturan, dan penyediaan statistik perdagangan. Namun demikian, dalam persekitaran pelepasan kastam ekspres, pengelasan HS perlu dilaksanakan di bawah keadaan yang sangat kritikal dari segi masa, dicirikan oleh jumlah penghantaran yang tinggi, kualiti dokumentasi yang terhad, keperluan tahap perkhidmatan yang ketat, serta peningkatan kebergantungan terhadap sistem pengisytiharan digital. Walaupun tatanama HS telah diseragamkan dan penggunaan alat pengelasan automatik serta berasaskan teknologi semakin meluas, salah pengelasan HS masih merupakan isu berterusan yang membawa implikasi pematuhan, fiskal, dan operasi yang signifikan. Penyelidikan sedia ada kebanyakannya menumpukan kepada tafsiran perundangan, hasil penguatkuasaan, atau reka bentuk sistem teknikal, manakala perhatian yang lebih terhad diberikan kepada keadaan manusia, organisasi, dan sosio-teknikal yang membentuk proses pembuatan keputusan pengelasan dalam amalan sebenar. Kajian ini meneliti faktor manusia, organisasi, dan berkaitan teknologi yang menyumbang kepada salah pengelasan HS dalam operasi pelepasan kastam ekspres dengan menggunakan reka bentuk penyelidikan kualitatif. Data dikumpulkan melalui temubual separa berstruktur dengan enam orang pengamal yang terlibat secara langsung dalam pengelasan HS, pengawasan penyeliaan, dan peranan sokongan operasi. Analisis tematik Secara deduktif menunjukkan bahawa salah pengelasan HS bukan semata-mata berpunca daripada kerumitan teknikal atau kesilapan individu. Sebaliknya, ia terhasil daripada interaksi antara tahap pengetahuan HS yang tidak sekata (khususnya pada peringkat subperkara dan digit kebangsaan), pembelajaran tidak formal melalui sesi bimbingan rakan sekerja, intensiti beban kerja yang tinggi, tekanan masa yang didorong oleh sasaran prestasi pelepasan semasa ketibaan (*cleared-on-arrival*, COA), peluang pengesahan yang terhad, serta amalan organisasi yang mengutamakan kelajuan pemprosesan berbanding ketelitian analisis. Dapatan kajian turut menunjukkan bahawa teknologi dan alat pengelasan berasaskan sistem memainkan peranan dua hala. Walaupun cadangan HS automatik dan aliran kerja digital menyokong kecekapan pemprosesan, ia juga berpotensi mengukuhkan corak pengelasan berasaskan sejarah dan mengurangkan pengesahan kritikal apabila mekanisme maklum balas pembetulan, tadbir urus sistem, dan kitaran pembelajaran berstruktur adalah terhad. Dinamik sosio-teknikal ini meningkatkan risiko salah pengelasan, khususnya apabila kualiti dokumentasi rendah dan tekanan operasi adalah tinggi. Dengan mengkonseptualisasikan salah pengelasan HS sebagai fenomena sosio-teknikal dan organisasi, bukannya semata-mata isu perundangan atau teknikal, kajian ini menyumbang pengetahuan empirikal kepada amalan pelepasan kastam ekspres serta menekankan kepentingan pengukuhan jaminan kompetensi, reka bentuk beban kerja dan proses, kawalan pengesahan, kualiti maklumat, serta tadbir urus pengelasan berasaskan teknologi bagi menyokong pematuhan yang mampan selari dengan objektif pemudahcaraan perdagangan.

Kata kunci: Sistem Harmonisasi, Salah pengelasan HS, Pelepasan kastam ekspres, Faktor manusia, Proses organisasi, Pengelasan berasaskan teknologi, Sokongan keputusan automatik

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ASEAN	Association of Southeast Asian Nations
COA	Cleared on Arrival
GRI	General Rules for the Interpretation of the Harmonized System
HS	Harmonized System
KPI	Key Performance Indicator
RMCD	Royal Malaysian Customs Department
SOP	Standard Operating Procedure
WCO	World Customs Organization
WTO	World Trade Organization

CHAPTER 1: INTRODUCTION

1.1 Introduction

This study explores the human and organizational factors contributing to Harmonized System (HS) code misclassification in express customs clearance operations. In the express logistics environment, accurate HS classification is essential for ensuring regulatory compliance, correct duty and tax assessment, and expedited border clearance under time-critical service models. Despite the availability of standardized nomenclature and automated declaration systems, HS misclassification continues to occur, suggesting that errors may stem not only from technical complexity but also from human judgment, organizational processes, and system interactions.

This chapter establishes the foundation of the study by presenting the research background, problem statement, research questions, research objectives, and the significance of the research. It further outlines the scope of the study, defines key terms, and describes the overall structure of the thesis.

1.2 Background of the Study

International trade has expanded substantially over the past several decades as a result of multilateral efforts to reduce trade barriers while maintaining regulatory controls at national borders (Baunsgaard & Keen, 2010; Konstantinidou & Kehris, 2024). Statistical evidence indicates that global trade volumes have increased markedly roughly 43 times since the mid-twentieth century, with a pronounced acceleration following the

establishment of the World Trade Organization (WTO) in 1995. Despite uneven trade performance across countries, average applied tariff levels have declined over time, with the current global average MFN applied tariff reported at 8.8% (WTO, n.d.).

In international trade, Customs represent the "doorkeepers" of each country (Martincus et al., 2013; Prost & Scattolo, 2024). As the authority responsible for controlling cross-border goods movements, Customs decisions shape whether shipments are released, inspected, delayed, or penalized. Because tariff classification determines the applicable duty rate, restrictions, and compliance requirements, errors in HS code declaration can translate into operational disruption and regulatory exposure (Prost & Scattolo, 2024) particularly in express customs clearance environments where time-definite delivery and high shipment volumes intensify decision pressure. The complexity of the Harmonized System nomenclature, with its 5,387 subheadings, further complicates accurate classification, leading to potential misinterpretations and significant financial and logistical consequences for traders and customs authorities alike (Lee et al., 2023). The intricate nature of HS codes, combined with the sheer volume of global trade, creates a substantial workload for customs personnel and businesses involved in international commerce (Gholamian et al., 2024). Moreover, the continuous evolution of logistics technology and the expansion of e-commerce have amplified the volume of trade transactions, further straining existing classification processes (Anggoro et al., 2024).

Within this evolving trade environment, customs administrations perform a central role in revenue collection, trade control, and regulatory enforcement (World Customs Organization, 2023). Although customs responsibilities have expanded beyond traditional revenue functions to include trade facilitation and security objectives, the assessment and

collection of customs duties and taxes remain a core function in many countries (Morini, Porto, & Inácio Jr., 2017). Trade taxes continue to represent a significant source of government revenue in several economies, particularly in middle- and low-income countries (World Customs Organization, 2023; Lashkaripour, 2020).

To support customs control and international trade administration, the Harmonized Commodity Description and Coding System (Harmonized System or HS) serves as the global standard for classifying traded goods (Anggoro et al., 2024; World Customs Organization, 2018). The HS is used by more than 200 countries and customs territories, accounting for approximately 98% of world trade, and provides the basis for customs tariffs, trade statistics, and the application of non-tariff measures (International Federation of Customs Brokers Associations, 2018). The HS further functions as a core classification framework that allows national tariff subdivisions and supports rules of origin, internal taxation, and other trade-related policy instruments (World Customs Organization, 2013).

Following the adoption of UN General Assembly Resolution 70/1 (Transforming our world: the 2030 Agenda for Sustainable Development) in 2015, the World Customs Organization (WCO) and its members have increasingly framed Customs modernization and border functions as contributors to the Sustainable Development Goals (SDGs), including through stronger coordination with other authorities and the private sector to support the UN 2030 Agenda. In this context, the HS itself has been positioned as a sustainability-relevant instrument: WCO work on the HS has included preparation of HS 2022 improvements explicitly intended to support the SDGs, alongside ongoing review cycles, reflecting how goods classification is tied to policy monitoring and facilitation objectives that align with SDG priorities (World Customs Organization, 2021).

Despite its widespread adoption, HS classification is widely recognized as a technically complex task. Classification decisions require detailed product information and the correct application of legal notes and interpretative rules, and difficulties arise when goods are classifiable under multiple headings or when product descriptions are not explicitly provided for in the nomenclature (Bureau of Customs, n.d.). Empirical observations further indicate that identical goods may be classified differently depending on the individual officer or customs office involved, reflecting interpretative challenges and variation in expertise (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021).

HS misclassification has been consistently identified as a prevalent form of customs non-compliance. Recent empirical evidence using transaction-level customs data further demonstrates that HS misclassification constitutes a distinct and substantive channel of tariff revenue loss (World Customs Organization, 2023). Using matched exporter–importer container data, the World Bank finds that misclassification accounts for approximately one-third of total tariff revenue losses associated with misreporting, even when undervaluation remains the dominant evasion channel overall, underscoring that classification accuracy has material fiscal consequences beyond valuation errors (Anne et al., 2023). Studies report misclassification as one of the most common methods used to evade higher tariff rates, anti-dumping duties, and excise or value-added taxes (Kee & Nicita, 2022; Lowitt, 2019). Cross-country surveys of customs administrations further rank misclassification among the most frequent customs fraud typologies globally (Zhuchkov & Pashko, 2021; Hinta et al., 2010).

The fiscal implications of HS misclassification are substantial. Audit findings indicate that a significant proportion of customs entry lines contain classification errors, contributing to large-scale duty underpayments (Nugrahaeni & Tjen, 2021). Earlier assessments suggested that approximately USD 22 billion per year may be owed to government treasuries worldwide due to customs tariff misclassification alone, in addition to indirect effects on trade statistics, risk assessment, and customs control effectiveness (Kappler, 2011). More recent studies indicate that no current global estimate isolates misclassification-related losses, as such errors are typically embedded within broader measurements of trade mis-invoicing and customs fraud. Using these broader approaches, research estimates that developing countries lost an average of USD 131 billion annually between 2000 and 2018, while total global tax abuse across all mechanisms reached approximately USD 492 billion per year by 2024 (Drenski et al., 2019; Brandt, 2020; Tax Justice Network, 2024). Although the precise share attributable to misclassification cannot be determined, existing evidence shows that improved detection can significantly increase tax collection, and that misclassification continues to undermine trade statistics, customs risk assessment, and control effectiveness (World Bank, 2024).

At the same time, research has highlighted that customs commodity reporting remains generally poor and that limited attention has been given to understanding the underlying causes of classification errors (Bagai & Wilson, 2006). Contemporary evidence suggests that even modern efforts to automate or benchmark classification performance reveal persistent high error rates and substantive challenges in classification accuracy, underscoring the complexity and quality issues in current reporting practices (Yuvraj & Devarakonda, 2025; Qi et al., 2025). Moreover, official studies indicate that ambiguity in

HS interpretation and inconsistent use of classification tools contribute to classification variability, further demonstrating the need for deeper research on the causes of classification errors beyond legal and technical frameworks (World Customs Organization, 2024).

Within express customs clearance, the expansion of cross-border e-commerce has contributed to a significant increase in express parcel movements processed by customs administrations and to the adoption of expedited clearance procedures (Blegen, 2023). Express consignments require formal goods declarations, and responsibility for declaration accuracy rests with the designated declarant, which is frequently the express operator rather than the importer directly (Blegen, 2023). Express clearance operations are characterized by time-sensitive processing and high shipment volumes, with reliance on commercial invoices and transport documents forming a key feature of declaration practices (Blegen, 2023).

Under expedited clearance arrangements, goods may be released based on limited information, with full verification conducted after release, thereby shifting greater compliance responsibility to authorized operators and their internal control systems (Blegen, 2023). Where tariff classification information is not provided by customers, express operators may classify shipments based on available shipping documentation and supplementary information obtained from importers (DHL Express, 2023). This operational setting places HS classification decisions within environments that rely heavily on human judgment, staff expertise, and organizational controls.

Although technological solutions such as automated classification tools, data analytics, and artificial intelligence are increasingly deployed to support customs

compliance, existing evidence indicates that such systems require human oversight and structured verification mechanisms to remain effective (World Customs Organization & World Trade Organization, 2022). Automated recommendations may reflect historical declaration practices or outdated nomenclature, reinforcing the continued importance of trained personnel, internal controls, and feedback mechanisms in ensuring classification accuracy (Grainger, 2024).

Taken together, existing literature demonstrates that HS misclassification remains a persistent issue with significant fiscal and operational implications, particularly within express customs clearance environments. However, comparatively limited empirical research has examined how human decision-making, and organizational practices interact to shape HS classification outcomes under expedited clearance conditions. Addressing this gap provides the basis for the present study.

1.3 Problem Statement

The Harmonized System (HS) is a core instrument for customs administration, forming the basis for tariff determination, trade statistics, and regulatory control in international trade (World Customs Organization, 2018; International Federation of Customs Brokers Associations, 2018). Despite its central role, extensive evidence demonstrates that HS misclassification remains a persistent issue across customs administrations, contributing to revenue underpayments, distorted trade statistics, and weakened risk management outcomes (Kappler, 2011; Lowitt, 2019).

Misclassification also matters because HS revisions and classification practices are increasingly expected to support sustainability-oriented monitoring and border measures; for example, WCO discussions highlight the need for HS evolution to better track progress toward SDG-related objectives and manage environment-sensitive goods flows (World Customs Organization, 2022).

While the prevalence and fiscal consequences of HS misclassification are well documented, existing research has paid comparatively limited attention to the conditions under which classification decisions are made in practice. Studies have noted that customs commodity reporting remains generally poor, and that insufficient attention has been given to understanding the underlying causes of classification errors, particularly beyond legal interpretation and enforcement outcomes (Bagai & Wilson, 2006; Qi et al., 2025; Yuvraj & Devarakonda, 2025).

This limitation is especially evident in express customs clearance environments. The expansion of cross-border e-commerce has increased the volume of express consignments processed under expedited clearance arrangements, where formal goods declarations are required and responsibility for declaration accuracy frequently rests with express operators acting as declarants (Blegen, 2023). Under such arrangements, HS classification may be performed based on limited commercial documentation and within time-sensitive operational settings, increasing reliance on human judgment, staff expertise, and organizational controls (Blegen, 2023; DHL Express, 2023).

Although automated classification tools and assistive technologies are increasingly deployed to support customs compliance, existing evidence indicates that these systems require effective human oversight and structured organizational governance to function

reliably (World Customs Organization & World Trade Organization, 2022; Grainger, 2024). Consequently, HS classification accuracy in express clearance operations continues to depend on the interaction between human factors and organizational practices rather than on technology alone (Wagner, 2023).

In express customs clearance environments, Harmonized System (HS) code classification is performed under conditions of high shipment volumes, strict clearance timelines, variable documentation quality, and increasing reliance on technology-assisted declaration systems. These operational conditions heighten the practical risk of HS code misclassification, which may result in clearance delays, reassessments, penalties, and compliance exposure (Prost & Scattolo, 2024; Sardana, 2024; Grainger, 2024). While such risks are widely recognized in operational practice, existing research has largely emphasized legal interpretation of the Harmonized System, enforcement outcomes, or technical system design in isolation. Consequently, there remains limited empirical understanding of how human judgement, organizational arrangements, and technology-assisted classification tools interact within express clearance workflows to shape HS classification decisions. This gap underscores the need for empirical investigation into the combined human, organizational, and technology factors influencing HS code misclassification in express customs clearance.

Hence, the central problem addressed in this study is the limited empirical understanding of how human, organizational, and technology-related factors interact to contribute to HS code misclassification in express customs clearance. Without a clearer understanding of these factors and their interaction within expedited clearance

environments, efforts to improve classification accuracy and compliance performance risk remaining incomplete.

1.4 Research Questions

1. What human factors influence HS code misclassification risk in express customs clearance operations?
2. What organizational and operational factors affect verification discipline and contribute to HS code misclassification in express customs clearance environments?
3. How do technological systems and tools shape classification behaviour and influence HS code misclassification risk in express customs clearance operations?
4. What practical recommendations can be proposed, based on participants' experiences and the study's findings, to reduce HS code misclassification risk in express customs clearance operations?

1.5 Research Objectives

The fundamental research questions of this study are:

1. To examine how human factors influence HS code misclassification risk in express customs clearance operations.
2. To identify organizational and operational factors that affect verification discipline and contribute to HS code misclassification in express customs clearance environments.

3. To analyze the role of technological systems and tools in shaping classification behaviour and influencing HS code misclassification risk in express customs clearance operations.
4. To propose practical recommendations, grounded in the study's findings, for improving HS classification reliability and reducing misclassification risk in express customs clearance operations.

1.6 Scope of the Study

This study focuses on understanding the human and organizational factors associated with Harmonized System (HS) code misclassification in express customs clearance operations. The scope of the study is defined in terms of context, participants, phenomenon of interest, and analytical focus.

In terms of context, the study is situated within express logistics and express customs clearance environments, where shipments are processed under expedited clearance arrangements. The research concentrates on HS classification activities related to express consignments that require formal customs declarations. Other customs processes, such as valuation, origin determination, enforcement investigations, or post-clearance audit procedures, are outside the scope of this study unless they directly relate to HS classification practices.

With regard to participants, the study involves individuals directly engaged in HS classification and customs declaration activities within express logistics operations. This includes personnel such as customs declarants, classification specialists, supervisors, and

operational staff who are involved in assigning or reviewing HS codes. The study does not include perspectives from customs officers, policymakers, or importers, except where such perspectives are indirectly reflected through organizational procedures or system requirements encountered by express operators.

The phenomenon of interest is limited to HS code classification and misclassification as experienced and perceived by practitioners. The study examines how human factors such as knowledge, skills, experience, and sensemaking processes and organizational factors such as standard operating procedures (SOPs), workload conditions, training practices, system design, and internal controls shape HS classification practices in express clearance operations. Technological tools and operational pressures are considered only to the extent that they influence or interact with human and organizational factors.

From an analytical perspective, the study adopts a qualitative approach aimed at exploring meanings, perceptions, and practices rather than measuring the frequency or statistical prevalence of misclassification. The research does not seek to quantify error rates, test causal relationships, or evaluate the financial impact of misclassification. Instead, it aims to develop an in-depth understanding of how HS classification decisions are made in practice within time-sensitive express clearance environments.

Geographically, this study is bounded to the express logistics context of the selected organizational setting; accordingly, the findings are not intended for statistical generalization, but to provide context-sensitive insights that may be transferable to comparable express customs clearance environments (Asenahabi, 2019; Oranga & Matere, 2023). This single-organization case enables in-depth examination of HS classification practices in a real-world, time-definite express clearance model characterized by high-

volume declarations, strict service-level requirements, compressed timelines, and performance-driven workflows (Gondimalla et al., 2024), where process KPIs such as Cleared on Arrival (COA) formalize time-based clearance expectations (DHL Express, n.d.). Although targets may vary across hubs, the analytical transferability argument is strengthened by evidence that express/customs-clearance functions commonly use similar KPI families focused on clearance time/timeliness, throughput, and declaration quality/error indicators (Cherkunov, 2025; Morales-Fusco et al., 2016; Resnyanskaya, 2021; Tadesse et al., 2022; Herusantoso & Saputra, 2020; Naura et al., 2024)

1.7 Significance of the Study

This study is significant in several ways, contributing to academic knowledge, industry practice, and policy and regulatory understanding related to Harmonized System (HS) classification in express customs clearance.

From an academic perspective, the study contributes to the limited empirical literature on HS misclassification by focusing on the human and organizational dimensions of classification practices in express customs clearance environments. While existing research has largely emphasized legal interpretation, enforcement outcomes, or technological solutions, this study provides qualitative insights into how classification decisions are made in practice under expedited clearance conditions. By examining HS misclassification through the perspectives of practitioners, the study extends understanding of classification as a socio-technical and organizational process rather than solely a technical or legal exercise.

From an industry perspective, the findings of this study are relevant to express logistics operators and customs service providers responsible for HS classification and declaration accuracy. Insights into how human factors, organizational processes, and operational pressures shape classification practices may help organizations identify areas for improvement in training, standard operating procedures, workload management, and internal controls. The study may also inform the design and use of technological tools to better support classification tasks without undermining clearance efficiency.

From a policy and regulatory perspective, the study offers insights that may be useful to customs administrations and policymakers concerned with improving compliance and trade facilitation. Clarifying the human and organizational conditions under which HS misclassification occurs can inform compliance strategies, capacity-building initiatives, and operational guidance for authorized operators working under expedited clearance regimes. These insights also have potential value for risk-based oversight because emerging customs analytics and "decision intelligence" approaches can help identify recurring misclassification patterns such as repeated incorrect HS coding linked to specific intermediaries or commodity profiles that may not be easily visible from the standpoint of a single declaration or individual agent (World Customs Organization, 2023). Accordingly, the findings can support more targeted interventions (e.g., focused guidance, verification triggers, coaching, or training refreshers) rather than relying only on broad corrective measures (World Customs Organization, 2023).

In addition, strengthening HS classification accuracy in time-sensitive express clearance can support broader sustainability outcomes because Customs and the HS are increasingly used to operationalize environmental and social policy measures at borders.

WCO discussions on “Green Customs” underline that HS codes and related data are central for monitoring commodities and implementing trade measures linked to environmental objectives (e.g., plastics, waste, e-waste), while recent HS changes have aimed to increase the visibility of goods with environmental impacts (World Customs Organization, 2021; World Customs Organization, 2022). The findings may also contribute to discussions on balancing facilitation objectives with control requirements in high-volume express clearance environments.

Overall, this study offers a structured account of HS misclassification in express customs clearance, relevant to scholars, practitioners, and regulators seeking to improve classification accuracy while maintaining efficient border processing.

1.8 Definition of Key Terms

1.8.1 Express

According to the ASEAN Secretariat (2013), "Express or Courier Service” means the integrated services for the collection, transmission and delivery of a letter, an envelope, a small packet, a package, a parcel, a wrapper, a container or goods that can be collected, transmitted and delivered in an expedited manner with premium features such as security, tracking, signature, specialization and individualization of services and acknowledgement with committed delivery times (ASEAN Secretariat, 2013).

1.8.2 Tariff Classification of Goods

Determination of the tariff subheading in a tariff nomenclature under which particular goods should be classified (World Customs Organization, 2024).

1.8.3 Tariff Heading (or Subheading)

The textual designation in a tariff nomenclature of a single commodity or a single group of related commodities (World Customs Organization, 2024).

1.8.4 Harmonized System (HS) Convention

The expression commonly used to refer to the international Convention of the Harmonized Commodity Description and Coding System, adopted by the Customs Co-operation Council in 1988 (World Customs Organization, 2024).

1.8.5 Customs

The Government Service which is responsible for the administration of Customs law and the collection of duties and taxes, and which also has the responsibility for the application of other laws and regulations relating to the importation, exportation, movement or storage of goods (World Customs Organization, 2024.

Notes:

- This term is also used when referring to any part of the Customs Service or its main or subsidiary offices.

- This term is also used adjectivally in connection with officials of the Customs, duties and taxes or control on goods, or any other matter within the purview of the Customs (Customs officer, Customs duties, Customs office, Customs declaration).

1.8.6 Clearance

The accomplishment of the Customs formalities necessary to allow goods to enter home use, to be exported or to be placed under another Customs procedure (World Customs Organization, 2024).

1.8.7 Customs Clearing Agent

A person who carries on the business of arranging for the Customs clearance of goods and who deals directly with the Customs for and on behalf of another person (World Customs Organization, 2024).

Notes:

- Examples of Customs clearing agents are Customs agents, Customs brokers and freight forwarders.
- Some countries require that Customs clearing agents or Customs brokers be approved or licensed by the Customs.

1.8.8 Customs Fraud

Any act by which a person deceives, or attempts to deceive, the Customs and thus evades, or attempts to evade, wholly or partly, the payment of duties and taxes or the application of prohibitions or restrictions laid down by Customs law or obtains, or attempts to obtain, any advantage contrary to Customs law, thereby committing a Customs offence (World Customs Organization, 2024).

Notes:

- In some countries, deceiving Customs constitutes Customs fraud only when it is intentional.
- Deceit through an act of omission may or may not be regarded as Customs fraud.
- In some countries or Customs territories, certain offences against statutory and regulatory provisions enforced or administered by Customs administrations on behalf of other government agencies are not considered as Customs fraud.

1.8.9 Declarant

Any person who makes a Goods declaration or in whose name such a declaration is made and as per stated in the General Annex, Chapter 2 of the Revised Kyoto Convention (World Customs Organization, 2024). In DHL Express, they are named as classifier or classification agent.

1.8.10 Goods Declaration

A statement made in the form prescribed by Customs, by which the persons interested indicate the Customs procedure to be applied to the goods and furnish the particulars which the Customs require to be declared for the application of that procedure (World Customs Organization, 2024).

Note:

- The persons interested may be the importer, the exporter, the owner, the consignee, the carrier, etc., of the goods or their legal representative, according to the country concerned.

1.8.11 Cleared on Arrival (COA)

Cleared on Arrival (COA) is a Process KPI used in Customs Operations, which measures the percentage of import declarable shipments that are either pre-cleared before arrival or cleared within one hour after arrival in the destination country (DHL Express, n.d.).

1.9 Organization of the Research

This thesis is organized into five chapters.

Chapter 1 introduces the study by presenting the research background, problem statement, research questions, research objectives, scope of the study, and significance of the research. This chapter establishes the context and rationale for examining HS code misclassification in express customs clearance.

Chapter 2 reviews the relevant literature related to Harmonized System classification, HS misclassification, and express customs clearance. It also discusses the theoretical perspectives underpinning the study, including human and organizational factors relevant to classification practices, and identifies research gaps that inform the development of the research framework.

Chapter 3 describes the research methodology adopted in this study. It outlines the qualitative research approach, research design, participant selection, data collection methods, and data analysis procedures. Issues of research ethics, validity, and reliability are also addressed.

Chapter 4 presents the findings of the study based on the analysis of qualitative data. The chapter reports key themes and patterns related to human factors, organizational processes, technological support, and operational pressures influencing HS code classification in express customs clearance operations.

Chapter 5 discusses the findings in relation to the research questions and existing literature. It highlights the theoretical and practical implications of the study, outlines the study's limitations, and provides recommendations for future research and practice.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 reviews the literature relevant to Harmonized System (HS) classification and HS misclassification within customs administration, with particular reference to express customs clearance environments. The chapter is structured to move from foundational perspectives to more context-specific and explanatory strands of research. It begins by reviewing the HS as a global legal and technical classification framework, establishing its structure, interpretative principles, and role in customs administration. This provides the baseline for understanding how classification decisions are formally intended to be made.

The review then shifts to literature on HS misclassification, examining how classification errors have been conceptualized in prior studies, their compliance and enforcement implications, and the limitations of approaches that focus primarily on legal interpretation or post-clearance outcomes. Building on this, the chapter considers the express customs clearance environment as a distinct operational context characterized by high shipment volumes, time-definite processing, and reliance on limited documentation, which shapes the conditions under which HS classification decisions occur.

Subsequent sections synthesize literature on the human, organizational, and technological factors that influence HS classification practices within such environments, including knowledge development, workload pressure, procedural arrangements, and the use of decision-support systems. The chapter concludes by identifying gaps in the existing literature, particularly the limited empirical attention to how these factors interact in real-

world express customs clearance operations, thereby motivating the focus and research questions of the present study.

2.1.1 Scope and Structure of the Literature on HS Classification and Misclassification

This chapter draws on several related bodies of literature covering the HS, HS classification practice, and HS misclassification. Prior studies have examined the HS as a legal and technical framework that enables the standardized classification of goods for tariff assessment, trade statistics, and regulatory control (World Customs Organization [WCO], 2013; Mikuriya, 2018). Related research has also treated HS misclassification as a persistent compliance issue, with implications for customs revenue, enforcement effectiveness, and trade facilitation outcomes (Azcárraga, 2025).

In addition, the chapter reviews literature on express customs clearance as a distinct operational context characterized by expedited processing, high shipment volumes, and reliance on simplified or limited documentation (Blegen, 2023; Grainger, 2024). Within this environment, studies have examined the influence of human factors (e.g., knowledge and decision-making), organizational arrangements (e.g., training practices and standard operating procedures), and technological tools that support or shape classification decisions (Gupta et al., 2023; Sasana et al., 2025).

To reflect these streams of research, Section 2.2 reviews the HS as a global classification framework, including its structure, evolution, and role in customs administration. Subsequent sections examine HS misclassification, key characteristics of express customs clearance operations, and the human, organizational, and technological

factors relevant to HS classification practices. The chapter concludes by identifying research gaps that inform the focus and positioning of the present study.

2.2 Harmonized System (HS) Classification in Customs Administration

2.2.1 The Harmonized System as a Global Classification Framework

The Harmonized Commodity Description and Coding System, commonly referred to as the Harmonized System (HS), is an internationally standardized nomenclature used to classify goods traded across borders (WCO, 2013). The HS is administered by the World Customs Organization and is applied by more than 200 countries and customs territories, accounting for most of the global merchandise trade (International Federation of Customs Brokers Associations [IFCBA], 2018).

The HS was adopted through the International Convention on the Harmonized Commodity Description and Coding System in 1983 and entered into force in 1988, following earlier international efforts to harmonize customs tariff nomenclatures (Mikuriya, 2018). Its adoption replaced prior systems such as the Brussels Tariff Nomenclature and the Customs Co-operation Council Nomenclature, which were limited in scope and consistency (Hindsdal, 2018).

The HS serves as a common classification language that enables customs administrations, traders, and policymakers to identify goods consistently across jurisdictions, despite differences in national tariff structures and legal systems (IFCBA, 2018). At the international level, the HS provides a uniform six-digit coding structure,

while individual countries may extend the code beyond six digits to meet domestic tariff, statistical, or regulatory needs (WCO, 2013).

2.2.2 Structure and Principles of the HS Code

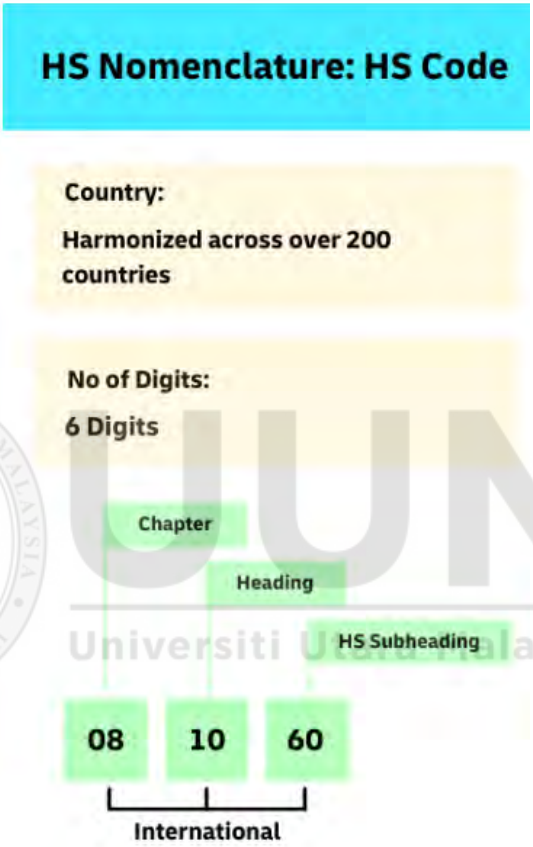

Figure 2.1

HS Code Hierarchy and Six-Digit Structure (Chapter–Heading–Subheading)

Table 2.1

Overview of HS Chapters and Commodity Families

Chapter	Commodities
01-05	Animal & Animal Products
06-15	Vegetable Products
16-24	Foodstuffs
25-27	Mineral Products
28-38	Chemicals & Allied Industries
39-40	Plastics / Rubbers
41-43	Raw Hides, Skins, Leather, & Furs
44-49	Wood & Wood Products
50-63	Textiles
64-67	Footwear / Headgear
68-71	Stone / Glass
72-83	Metals
84-85	Machinery / Electrical
86-89	Transportation
90-97	Miscellaneous
98-99	Service

The HS code is structured hierarchically and consists of six digits at the international level (WCO, 2013). The first two digits identify the chapter (refer table 2.1), the next two digits identify the heading, and the final two digits identify the subheading (WCO, 2013). This hierarchical structure (refer figure 2.1) allows goods to be classified progressively from broad product categories to more specific descriptions.

Figure 2.2

HS Arrangement by Degree of Processing: From Raw Materials to Finished Products

The arrangement of goods within the HS is largely based on the degree of processing or manufacture (refer figure 2.2), with raw materials generally appearing in earlier chapters and finished products appearing in later chapters (Weerth, 2008). In some cases, goods are classified according to function or use rather than production stage, reflecting the complexity of modern products and industrial processes (WCO, 2013).

Figure 2.3

HS Classification Workflow Based on GIR 1–6

Classification under the HS is governed by the General Rules for the Interpretation of the Harmonized System (GIRs), which are legally binding for contracting parties (WCO, 2013). These rules require classifiers to first consider the wording of headings and relevant section, and chapter notes before applying subsequent interpretative rules. As a result, HS classification is a rule-based and sequential decision process (refer figure 2.3) rather than a discretionary activity (WCO, 2013).

2.2.3 Evolution and Revision of the HS

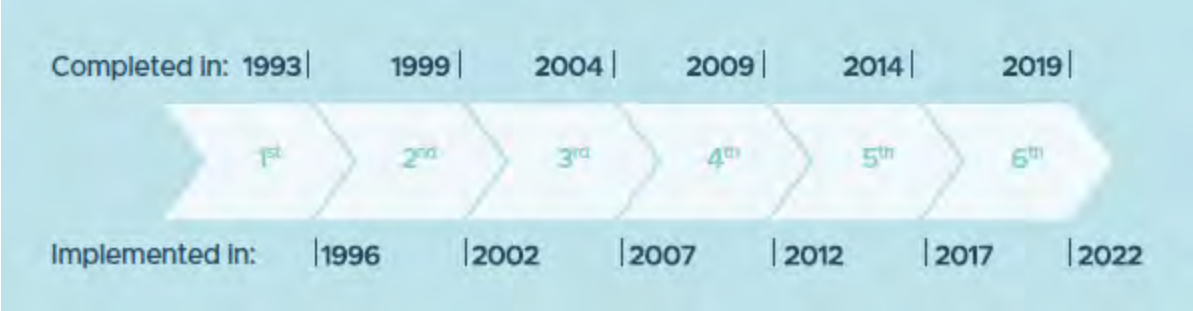

Figure 2.4

Timeline of Harmonized System (HS) Amendments and Implementation Cycles (1993–2022)

The HS is subject to periodic revision to ensure that it remains aligned with changes in international trade patterns, technological development, and product innovation (WCO, 2013). The World Customs Organization administers a formal review and amendment process, typically conducted on a five-year cycle (refer figure 2.4), during which new headings may be introduced and existing provisions modified or deleted (Thomas, 2021).

Revisions to the HS are intended to address the emergence of new products and industries, including advances in electronics, chemicals, and environmentally related goods (Mikuriya, 2018). However, amendments may also require classifiers to update their knowledge and adapt existing practices, particularly where products previously classified under one heading are reassigned under revised nomenclature editions (Li, G. & Li, Na., 2019).

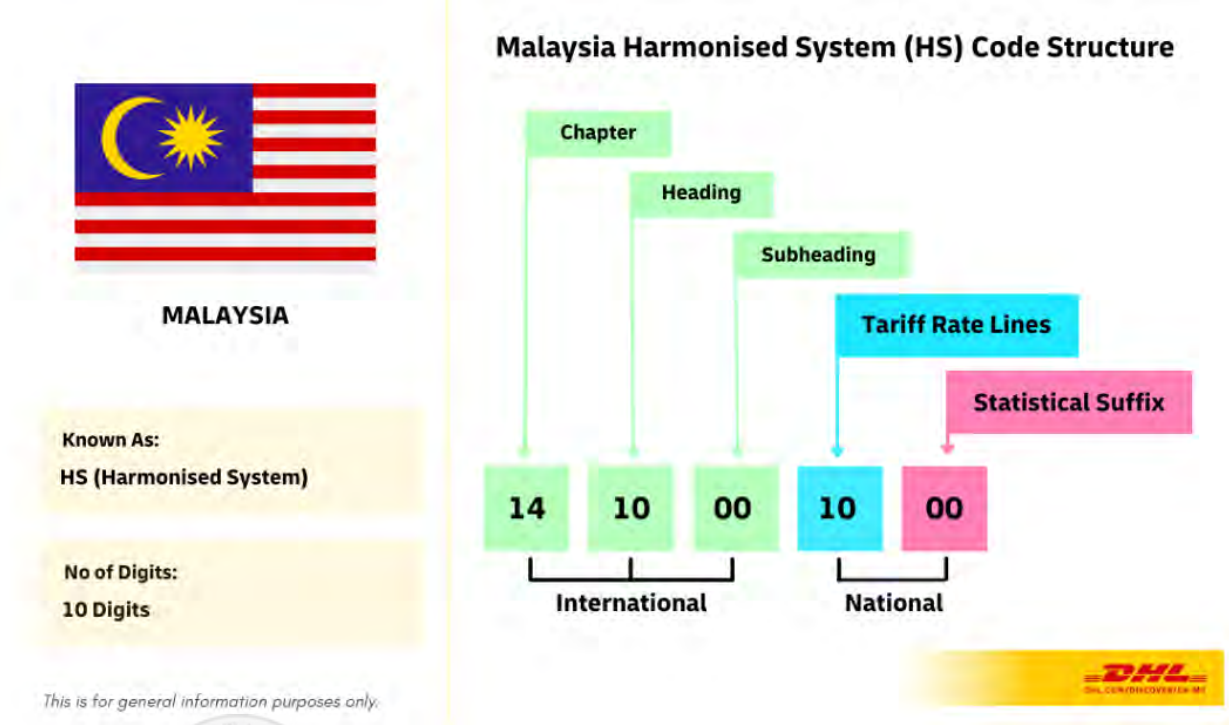

Figure 2.5

Structure of Malaysia's HS/Tariff Code: Chapter to Statistical Suffix

At national and regional levels, the HS forms the basis for tariff schedules and statistical classifications. In the ASEAN context, the HS is implemented through the ASEAN Harmonized Tariff Nomenclature (AHTN), which incorporates additional subdivisions (refer figure 2.5) beyond the international six-digit level to support regional trade and tariff administration (Department of Statistics Malaysia, 2018). This layered structure increases classification complexity by requiring alignment across international, regional, and national coding systems.

2.2.4 Role of HS Classification in Customs Administration

HS classification determines the applicable customs duties and taxes payable on goods that are imported or exported and declared to customs authorities It also provides the basis for the application of non-tariff measures, trade statistics compilation, and regulatory controls administered by customs authorities. Accurate HS classification is therefore a fundamental requirement for customs compliance, revenue assessment, and enforcement effectiveness (Sardana, 2024; Wagner, 2023; WCO, 2013).

Beyond international trade transactions, HS classification is also applied to certain movements of goods within national borders or domestically (refer table 2.2 & 2.33) that remain subject to customs control. In Malaysia, goods moving between customs-controlled area such as Licensed Manufacturing Warehouses (LMWs), Free Zones (FZs), and other designated or special areas and the Principal Customs Area (PCA) are administered under customs procedures that may trigger tax liability and require formal customs declarations using HS codes, even though the physical movement occurs domestically (Royal Malaysian Customs Department [RMCD], 2018).

The *Guide on Manufacturing and Import / Export* issued by the Royal Malaysian Customs Department provides operational clarification on this treatment through matrix tables specifying sales tax implications based on the origin and destination of goods movements involving PCA and special areas (RMCD, 2021). For example, the guide sets out circumstances where movements from special regimes into the PCA are treated as taxable events and require declaration using the appropriate customs form and the relevant HS code to determine the correct tax rate (RMCD, 2021).

Table 2.2

Sales Tax Treatment for Designated Areas (DA)

NO.	TRANSPORTED FROM	TRANSPORTED TO	TYPE OF FORM	SALES TAX TREATMENT
1.	Overseas / Place Outside Malaysia	Designated Areas (DA)	K1	No sales tax Section 50(a)(i)
2.	Malaysia / Principal Customs Area (PCA)	Designated Areas (DA)	K2	No sales tax Section 50(a)(i)
3.	Designated Areas (DA)	Designated Areas (DA)	K8	No sales tax Section 50(a)(ii)
4.	Designated Areas (DA)	Special Areas (Free Zone / FZ)	K8	No sales tax Section 50(a)(iii)
5.	Designated Areas (DA)	Special Areas (Licensed Warehouse / LW)	K8	No sales tax Section 50(a)(iii)
6.	Designated Areas (DA)	Special Areas (Licensed Manufacturing Warehouse / LMW)	K1	No sales tax Section 50(a)(iii)
7.	Designated Areas (DA)	Special Areas (Joint Development Area / JDA)	JDA1	No sales tax Section 50(a)(iii)
8.	Designated Areas (DA)	Inland Clearance Depot (ICD)	K8	Exemption Item 49
9.	Designated Areas (DA)	Overseas / Place Outside Malaysia	K2 (air / sea mode) K8 (road mode)	Exemption Item 56
10.	Designated Areas (DA)	Malaysia / Principal Customs Area (PCA)	K1	Sales tax chargeable (Import) Section 50(b)

Table 2.3

Sales Tax Treatment for Special Areas (Licensed Warehouse / LW)

NO.	TRANSPORTED FROM	TRANSPORTED TO	TYPE OF FORM	SALES TAX TREATMENT
1.	Overseas / Place Outside Malaysia	Special Areas (Licensed Warehouse / LW)	K8	No sales tax Section 57(a)(i)
2.	Malaysia / Principal Customs Area (PCA)	Special Areas (Licensed Warehouse / LW)	K2	No sales tax Section 57(a)(i)
3.	Special Areas (Licensed Warehouse / LW)	Special Areas (Licensed Warehouse / LW)	K8	No sales tax Section 57(a)(ii)
4.	Special Areas (Licensed Warehouse / LW)	Special Areas (Free Zone / FZ)	K8	No sales tax Section 57(a)(ii)
5.	Special Areas (Licensed Warehouse / LW)	Special Areas (Licensed Manufacturing Warehouse / LMW)	K8	No sales tax Section 57(a)(ii)
6.	Special Areas (Licensed Warehouse / LW)	Special Areas (Joint Development Area / JDA)	JDA1	No sales tax Section 57(a)(ii)
7.	Special Areas (Licensed Warehouse / LW)	Designated Areas (DA)	K8	No sales tax Section 57(a)(iii)
8.	Special Areas (Licensed Warehouse / LW)	Inland Clearance Depot (ICD)	K8	Exemption Item 49
9.	Special Areas (Licensed Warehouse / LW)	Overseas / Place Outside Malaysia	K8	Exemption Item 56
10.	Special Areas (Licensed Warehouse / LW)	Malaysia / Principal Customs Area (PCA)	K1 / K9	Sales tax chargeable (Import) Section 57(b)

These provisions demonstrate that HS classification functions not only as an instrument for regulating cross-border trade but also as an operational tool for administering domestic movements that fall within the custom's regulatory perimeter (RMCD, 2018; RMCD, 2021). Consequently, inaccuracies in HS classification may result

in incorrect tax assessment and non-compliance risks, even where goods do not physically cross an international border (RMCD, 2021).

2.3 HS Misclassification in Customs Operations

HS misclassification is discussed in the literature as a recurring compliance and operational issue within customs declaration processes, occurring when goods are declared under tariff codes that do not accurately correspond to their characteristics, composition, or use. The attached studies consistently describe HS misclassification as a form of declaration error that may arise unintentionally through incorrect interpretation or insufficient information, as well as deliberately as a means of reducing duty or tax exposure (Kee & Nicita, 2022; Lowitt, 2019; Kappler, 2011).

Evidence drawn from audit and enforcement reviews indicates that tariff misclassification represents a significant proportion of customs non-compliance cases and contributes to revenue leakage and post-clearance recovery actions. Because HS codes are used as key inputs in customs risk assessment and targeting systems, incorrect classification also weakens inspection selectivity and undermines the effectiveness of compliance controls (WCO, 2023; Kee & Nicita, 2022; Lowitt, 2019; Kappler, 2011).

A prominent contributor to HS misclassification identified across the attached literature is the quality and completeness of product information available at the time of declaration. Studies note that commercial invoices and shipment descriptions are frequently prepared for transactional or commercial purposes rather than for regulatory classification, resulting in vague, generic, or incomplete descriptions that constrain

accurate HS determination (Yi & Moon, 2019; Blegen, 2023). In such cases, declarants may rely on assumptions, historical classifications, or residual headings, increasing the likelihood of misclassification.

Human knowledge and expertise are also repeatedly highlighted as critical factors influencing classification accuracy. The literature emphasizes that HS classification requires specialized tariff knowledge, familiarity with classification rules, and the ability to interpret technical product characteristics, yet declarants and intermediaries may not always possess sufficient depth of expertise, particularly when dealing with complex or novel products (Gupta et al., 2023). Under these conditions, classification decisions may shift from analytical rule-based reasoning toward heuristic judgement, increasing susceptibility to error (Gupta et al., 2023).

Organizational conditions further shape misclassification outcomes. Research focusing on operational efficiency and compliance identifies workload intensity, time pressure, and performance-driven workflows as factors that reduce the depth of review applied to complex decision tasks (Gupta et al., 2023). Within customs operations, these conditions may limit opportunities for verification, peer review, or escalation, thereby increasing the probability of HS misclassification (Prost & Scattolo, 2024).

The attached literature also identifies coordination and communication gaps between exporters, importers, and declarants as contributing factors. Where declarants depend on incomplete or second-hand product information and face constraints on follow-up clarification, classification accuracy is adversely affected, particularly in expedited clearance settings (Blegen, 2023).

Overall, the literature conceptualizes HS misclassification as a multifaceted operational phenomenon influenced by information quality, human expertise, and organizational arrangements (Anggoro et al., 2024). While these contributing factors are well documented in customs compliance and operational research, the attachments consistently note that direct empirical examination of HS classification decision-making processes in express customs clearance environments remains limited, highlighting a gap that warrants further investigation (Blegen, 2023; Gupta et al., 2023).

2.3.1 Example Previous Cases of HS Misclassification

Enforcement and audit records provide concrete illustrations of how HS misclassification manifests in practice across different jurisdictions. These documented cases demonstrate that misclassification may arise from both interpretative ambiguity and deliberate attempts to reduce duty liability.

Several cases reported by the World Customs Organization illustrate misclassification involving technical product characteristics and intended use. For example, imports of liquid crystal display (LCD) monitors into Slovenia and other European Union countries were incorrectly declared under HS heading 8531, attracting a zero-duty rate, instead of HS heading 8528, which carried a higher duty rate applicable to monitors (World Customs Organization [WCO], 2010). This case highlights the impact of incorrect functional interpretation on tariff classification outcomes.

Misclassification has also been observed in cases involving complex systems and composite goods. In Romania, instruments declared under HS subheading 9026.10.51.000

as flow-measuring devices were later found, following technical analysis and audit, to constitute complete systems for measuring the flow of petrol, comprising multiple integrated components. The goods were subsequently reclassified under HS subheading 9028.20.00.000, reflecting the application of the General Rules for Interpretation concerning completeness and essential character (WCO, 2010).

Other cases demonstrate misclassification motivated by duty rate changes. In Ireland, imported door facings were initially correctly classified under HS code 4411191000. Following the introduction of an additional staged duty under European Union regulations, the importer altered the declared HS code to avoid the higher rate. Subsequent laboratory analysis confirmed that the original classification was correct, indicating deliberate misclassification linked to tariff escalation rather than interpretative uncertainty (WCO, 2010).

Material composition has also been a source of misclassification. In Italy, imports of sheets declared as polytetrafluoroethylene (PTFE or Teflon) products under CN heading 7410210010 were investigated. Technical documentation revealed that the products did not contain PTFE but were instead composed of copper, epoxy resin, and glass fibers. The goods were reclassified under CN heading 7410210090, to which no duty suspension applied, demonstrating the importance of accurate material identification in HS classification (WCO, 2010).

Textile products represent another recurring area of misclassification. In Norway, clothing imported from China was declared under HS heading 5209 as woven cotton fabrics, attracting a zero-duty rate. Invoice scrutiny revealed that the goods were in fact

finished garments jackets and trousers classifiable under HS headings 6201 and 6203, which carried higher duty rates (WCO, 2010).

Figure 2.6

Tariff Classification Ambiguity Example: Ford Transit Connect Classified as Passenger Van or Cargo Van

More recent enforcement action in the United States illustrates deliberate misclassification at an industrial scale. In 2024, Ford Motor Company agreed to pay USD 365 million to settle allegations that it misclassified imported Transit Connect cargo vans as passenger vehicles to benefit from a lower duty rate (refer figure 2.6). The investigation found that the vehicles were presented with temporary seating solely for customs purposes, despite being intended for cargo use, allowing the company to avoid the higher duty applicable to cargo vehicles (U.S. Department of Justice [DOJ], 2024).

Collectively, these cases illustrate that HS misclassification arises through multiple mechanisms, including incorrect interpretation of product function, misidentification of material composition, incomplete application of interpretative rules, and deliberate tariff manipulation. They demonstrate how HS misclassification can occur across product categories and jurisdictions, reinforcing the importance of accurate classification and robust controls within customs operations.

2.4 Express Customs Clearance Environment

Express customs clearance is widely recognized as a specialized regime intended to support the rapid release of time-definite consignments within an integrated express delivery service model. In practice, express delivery providers manage an end-to-end, time-bound logistics chain from collection, handling, and transport to storage, customs clearance, duty payment, and final delivery meaning that customs processing is operationally embedded within the express value chain rather than treated as a separate downstream activity (Ishido

& Chang, 2022; Blegen, 2023). At the international level, World Trade Organization formalizes expedited shipment facilitation under the Trade Facilitation Agreement (TFA), which calls for simplified documentation, advance electronic information, and rapid release for express consignments, while maintaining appropriate customs control through risk management and compliance measures (WTO, 2017).

The TFA framing implies that express consignments are associated with high frequency and short delivery lead times, requiring customs administrations to balance facilitation objectives with regulatory oversight using selective inspection, risk-based controls, and post-clearance mechanisms rather than comprehensive examination of every shipment at the border (WTO, 2017; Vijayakumar, 2025). Consistent with this, case-based evidence indicates that express clearance systems rely heavily on automated risk selection, with most consignments released on the basis of declaration data and only a small proportion diverted for physical inspection (Chen, 2016). This operating model increases the system-wide sensitivity to the accuracy and completeness of information available at the point of declaration (Hillberry et al., 2021).

Within express clearance operations, responsibility for declaration accuracy including HS code assignment is frequently assumed by express operators or appointed agents acting as declarants on behalf of importers (Blegen, 2023). Because HS classification may be performed using limited commercial documentation and under compressed timeframes, practitioners may depend more heavily on prior patterns, heuristics, or system-supported cues to meet expedited release expectations (Yi & Moon, 2019; Blegen, 2023). Operational studies further note that express environments are often throughput- and performance-driven, where speed-oriented indicators can intensify the

tension between timely release and verification depth if not balanced with quality and compliance controls (Chen, 2016; Gupta et al., 2023). Taken together, the TFA and empirical literature depict express customs clearance as a high-volume, time-definite, data-reliant environment conditions that provide a critical foundation for examining how human, organizational, and technology factors interact to shape HS misclassification risk.

2.5 Human Factors in HS Classification

Human factors play a significant role in the accuracy of Harmonized System (HS) code classification, particularly in operational environments where classification decisions are made under time constraints and high workload conditions. Empirical studies consistently report that HS misclassification frequently arises from limitations in individual knowledge, cognitive processing capacity, and decision-making practices rather than solely from deficiencies in legal frameworks or tariff structures (Prachsarnpetch, 2009; Sahara et al., 2022).

2.5.1 Knowledge and Competency in HS Classification

Several studies identify insufficient technical knowledge of the HS nomenclature as a primary contributor to misclassification. Prachsarnpetch (2009) and Sahara et al (2022) documents that import goods classification errors often stem from a lack of detailed understanding of HS rules, chapter notes, and explanatory notes, particularly when goods exhibit multifunctional or composite characteristics (Lee et al., 2023). Similar findings are reported by Sahara et al. (2022), who attribute incorrect HS assignment in an import case

study to human error linked to limited familiarity with product specifications and classification principles.

Tariff classification also constitutes a legally interpretive task, particularly for products with multifunctional or ambiguous characteristics. Regulatory commentary from China indicates that multiple HS codes may plausibly apply to a single product, with classification outcomes contingent on the correct application of HS rules and relevant administrative or advance rulings (Hao, 2013; Bureau of Customs, n.d). The same analysis notes that reliance on non-specialist personnel for HS determination remains common in practice, thereby elevating misclassification risk. This observation reinforces the importance of sustained technical and legal competence in HS classification (Naujoke, 2023), especially in high-volume and time-constrained clearance environments.

From a policy and competency perspective, tariff classification is widely recognized as a foundational skill for customs practitioners in both the public and private sectors. The European Commission (2019) emphasizes that customs commodity codes form the basis of most customs controls, making a detailed understanding of HS classification an essential prerequisite for professional entry. However, the effort and cost associated with classification activities vary substantially depending on the scale of classification tasks, the volume of goods processed, and organizational risk appetite regarding misclassification. Importantly, perceptions of classification effort and cost differ between regulatory authorities administering controls and commercial actors seeking compliance. Many classification-related costs are inherently embedded in the time and cognitive effort required to become familiar with HS rules and their practical application,

which may discourage deep analytical classification in high-volume, time-constrained environments (European Commission, 2019).

Research focusing on declarants and customs brokers further indicates that HS classification knowledge is unevenly distributed across practitioners. Nelson (2021) reports that both importers and intermediaries frequently rely on prior declarations or commercial descriptions rather than conducting a systematic legal analysis of the HS structure, increasing the likelihood of repeated classification errors. This pattern is reinforced in express clearance environments, where non-specialist personnel may be tasked with declaration preparation to meet operational timelines (Yi & Moon, 2019).

2.5.2 Cognitive Load and Decision-Making Under Time Pressure

Human cognitive limitations are amplified in express customs clearance settings characterized by compressed processing times and high declaration volumes. Yi and Moon (2019) demonstrate that time pressure shifts classification behaviour away from analytical reasoning toward heuristic decision-making, such as keyword matching or reliance on precedent codes. Under such conditions, borderline or novel products are more likely to be assigned to incorrect headings when sufficient time is unavailable for detailed interpretation of HS rules.

Empirical evidence from express clearance studies shows that high throughput reduces the feasibility of physical inspections and in-depth verification, thereby increasing dependence on declarant-provided descriptions and automated aids (Yi & Moon, 2019). This reliance places greater cognitive demands on individual classifiers to interpret

incomplete or ambiguous information, heightening the risk of misclassification when mental workload exceeds individual processing capacity.

2.5.3 Human Error and Information Interpretation

Human error in HS classification is frequently linked to misinterpretation of product descriptions and insufficient communication between supply chain actors. Sahara et al. (2022) document that incorrect HS assignment resulted from inadequate exchange of technical product information between exporters and importers, leading declarants to rely on assumptions rather than verified specifications. Similar communication gaps are noted by Spichakova and Haav (2020), who observe that misclassification disputes often arise when declarants lack access to advance rulings or authoritative classification guidance.

Studies also highlight that commercial invoices and shipment descriptions are typically prepared for transactional purposes rather than regulatory compliance, resulting in vague or non-technical descriptions that complicate human interpretation during classification (Nelson, 2021). When such descriptions are processed under time pressure, the likelihood of classification errors increases, particularly for products requiring detailed material or functional analysis.

2.5.4 Training and Continuous Capacity Building

The literature consistently emphasizes the importance of continuous training and institutional support in mitigating human-related HS misclassification risks. However, ongoing professional competence cannot be assumed solely on the basis of entry-level

licensing or examination. Naujokė (2023) observes that in Lithuania, once the customs broker examination has been passed, there are no formal requirements for regular reassessment of knowledge or mandatory continuing professional development. In a regulatory and procedural environment that evolves continuously, this creates a risk of outdated classification knowledge, suggesting that licensing alone is insufficient to ensure sustained classification competence. Consequently, organizations must rely on internal competency-assurance mechanisms such as periodic assessments, refresher training, and structured knowledge-sharing practices rather than treating licensure as a proxy for ongoing expertise.

Grainger (2024) and Prachsarnpetch (2009) further argues that increasing product complexity necessitates continuous capacity building to enable classifiers to adapt to technological convergence and the emergence of new product categories. In the absence of regular training, practitioners may lack the confidence and technical depth required to apply HS rules consistently, particularly for hybrid or novel goods. These vulnerabilities are amplified in operational environments that prioritize speed and throughput, where formal classification expertise may be subordinated to operational efficiency (Nelson, 2021). Under such conditions, misclassification risk becomes embedded within organizational routines, transforming human error from an individual lapse into a systemic issue.

Beyond training provision alone, international guidance underscores the importance of formal mechanisms to ensure that customs brokers maintain current and verifiable knowledge over time. The World Customs Organization (2018) highlights those deficiencies in knowledge of customs procedures, documentation requirements, and the

Harmonized System contribute not only to classification errors but also to declaration delays, clearance backlogs, and inefficient use of customs resources. Accordingly, the WCO recommends that customs modernization initiatives incorporate structured capacity-building arrangements, including cooperation between Customs administrations, broker associations, and academic institutions, as well as the implementation of suitable assessment or verification systems to periodically test brokers' knowledge and support sustained compliance.

2.6 Organizational Factors in HS Misclassification

Organizational factors are widely identified in the literature as structural conditions that influence HS classification accuracy by shaping how classification tasks are assigned, prioritized, and controlled within customs and express clearance operations. Unlike individual human factors, organizational factors relate to institutional arrangements, workflow design, performance expectations, and governance mechanisms that affect classification practices at scale (Gupta et al., 2023).

2.6.1 Workload Allocation and Process Design

Several studies report that organizational workload allocation plays a critical role in HS misclassification. Express customs clearance operations are characterized by high declaration volumes processed within compressed timeframes, which limits the feasibility of detailed classification verification (Yi & Moon, 2019; Grainger, 2024). Under such conditions, organizations may distribute classification tasks across multiple roles or assign

them to staff with varying levels of expertise, increasing inconsistency in HS code application (Blegen, 2023).

Process design choices further influence classification outcomes. Gupta et al. (2023) note that workflows optimized for speed and throughput tend to reduce opportunities for escalation, peer review, or second-level verification. When classification is embedded within linear, time-sensitive workflows, errors may propagate across multiple declarations before detection, particularly where post-clearance audit mechanisms are weak or delayed.

2.6.2 Standard Operating Procedures and Internal Controls

The presence and quality of standard operating procedures (SOPs) are repeatedly identified as organizational determinants of classification accuracy. Studies indicate that unclear, outdated, or inconsistently applied SOPs limit the ability of declarants to follow a systematic approach to HS classification, especially in cases involving ambiguous or complex products (Wagner, 2023; Nelson, 2021). Where SOPs emphasize procedural completion rather than interpretative accuracy, classification decisions may prioritize speed over legal correctness.

Internal control mechanisms, such as supervisory review and quality assurance checks, are also discussed as mitigating factors. However, the literature reports that in high-throughput environments, such controls are often selectively applied or focused on high-risk shipments, leaving routine declarations subject to minimal oversight (Yi & Moon,

2019). This selective control approach increases the likelihood that misclassification remains undetected at the point of clearance.

2.6.3 Performance Metrics and Organizational Pressure

Performance measurement systems are repeatedly identified as a powerful organizational influence on HS classification behaviour because they shape what "good performance" means at the operational level. In time-critical clearance environments, organizational performance is frequently evaluated through speed- and volume-oriented indicators (e.g., clearance time, throughput, service-level compliance), which can create a structural tension between timeliness and analytical depth in compliance decisions (Chen, 2016; Morales-Fusco et al., 2016). While such KPIs are often justified as necessary for maintaining network fluidity and meeting customer delivery commitments, the literature cautions that strong emphasis on speed may unintentionally normalize "satisficing" behaviours such as minimizing verification steps, relying on incomplete descriptions, or avoiding escalation especially when shipment queues are volatile and staffing buffers are limited (Gupta et al., 2023; Grainger, 2024).

A key mechanism discussed across studies is the misalignment of time horizons between productivity KPIs and compliance consequences. When timeliness indicators are measured in real time, but classification accuracy is assessed retrospectively (e.g., audits, post-clearance findings), the immediate organizational feedback loop becomes weaker: classifiers experience direct, immediate consequences for delay, but delayed or uncertain consequences for misclassification (Gupta et al., 2023). This can shift local decision

priorities toward clearance continuity rather than evidentiary completeness, particularly where operational routines reward clearing backlogs and preventing “stuck” shipments (Chen, 2016). KPI frameworks in customs and logistics contexts therefore matter not only as measurement tools but as behavioural signals that can shape discretion at the point of declaration (Resnyanskaya, 2021; Cherkunov, 2025).

At the same time, the literature suggests important boundary conditions: speed–compliance trade-offs are more likely to intensify when timeliness metrics dominate without counterbalancing controls, whereas more balanced KPI designs where quality indicators are made visible, timely, and actionable can reduce the pressure to prioritize speed over correctness (Morales-Fusco et al., 2016; Gupta et al., 2023). Taken together, these studies imply that performance metrics do not merely “measure” clearance performance; they can actively structure incentives and attention in ways that increase or reduce HS misclassification risk depending on how speed targets, quality checks, and corrective governance are combined (Gupta et al., 2023; Resnyanskaya, 2021).

2.6.4 Training Structures and Knowledge Retention

Organizational training structures are identified as contributing factors to HS misclassification. While initial training may be provided to staff involved in customs declaration, several studies report limited emphasis on continuous skill development or advanced classification training in express environments (Nelson, 2021; Prachsarnpetch, 2009). High staff turnover and task rotation further constrain the accumulation and

retention of classification expertise within organizations, particularly where classification responsibilities are not clearly specialized.

Institutional evidence reinforces these observations. A study by the Japan International Cooperation Agency reports that customs officers are often expected to classify goods across the full range of HS chapters despite the breadth and complexity of the nomenclature, yet sufficient training to develop such comprehensive expertise is frequently lacking (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021). The study highlights that this gap contributes to inconsistent classification outcomes and increased reliance on individual interpretation rather than institutional standards.

Gupta et al. (2023) further observe that organizational reliance on informal knowledge transfer, such as peer guidance or historical case references, may perpetuate existing classification errors where formal corrective mechanisms are absent. In such contexts, misclassification becomes embedded within organizational routines rather than attributable to isolated individual mistakes. The JICA study similarly notes that without structured human resource development such as on-the-job training and progressive specialization classification competence develops unevenly, reinforcing systemic rather than incidental misclassification risks (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021).

2.6.5 Inter-Organizational Coordination and Information Flow

Organizational factors also extend beyond internal structures to include coordination between exporters, importers, brokers, and express operators. The literature documents that fragmented responsibility for product information and documentation contributes to misclassification risk, particularly where declarants lack direct access to detailed technical specifications (Sahara et al., 2022). When organizational boundaries restrict information flow, declarants may be required to make classification decisions based on incomplete or second-hand data.

Evidence from institutional assessments supports this finding. The JICA study reports that limited coordination between operational units and specialized item classification centers reduces opportunities for consultation when classification uncertainty arises, leading to inconsistent HS code application across officers and customs offices (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021). The study also notes private-sector concerns that classification outcomes may vary depending on the point of clearance, further indicating weaknesses in institutional information-sharing and coordination mechanisms.

Studies further note that limited use of advance rulings or authoritative classification guidance reflects organizational rather than individual constraints, including cost considerations, time pressures, and lack of awareness (Spichakova & Haav, 2020). These organizational choices influence how classification uncertainty is managed in practice. Consistent with this, the JICA study identifies the strengthening of advance ruling systems and institutional consultation mechanisms as organizational measures to reduce

reliance on ad hoc judgement and improve consistency in HS classification (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021).

2.7 Technological and System-Related Factors in HS Misclassification

The literature identifies technological systems and digital tools as influential factors in HS classification outcomes, particularly in express customs clearance environments where declarations are processed at scale. These systems shape how classification decisions are supported, standardized, and reviewed, but they do not operate independently of human judgement or organizational processes (Wagner, 2023, Gupta et al., 2023).

2.7.1 Automated Classification Support and Decision Aids

Several studies report the use of automated or semi-automated systems to support HS classification, including tariff lookup tools, system-suggested HS codes, and rule-based decision aids (Gupta et al., 2023). These tools are commonly positioned as facilitators of efficiency and consistency by providing classifiers with pre-populated options or recommendations based on historical declarations, keyword matching, or learned patterns (Gupta et al., 2023; Sasana et al., 2025). However, across the reviewed literature, automation is not framed as a substitute for classification judgement; rather, correct outcomes still depend on how users interpret product attributes, validate system outputs, and apply HS logic under operational constraints (Wagner, 2023).

A critical risk highlighted in the literature is error propagation through history-based suggestions. Where system recommendations are derived from prior declarations,

incorrect historical classifications can be repeated and scaled, particularly when operational time pressure increases reliance on “default” system outputs (Gupta et al., 2023). This becomes more consequential in express-like environments where documentation can be limited and the cost of delay is operationally salient, increasing the attractiveness of quick acceptance of suggested codes (Grainger, 2024; Gupta et al., 2023). In this sense, technology can amplify existing weaknesses: it can accelerate correct decisions when the underlying data and governance are strong, but it can also accelerate the repetition of incorrect patterns when corrective feedback and exception-handling are limited (Gupta et al., 2023; Wagner, 2023).

The literature also points to boundary conditions that shape whether decision aids improve or degrade accuracy. Decision support tends to perform better when it is paired with governance mechanisms that detect and correct errors (e.g., systematic feedback loops, curated reference data, structured escalation for ambiguous goods), and when users have sufficient competency to challenge system outputs rather than treat them as authoritative defaults (Gupta et al., 2023; Wagner, 2023). This aligns with comparative work on predictive approaches for HS coding, where algorithmic performance depends heavily on training data quality, product description richness, and the way outputs are integrated into real workflows (Spichakova & Haav, 2020; Sasana et al., 2025). Accordingly, automated aids should be understood as socio-technical components whose impact on HS misclassification depends on data quality, workflow design, and the organization’s capacity to support verification and learning (Gupta et al., 2023; Wagner, 2023).

2.7.2 Data Quality and System Dependence

Technological systems rely heavily on the quality and structure of input data. The literature reports that commercial invoices and shipment descriptions processed through customs IT systems are frequently incomplete or non-technical, limiting the effectiveness of automated classification support (Yi & Moon, 2019). When systems process ambiguous or generic descriptions, the resulting HS code suggestions may lack accuracy, requiring human intervention to interpret product characteristics.

Studies further indicate that in high-volume express environments, system dependence increases as a practical response to time pressure (Blegen, 2023). Under such conditions, declarants may rely more heavily on system outputs to meet processing deadlines, even when the information available is insufficient for confident classification. The literature does not suggest that systems cause misclassification independently, but rather that system reliance amplifies the effects of poor data quality (Yi & Moon, 2019).

2.7.3 System Integration and Workflow Constraints

Research examining express clearance workflows highlights that customs IT systems are often tightly integrated with operational processes optimized for speed and throughput (Chen, 2016). In such environments, technological systems prioritize rapid declaration processing and automated risk routing, leaving limited scope for iterative review or manual correction during initial clearance. This design characteristic constrains opportunities for classifiers to revisit or refine HS code decisions once declarations are submitted (Chen, 2016).

Gupta et al. (2023) observe that system-driven workflows may reduce the visibility of classification uncertainty by encouraging binary decision outputs rather than exploratory analysis. Where systems require a single HS code input to proceed, classification ambiguity may be resolved procedurally rather than analytically, particularly when escalation options are not embedded within the system design.

2.7.4 Limited Corrective Feedback and Learning Mechanisms

The literature also notes limitations in system-level feedback mechanisms related to HS classification accuracy. Studies report that misclassification is often detected post-clearance through audits or inspections, with limited integration of corrective outcomes into operational systems in real time (Gupta et al., 2023). As a result, technological systems may continue to suggest or accept incorrect HS codes until formal corrective actions are implemented.

Practitioner commentary further suggests that analytics and "decision intelligence" can complement post-clearance controls by identifying recurring misclassification patterns such as repeated incorrect HS coding associated with particular intermediaries or commodity profiles which may not be visible from reviewing single declarations in isolation (World Customs Organization, 2023). However, these benefits depend on whether audit outcomes and pattern signals are fed back into operational classification tools and guidance, rather than remaining siloed within separate assurance functions.

In addition to the challenge of limited feedback loops, practitioner literature highlights capacity constraints in post-clearance functions. Squirrell (2020) notes that post-

clearance audit teams may be under-resourced and argues that machine-learning analytics applied to recent declaration datasets can support risk targeting by flagging traders and commodity patterns associated with undervaluation and misclassification. This type of analytics-enabled targeting can help prioritize reviews where compliance impact is likely to be highest, potentially strengthening deterrence while also creating a clearer pathway for audit outcomes to inform future controls and learning.

Blegen (2023) further notes that in express clearance environments, post-clearance findings may not be systematically fed back into classification support tools due to operational separation between clearance and audit functions. This organizational separation limits the capacity of systems to function as learning tools for improving future classification accuracy.

2.7.5 System Use as an Organizational Choice

Importantly, the literature treats technological systems not as neutral artefacts but as organizational choices that reflect institutional priorities. Gupta et al. (2023) emphasize that system design, configuration, and enforcement of system use are shaped by organizational objectives, such as throughput and service-level performance. Consequently, technological factors interact closely with organizational and human factors rather than acting as independent determinants of HS misclassification.

Across the reviewed studies, technological systems are therefore described as enablers and amplifiers of existing practices rather than as primary causes of misclassification. Their influence on HS classification accuracy depends on how they are

integrated into workflows, the quality of data they process, and the extent to which organizations support corrective learning and human oversight (Gupta et al., 2023; Blegen, 2023).

2.8 Conceptual Framework

This study is guided by a socio-technical conceptual framework that positions HS misclassification risk as the outcome of interacting human, organizational, and technological conditions within express customs clearance operations. Rather than treating misclassification as an isolated individual error, the framework conceptualizes it as emerging from the interaction between (i) interpretative complexity and information ambiguity, (ii) human sensemaking and cognitive capacity, (iii) organizational workflow design and performance expectations, and (iv) technology-enabled decision support systems operating under time-critical conditions.

At the human level, classification behaviour is shaped by knowledge, experience, cognitive load, and interpretative judgement in applying the General Rules of Interpretation. At the organizational level, performance expectations (e.g., throughput targets, queue management, COA urgency), supervision practices, and training structures influence the availability of time and attention for verification. At the technological level, system prompts, historical entries, automation tools, and workflow integration shape how decisions are initiated, guided, and checked.

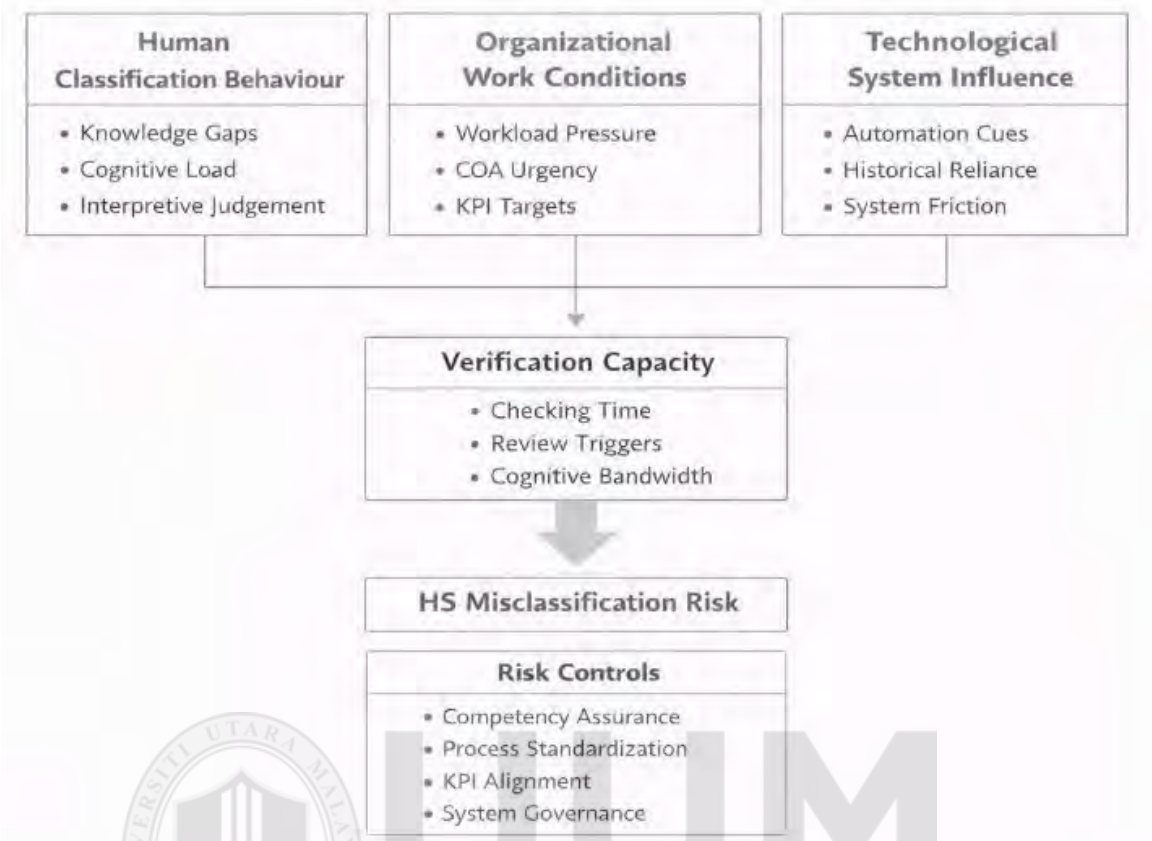

Figure 2.7

Socio-Technical Conceptual Framework of HS Misclassification Risk in Express Customs Clearance

The framework proposes that misclassification risk increases when verification capacity defined as the availability of time, procedural triggers, system support, and cognitive space to cross-check decisions is constrained by operational pressure, fragmented workflows, or over-reliance on system cues.

Conversely, risk is mitigated when organizational design, technological tools, and human expertise align to support structured verification. This conceptual framing informed the development of the research questions and interview protocol and guided the initial coding structure during thematic analysis. However, theme refinement remained grounded

in participants' accounts to ensure empirical sensitivity to the express customs clearance context.

2.9 Chapter Summary

This chapter reviewed the literature relevant to Harmonized System (HS) classification and misclassification within customs operations, with a particular focus on express customs clearance environments. It began by outlining the conceptual and operational foundations of HS classification, establishing its central role in customs administration, revenue collection, regulatory enforcement, and trade facilitation. The review then examined HS misclassification as a recurring compliance and operational issue, highlighting how misclassification arises through interpretative complexity, information limitations, and decision-making under operational constraints.

Illustrative enforcement cases were presented to demonstrate how HS misclassification manifests across different product categories and jurisdictions. These cases showed that misclassification may result from incorrect interpretation of product function or composition, incomplete application of interpretative rules, or deliberate responses to duty differentials. Together, they provided concrete context for understanding the practical implications of misclassification beyond abstract regulatory definitions.

The chapter further examined the express customs clearance environment as a distinct operational setting characterized by high shipment volumes, time-definite delivery commitments, simplified procedures, and performance-driven workflows. The literature reviewed indicates that these characteristics shape the conditions under which HS

classification decisions are made, increasing reliance on limited documentation, system support tools, and expedited decision-making processes.

Human factors were analyzed as a key dimension influencing HS classification accuracy. The literature identified knowledge limitations, experience dependence, time pressure, cognitive workload, and judgement variability as factors affecting how individuals interpret product information and apply HS rules. These human factors were shown to interact closely with organizational conditions rather than operating in isolation.

Organizational factors were then reviewed, including workload allocation, process design, standard operating procedures, performance metrics, training structures, specialization practices, and inter-organizational coordination. The literature demonstrated that organizational arrangements shape classification practices by influencing task prioritization, access to guidance, training opportunities, and information flow, thereby conditioning the likelihood of misclassification at scale.

Technological and system-related factors were also examined. The review showed that automated classification support tools, system-driven workflows, and data quality constraints influence HS classification outcomes by shaping how decisions are supported and constrained in practice. The literature emphasized that technological systems function as enablers or amplifiers of existing practices, with their impact dependent on data quality, system design, and organizational governance.

Finally, the chapter identified clear research gaps in the existing literature. While HS misclassification and its contributing factors have been widely discussed, there remains limited empirical understanding of how HS classification decisions are made in express

customs clearance environments. Notably, there is limited qualitative evidence explaining how classification judgements are formed and constrained at the point of declaration, where time-definite workflows and limited documentation are common, and where system-driven decision aids may influence reliance on historical patterns (Wagner, 2023).

In summary, this chapter suggests that HS misclassification risk in express customs clearance emerges from the interaction of three domains: human factors (knowledge depth, experience dependence, cognitive workload, judgement variability), organizational factors (workflow design, task prioritization, performance pressure, training and guidance structures, escalation norms, and feedback controls), and technological factors (automation support, system constraints, and data quality). The synthesis indicates that organizational pressure and workload volatility may compress verification, while technology may either support or amplify decision shortcuts depending on governance and data quality, thereby shaping the conditions under which misclassification becomes more likely (Wagner, 2023). This conceptual linkage provides a clear foundation for the research questions and supports the qualitative methodology and interview protocol described in the next chapter.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology employed in this study. It describes the research design and overall approach adopted to address the research questions, followed by the research setting and sampling strategy used to select participants who were directly involved in HS classification work within an express customs clearance environment. The chapter then presents the interview protocol and data collection procedures, including how interviews were conducted and documented. Finally, it explains the strategies used for data analysis and the steps taken to ensure trustworthiness and ethical conduct throughout the study. Consistent with the study's problem framing and literature review, the methodology was structured around a deductive, theory-informed qualitative logic, in which the inquiry was guided by established concepts and prior evidence on HS misclassification (human, organizational, and technological influences), while remaining open to context-specific insights that emerged during interviews.

3.2 Research Design

A research design serves as a roadmap that guides the systematic collection, analysis, and interpretation of data to address the research problem effectively (Asenahabi, 2019). This study adopted a qualitative research design, as the objective was not to test statistical hypotheses or produce statistically generalizable results, but to gain an in-depth

understanding of HS classification practices and misclassification risk within an express customs clearance context.

Qualitative research supports the development of concepts that explain social and organizational phenomena in natural settings, with attention to participants' meanings, experiences, and perspectives (Oranga & Matere, 2023). In line with this perspective, the present study examined HS misclassification through the accounts of practitioners directly involved in classification and clearance activities, rather than through experimental or survey-based methods. The goals of the investigation were understanding, description, and explanation of practice in context, which are commonly associated with qualitative inquiry (McKenna & Silbey, 2023).

Importantly, although the study used qualitative interviews and thematic analysis, its overall research logic was deductive (theory-informed) rather than purely inductive. The research problem and the research questions were specified in advance, and the interview protocol was organized to reflect theoretically and empirically established domains relevant to HS misclassification risk—namely human factors, organizational conditions, and technological systems—as synthesized in the literature review. Accordingly, the study sought to examine how known factors and mechanisms described in prior literature manifested within a real-world express clearance environment, and how participants interpreted their influence on classification behaviour and misclassification risk. At the same time, the analysis remained sufficiently flexible to capture unexpected operational details and context-specific explanations introduced by participants during interviews.

3.3 Research Setting

The study was conducted within the express customs clearance operations of DHL Express. DHL Express operates under a time-definite express clearance model, where import and export declarations are processed at high volume and under strict service-level requirements.

This organizational setting provides a relevant and bounded context for examining HS misclassification, as classification decisions are made under operational conditions characterized by limited documentation, compressed timelines, and performance-driven workflows. Studying HS classification within this natural setting is consistent with the qualitative emphasis on understanding practices as they occur in real operational environments (Gondimalla et al., 2024).

3.4 Sampling Strategy and Participant Selection

This study employs purposive convenience sampling, a form of non-probability sampling that combines purposive selection with accessibility considerations. Purposive sampling enables the researcher to deliberately select participants who possess direct experience relevant to the research questions, ensuring the inclusion of information-rich participant capable of providing detailed and meaningful insights (Memon et al., 2024).

Participants were selected based on predefined criteria determined by the researcher, namely direct involvement in HS classification, express customs clearance processing, or supervisory oversight of classification activities. Convenience sampling was

applied because participants were accessible within the organizational setting, allowing data collection to be conducted efficiently (Gönüldaş et al., 2023). While this approach may introduce sampling bias and limits statistical generalizability, it is appropriate for qualitative research that prioritizes depth and contextual understanding over representativeness.

A total of six (6) participants were interviewed in the study:

- One (1) Clearance Supervisor.
- One (1) Gateway Customer Service Agent (with prior experience as a Classification Agent).
- Three (3) Import Classification Agents, also known as classifier.
- One (1) Export Classification Agent, also known as classifier.

The sample size was guided by the principle of data saturation, defined as the point at which additional interviews no longer generate substantively new insights relevant to the study aims (Squire et al., 2024). Saturation was assessed in a structured and iterative manner, aligned with the semi-structured interview protocol described in Section 3.7. Specifically, the interview protocol ensured consistent coverage of core topics (e.g., decision steps, verification practices, operational constraints, escalation behaviours, and sources of misclassification risk), while allowing probing where participants introduced new details. After each interview, the transcript was reviewed, and preliminary coding notes were updated to identify whether new codes or themes were emerging. By Interview 5, the main themes were recurring across roles, and Interview 6 primarily reinforced and elaborated existing themes rather than introducing new thematic categories. On this basis,

six interviews were considered sufficient to provide rich, in-depth data while remaining feasible within the study's time and resource constraints.

3.5 Data Collection Methods

Data were collected through semi-structured interviews, which allow flexibility while ensuring that key topics relevant to the research questions are addressed consistently across participants. Semi-structured interviews are particularly suitable for qualitative research because they enable participants to articulate their experiences, challenges, and perspectives in their own words, facilitating deeper understanding of complex operational processes (Lorraine, 2023).

Each interview lasted approximately one hour, allowing sufficient time for participants to reflect on HS classification practices, decision-making challenges, and organizational influences. Interviews were conducted individually to encourage openness and reduce the influence of group dynamics.

All interviews were audio-recorded with participants' consent and subsequently transcribed verbatim. Verbatim transcription involves converting spoken language into written text exactly as it was expressed, preserving wording and emphasis, which is essential for rigorous qualitative analysis and accurate interpretation (Taherdoost, 2021).

3.6. Data Analysis (Thematic Analysis)

The study employed manual thematic analysis, without the use of qualitative data analysis software. The data collected were analyzed using thematic analysis, a qualitative research technique that was appropriate for identifying, analyzing, and reporting patterns (themes) within qualitative data. The transcribed interviews were systematically reviewed to draw out common concepts and shared understandings based on the research questions. Although themes were developed from participants' accounts, the analysis was conducted within a deductive, theory-informed orientation, guided by the study's pre-specified research questions and literature-informed analytical domains (Human–Organizational–Technology). Accordingly, initial coding and theme development focused on examining how established factors described in the literature manifested in the express customs clearance setting, while remaining open to additional context-specific insights that extended or refined the initial framing. To ensure analytic structure and transparency, the analysis followed Braun and Clarke's six-step thematic analysis procedure (Braun & Clarke, 2006), expressed below as a sequential workflow.

Firstly, the researcher familiarized themselves with the dataset through repeated reading and re-reading of interview transcripts to gain a comprehensive understanding of participants' accounts. During this stage of immersion, initial insights, notable statements, and potential patterns were recorded through brief annotations and analytic memos to strengthen sensitivity to meaning and context (Naeem et al., 2023).

Subsequently, initial codes were generated systematically across the dataset. Initial codes were assigned to segments of text representing specific ideas, issues, or experiences related to HS classification. Coding involved identifying and naming relevant aspects of

the data that were significant to the research questions, ensuring that the analysis remained grounded in participants' responses (Naeem et al., 2023).

Thirdly, the researcher examined relationships among codes and collated them into candidate themes. This involved comparing codes across participants and grouping conceptually related codes into broader themes that represented recurring patterns of meaning linked directly to the objectives of the study. A code represented a specific label assigned to a unit of data, whereas a theme captured a recurring pattern clustered around a central organizing concept across the dataset. This distinction supported systematic comparison across participants and enhanced analytic clarity (Naeem et al., 2023).

Thereafter, candidate themes were reviewed and refined to ensure they accurately represented both the coded extracts and the dataset as a whole. Themes were evaluated for internal coherence and clear distinction from one another. Where necessary, themes were merged, broken down into sub-themes, or discarded if they lacked sufficient supporting evidence (Braun & Clarke, 2021).

Fifthly, themes were defined and named to capture their essence in a concise and meaningful way. This involved clarifying the scope and focus of each theme and identifying the "story" each theme talked about the data, thereby strengthening the structure for presenting findings in Chapter 4 (Naeem et al., 2023).

Finally, the themes were integrated into a coherent analytic narrative that answered the research questions and linked the findings to the literature reviewed in Chapter 2 and the objectives outlined in Chapter 1. The narrative was supported by direct quotations from

the interviews to demonstrate how conclusions were grounded in participants' accounts and to preserve authenticity (Naeem et al., 2023).

Overall, the analysis followed a deductive, theory-informed thematic approach, where initial coding was guided by the research questions and the study's conceptual framework (Human–Organizational–Technology domains). At the same time, the analysis remained flexible: theme boundaries and sub-themes were refined through close engagement with the data to capture unanticipated patterns within (and where necessary beyond) the initial coding structure. Throughout the analytic process, attention was paid to preserving participants' intended meanings and grounding claims in the data through illustrative extracts (Braun & Clarke, 2006).

3.7 Interview Protocol

This study employed a semi-structured interview protocol to elicit participants' experiences and interpretations of HS code classification work in an express customs clearance environment. The protocol was designed to ensure consistent coverage of the study's research questions across participants, while still allowing flexibility for probing and follow-up questions to clarify decision-making processes, operational work conditions, and sources of misclassification risk. This format enabled participants to describe their practices in their own terms and to elaborate on experiences, perspectives, and suggestions relevant to the research objectives.

The interview guide was organized into structured question clusters to promote systematic coverage. Interviews began with brief background questions to contextualize

each participant's role, responsibilities, and scope of work. The discussion then progressed to questions on training and knowledge development, workflow steps and system use, information availability and verification practices, cognitive workload and time pressure, and organizational expectations, including time-definite performance targets such as cleared-on-arrival (COA) requirements. Participants were also asked to describe how they make sense of classification ambiguity, including how they interpret incomplete descriptions, resolve uncertainty, and decide when to escalate or seek confirmation. The protocol included reflective prompts on misclassification episodes (e.g., circumstances, contributing factors, and downstream impacts), and concluded with improvement-oriented questions to inform practical recommendations.

All interviews were conducted using the same protocol (Table 3.1) to support comparability across participants. With participants' consent, interviews were audio-recorded and later transcribed for analysis. Participants were reminded that participation was voluntary, that they could decline to answer any question, and that they could stop the interview at any time without consequence. Throughout the interviews, non-leading probes (e.g., "Can you walk me through what happened?", "What information did you rely on?", "What made that difficult?", "What would you do differently?") were used as needed to elicit concrete examples, clarify meanings, and improve the completeness of accounts while avoiding the introduction of assumptions. This structured-yet-flexible protocol supported both depth and consistency in the data collected for thematic analysis.

Table 3.1

Interview protocol: Semi-structured interview questions (Human–Organizational–Technological domains)

Domain	Interview questions	Optional probes / notes
Section A: Participant Background	1. Can you describe your current role in customs clearance or HS classification? 2. How long have you been involved in HS code checking or declaration work? 3. What types of shipments do you typically handle (e.g., small parcels, commercial shipments, controlled items, regulatory goods)? 4. How does your daily workload look (volume, peak hours, complexity)?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.
HUM (Human) – Section B: Knowledge, Training, and Competence	1. How were you trained to classify HS codes when you first started? 2. What references or learning sources do you rely on the most (e.g., Customs Duties Order, internal database, CoOs, past shipments)? 3. In your view, is the current training sufficient to ensure correct HS classification? Why or why not? 4. Which part of the HS structure is the most difficult for you to understand (chapter, heading, subheading, legal notes)? 5. How confident do you feel about your own classification skills today?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.
TECH (Technology)– Section C: Process and System Interaction	1. Could you walk me through your typical workflow when assigning an HS code from start to finish?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent

	2. What digital tools or systems do you use, and how do they affect your speed and accuracy? 3. Are there design or system features that you feel contribute to mistakes (e.g., dropdown lists, too many shipment lines, vague descriptions)? 4. Do the systems you use feel compatible with your work style or do they slow you down? 5. What part of the system workflow requires the most mental effort?	case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.
HUM (Human)– Section D: Cognitive Factors (Mental Workload and Human Error Patterns)	1. When you classify under time pressure, what types of mistakes become more likely? 2. What types of shipments require the most thinking or analysis for you, and why? 3. Do you usually double-check your HS codes? When do you skip double-checking? 4. Have you ever felt mentally overloaded during classification? What caused it? 5. How do you manage mental fatigue when dealing with high volumes of shipments?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.
ORG (Organizational)– Section E: Organizational Influence and Workplace Pressure	1. Are there performance KPIs (e.g., COA, inspection targets) that influence how fast you classify? 2. Do you feel pressure to clear shipments quickly, and does this affect your accuracy? 3. How does management support (supervisor guidance, peer review, escalation	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.

	channels) influence your confidence in HS classification? 4. Do you feel your team has sufficient manpower and expertise for accurate classification? 5. How does the organization handle errors corrective? punitive? supportive?	
HUM (Human) – Section F: Ambiguity, Interpretation, and Sensemaking	1. What types of goods are most ambiguous or difficult to classify? 2. How do you resolve HS debates (asking colleagues, referencing past records, interpreting legal notes, guessing)? 3. How often do you receive insufficient or unclear descriptions from shippers? 4. When information is incomplete, how do you decide on a classification? 5. Are there cases where rules between chapters overlap or conflict?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.
Mixture or Cross-domain (HUM/ORG/TECH) – Section G: Error Reflection (Human Error Theory)	1. Can you recall a specific example of HS misclassification? What caused it? 2. When a misclassification is discovered, how is it normally handled? 3. Do you receive feedback or coaching after errors? 4. What personal factors do you believe contribute most to misclassifications (fatigue, assumptions, time pressure, unclear SOPs)?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.

	5. What organizational or system factors contribute to misclassification?	
Mixture or Cross-domain (HUM/ORG/TECH)– Section H: Improvement and Recommendations	1. If you could redesign the HS classification process, what would you change? 2. What support, tools, or technologies would help reduce HS misclassification? 3. What advice would you give to new staff to avoid classification errors? 4. What improvement do you want to see from management or system developers? 5. In your opinion, what is the single biggest cause of misclassification in express clearance?	Use neutral prompts (e.g., "Can you elaborate?" "What information did you rely on?" "Can you describe a recent case?") and clarify terms (e.g., HS chapter/heading/subheading, internal systems, COA expectations) when needed.

Note. The interviewer may adapt wording to match participant role (e.g., import/export classification, customer query, supervisory review) while keeping the intent of each question consistent.

3.8 Trustworthiness and Rigor

Ensuring rigor in qualitative research requires attention to credibility, dependability, and confirmability. Triangulation was applied conceptually by comparing perspectives across participants occupying different operational and supervisory roles. Triangulation strengthens qualitative findings by reducing reliance on a single viewpoint and supporting interpretations through converging evidence (Sciberras & Dingli, 2023).

Credibility was supported through data-source triangulation by interviewing participants from different functional roles (Sciberras & Dingli, 2023) within express customs clearance (import classification, export classification, supervisory oversight, and

gateway customer service/CQ) and comparing their accounts for convergence and divergence on HS misclassification risks. This role-based comparison helped distinguish issues consistently reported across roles from those that were role-specific (e.g., downstream visibility in CQ versus throughput focus on classification). As the study relied on a single primary method (semi-structured interviews) and a single analyst, triangulation is interpreted here as triangulation of perspectives rather than methodological or investigator triangulation.

The semi-structured interview guide further supported rigor by standardizing coverage across research questions while allowing role-specific probing, thereby strengthening credibility and dependability through consistent topic coverage and comparable questioning across participants. To strengthen coding trustworthiness in a manual, single-analyst process, the researcher followed a structured thematic analysis workflow and maintained an audit trail through analytic memos and documented notes capturing key coding and theme-development decisions (e.g., how overlapping codes were resolved and why themes were refined). Consistency was further supported through a code–recode stability check, whereby selected transcripts were revisited after a time gap and earlier coding was compared with later interpretations; where differences emerged, coding logic was clarified, and earlier coded segments were rechecked for alignment. In addition, peer debriefing sessions were conducted with supervisor, in which anonymized extracts, emerging codes, and candidate themes were reviewed to challenge interpretations, clarify code boundaries, and strengthen the coherence and distinctiveness of the final thematic structure.

Dependability was supported by documenting the sequence of analytic steps and refinements so that the progression from raw data to themes remained traceable. Confirmability was strengthened through reflexive note-taking that recorded the rationale for interpretations and helped ensure that conclusions were grounded in participants' accounts rather than researcher assumptions.

3.9 Ethical Considerations

Ethical principles were upheld throughout the research process in line with standard qualitative research practice. Participation was strictly voluntary, and potential participants were provided with clear information about the study's purpose, procedures, and expected time commitment prior to the interviews. They were also informed of their right to decline to answer any question and to withdraw from the study at any point without penalty (Laryeafio & Ogbewe, 2023).

Confidentiality was safeguarded by anonymizing participant identities and work roles in all transcripts, notes, and reported findings, with any potentially identifying details removed or generalized. Obtaining informed consent is a fundamental ethical obligation in research, ensuring that participants voluntarily take part with a clear understanding of their role (Hieu & Thảo, 2024).

In addition, interview data were handled securely and accessed only by the researcher for analysis and reporting purposes. Data collected were used solely for academic purposes. Organizational sensitivity was respected by avoiding disclosure of

proprietary information or operational details that could identify individuals or compromise organizational integrity.

3.10 Chapter Summary

This chapter described the qualitative methodology adopted to explore human and organizational factors contributing to HS misclassification in express customs clearance. The research design, sampling strategy, data collection method, and data analysis approach were selected to support in-depth understanding of classification practices within their natural operational context. These methodological choices provide a foundation for the presentation and interpretation of findings in the following chapter.

CHAPTER 4: FINDINGS AND ANALYSIS

4.1 Introduction

This chapter presents the study's findings from the semi-structured interviews and reports how participants described HS classification work and the sources of misclassification risk in an express customs clearance environment. To strengthen clarity and ensure alignment with the study aims, the findings are organized in the sequence of the research questions. Each main section corresponds to one research question and synthesizes participants' accounts into themes and sub-themes that directly address the focus of that question.

For reader guidance, each subsection begins with a brief *interview question focus* statement to indicate the prompt area that the findings respond to. Participant quotations are presented as supporting evidence and are followed by interpretive explanation that links the reported experience back to the relevant research question. This structure is intended to provide a clear audit trail from interview prompts to participant evidence and, ultimately, to the answers for research questions. Consistent with qualitative reporting norms, direct quotations are included to preserve meaning and provide transparency, while broader interpretation and theory linkage are reserved for Chapter 5.

4.2 Participant Background and Operational Context

Participants represented operational roles across import classification, export classification, supervisory oversight, and a former import classifier (currently a Gateway

Customer Service Agent; GTW CSA). Experience ranged from approximately 6 years total experience (across roles) to 13 years in export classification, indicating a sample with varied exposure to operational cycles, shipment complexity, and downstream issue handling. This variation matters because it shapes how participants describe misclassification risks: for example, those with GTW CSA experience described deeper visibility into documentation gaps and post-classification consequences, whereas "pure classifier" work was described as more throughput oriented.

Table 4.1

Participants' Years of Experience and Roles

Participant	Years of experience	Role / position
P1	6	Former Import Classifier
P2	9	Import Classifier
P3	7	Import Classifier
P4	8	Import Classifier
P5	13	Export Classifier
P6	7	Clearance Supervisor

4.3 Cross-cutting overview of misclassification conditions in express customs clearance

This section provides a cross-cutting synthesis of the conditions that participants described as elevating HS misclassification risk in an express-clearance setting. It functions as an integrative bridge to the RQ-specific sections by summarizing patterns that cut across roles and workflow positions (classification, supervisory oversight, and downstream/customer-query functions). Across interviews, five interrelated clusters emerged: (i) operational

tempo, workload intensity, and COA-driven urgency; (ii) information quality constraints in shipment documentation; (iii) system/tooling design and workflow friction; (iv) uneven capability and knowledge depth across staff; and (v) how misclassification becomes visible through downstream detection, escalation, and feedback mechanisms.

To strengthen internal triangulation, the analysis notes where accounts converge across roles (e.g., workload pressure compressing verification time) and where they diverge by role (e.g., classifiers emphasizing speed/queue completion while downstream teams emphasize visibility through queries, disputes, or post-error review). The subsequent sections then elaborate these clusters in relation to the study's revised RQs: human factors (Section 4.4), organizational/operational factors shaping verification discipline (Section 4.5), and technology/tools shaping classification behaviour under operational pressure (Section 4.6), followed by improvement recommendations (Section 4.7). Evidence is supported by direct quotations (P1–P6).

4.4 RQ1: Human factors shaping HS classification and misclassification risk

This section addresses RQ1 by explaining how participants' knowledge, skills, and sensemaking shape HS classification decisions in express customs clearance. Each subsection begins with an Interview question focus to show how the evidence links directly to RQ1. Participant quotes are presented as supporting evidence for the interpretations.

4.4.1 Informal learning pathways and self-directed capability development

Interview question focus: *How did you learn HS classification work, and what kind of training/onboarding supports your knowledge and skills?*

Participants described HS capability as something that is often developed through day-to-day exposure rather than fully structured instruction. Several accounts framed "training" as a continuing need, implying that informal learning alone may not be sufficient to build consistent HS reasoning skills across staff especially for unfamiliar commodities and exceptions.

"*It's not enough. It's more like… you have to self-motivate to learn this… it's not enough. It's not enough. I strongly disagree, because this isn't something you can treat it lightly*." (P1)

"*For me, it's a bit lacking (proper/formal training). You're the one who has to learn it yourself… it's not enough*." (P2)

"*…There needs to be proper or formal training*." (P6)

These reflections suggest that when HS learning is highly self-driven, capability may vary by individual initiative and exposure, which can increase inconsistency in judgement when classifications require deeper interpretation.

4.4.2 Knowledge sources, reference habits, and verification behaviours

Interview question focus: *What references/tools do you use when deciding HS codes, and how do you verify uncertain classifications?*

Participants described sensemaking as a reference-led process, combining internal aids, online search, and official tools often followed by a verification step when uncertainty remains. This indicates that classification is not only "knowing a code," but also knowing how to justify and confirm it using reliable anchors.

"*I look at that JKDM Excel (file)*." (P1)
"*Mostly Google*." (P3)
"*JKDM HS Explorer… all export classifiers use it*." (P5)
"*AI (Gemini) gives an overview… then I go into JKDM (HS Explorer) to double-check*." (P5)

The verification theme also appeared as advice and operating logic participants cautioned against accepting external inputs without cross-checking.

"*Do not rely on others blindly; double-check first*." (P4)
"*We still have to double-check. Sometimes the HS code given by the customer isn't correct*." (P5)

Together, these accounts show that human judgement in HS classification is strongly shaped by reference selection, search behaviour, and verification discipline.

4.4.3 Competence confidence and perceived sufficiency of current training

Interview question focus: *Do you feel your current training/experience is sufficient, and what situations challenge your confidence?*

Participants' views on "sufficiency" were mixed, but many statements emphasized that confidence depends on whether work is routine vs. complex, and whether classifiers must defend a decision under dispute/audit-like conditions. This supports the interpretation that competence is not only speed-based familiarity, but also interpretive depth and reasoning under ambiguity.

"*I think there needs to be other training as well*." (P4)

"*Not enough*." (P1, P2 & P6)

The chapter's narrative also explains that what feels "adequate" for repetitive classification may not be adequate for dispute/exemption contexts that require stronger justification.

4.4.4 Sensemaking under workload strain: cognitive load, fatigue, and attention slips

Interview question focus: When do you feel mentally overloaded, and how do fatigue or pressure affect your classification judgement?

Participants linked decision quality to cognitive conditions such as urgency, multiline complexity, and shift fatigue. These accounts show a human-factor pathway where sensemaking becomes harder when classifiers must interpret multiple item lines quickly, increasing the risk of attention slips or incomplete checking.

"*…When the workload is heavy, and then there are shipments marked as urgent, and there are multiple line charges… many items… that's what makes us more stressed… it can lead to many mistakes …*" (P1)

"*Mentally, we're exhausted during shifts. Because we have to rotate (change shifts)*." (P3)

Error reflection responses also highlighted fatigue and time pressure as personal contributors to misclassification, while others emphasized assumptions (addressed in 4.4.5).

4.4.5 Precision-stage difficulty: later digits, assumptions, and "guessing" under unclear details

Interview question focus: Which HS decision points are most difficult (e.g., subheading/national digits), and what happens when item information is unclear?

Participants indicated that difficulty often increases at the more specific HS levels, where small product differences matter. In addition, when item descriptions are unclear, participants described a tendency to rely on assumptions, which directly reflects sensemaking under uncertainty.

The challenging part is often refining the later digits rather than identifying broad categories. A concrete example also pointed to errors occurring "at the back part" (national level).

"*Wrong at the back part (the national level)*." (P2)

Participants explicitly named "assumption" as a key personal factor especially when descriptions are unclear.

"*That's assumption number one. An assumption*." (P1, P4 & P6)

"*(Item) The description isn't clear… then it becomes our assumption. We just use assumptions to estimate*." (P4)

These accounts show that human-factor risk is highest when (i) later-digit precision is required and (ii) product information is incomplete pushing classifiers toward faster sensemaking strategies (search, inference, or assumptions) that may not reliably match HS legal/technical distinctions.

4.4.6 Human capability variability (training depth, HS complexity)

Interview question focus: How were staff trained initially? Is training sufficient? Which HS structure elements are hardest (chapter/heading/subheading/national digits), and how confident are staff?

Participants described onboarding as largely dependent on buddy sessions, with multiple statements indicating limited or absent formal training at entry.

"*Ah, just one buddy session…" / "No. There was never any proper or formal training*." (P1)

"…y*ou do the work while asking questions… there isn't a full buddy (system)… not completely*." (P4)

On training sufficiency, most participants expressed that training is not enough, often shifting responsibility to self-learning and motivation creating uneven capability across individuals and shifts.

"*Not enough… it's more about self-motivation… not enough… I don't agree…*" (P1)

"*For me, it's lacking… you're the one who has to do it yourself… it's not enough*." (P2)

Capability variability was also reflected in what staff find "hard" in HS structure. Several participants emphasized difficulty at subheading/national-digit levels (where duty/SST differences are determined), while others noted that wrong chapter selection leads to entirely different item categories.

"*…The subheading part is a bit difficult… the last four digits are the ones that determine the duty and SST*." (P1)

"*"It's the last four digits that are confusing…*" (P3)

"*Chapter… the first two digits*." (P5)

Participants also varied in self-reported confidence, reinforcing that misclassification risk is partly shaped by uneven confidence/competence under speed constraints.

4.5 RQ2: Organizational processes and practices contributing to HS misclassification.

This section answers RQ2 by examining how the organization structures HS classification work, standardizes (or fails to standardize) procedures, allocates resources and supervision, and responds to errors through control and feedback mechanisms. Across interviews,

participants described how workflow segmentation, verification routines, staffing adequacy, and learning controls shape the conditions under which misclassification occurs.

4.5.1 Work segmentation and workflow design

Interview question focus: How is HS classification work organized across roles/steps, and how does that workflow design shape misclassification risk?

Participants described classification as a structured workflow with defined steps and performance expectations. One participant explicitly framed the workflow as a required "seven-steps" process that must be followed, showing that classification decisions are not purely individual acts but are embedded within a standardized operational flow:

> "*"Okay, for classification we have… a seven-step KPI. A seven-step declaration process that we have to follow*." (P1, P2 & P4)

At the same time, participants' broader descriptions of the clearance environment indicate that work is segmented across tasks and teams, and that speed and volume constraints can create friction between "doing the steps" and "getting the queue done." In practice, this segmentation can increase handoff dependency and reduce time available for deeper verification especially when upstream information is incomplete or when cases are complex (as reflected in participants' calls for workflow redesign and system support).

4.5.2 Operational tempo, workload, and KPI/COA pressure

Interview question focus: How does daily workload look (volume/peaks/complexity)? Do COA and other KPIs influence speed, and does speed pressure affect accuracy?

Participants consistently linked high throughput expectations and queue volatility to reduced checking discipline and increased "overlook" risk. Import-side targets were described as rising over time (e.g., 120 → 150 → 180 shipments/day per person), while peaks were intensified by disruptions such as flight delays and missing imaging, which push "yesterday's queue" into the current day.

"*…If there's a flight delay, the workload increases… for example, from 500 it becomes 700 or 800… and that's not even counting paperwork issues, like missing imaging*." (P1)

Resource constraints amplified this pressure. One participant described the combination of limited manpower with high targets as a structural driver of rushed decisions.

"*Because right now manpower isn't sufficient, but our targets are high*." (P3)

COA was explicitly recognized as the dominant KPI, and several accounts described how speed expectations can produce overlook behavior especially during peak AP-CN flows or time-sensitive surges.

"*…Pressure is really pressure… sometimes when we want to be fast, it can cause things to be overlook*." (P1)

Participants linked misclassification risk to a work environment shaped by strong queue-completion expectations and the need to avoid carry-over, particularly when targets rise or workload accumulates. This pressure was described as urgency to finish within the shift, with spillover consequences if queues remain:

"*We're under pressure to complete it. If we don't finish, we get pushed, like what happened yesterday*." (P3).

Participants also described an explicit speed–quality trade-off during peaks:

"*When our volume is high, our quality drops*." (P1, P4 & P5).

These accounts suggest that COA/throughput urgency operates less as a direct "cause" of error and more as an organizational condition that compresses verification time, increases reliance on quick judgement, and heightens vulnerability during peak periods especially when system defaults or suggestions are accepted with reduced checking (see Section 4.6). Operational pressure was also described as extending beyond shifts (particularly on the export side), suggesting fatigue accumulation and time scarcity as contributors to error.

"*We really have to continue the work at home… there just isn't enough time*." (P1 & P5)

Participants implied that some errors become visible only after downstream triggers for example, write-off risk when volumes rise and full checking becomes impractical, or when

later teams/customers challenge the declaration. A participant noted that increased targets reduce the ability to "check all shipments," raising write-off risk.

"*Now it's become 180… the risk of write-offs is high… trying to check all those shipments, it's just not possible (there's no time).*" (P1, P3 & P4)

4.5.3 SOP presence/absence and verification discipline

Interview question focus: What procedures or verification habits guide classification, and how does the organization reinforce (or weaken) checking behavior?

Participants pointed to the importance of disciplined verification rather than relying on informal trust or shortcuts. One participant advised new staff not to blindly follow others and to cross-check before confirming an HS decision.

"*Do not rely on others blindly; always double-check first*." (P4)

"*Always double check first*." (P2)

Another participant referred directly to a step-based process expectation:

"*(DHL) 7 steps lah*." (P1)

Participants also noted a process shift away from simply following shipper-provided HS codes toward requiring double-checking, suggesting that earlier reliance on shipper HS could have been a hidden error pathway that is only caught later.

"*Before, we just followed the HS code on the invoice. But now, we must double-check*."

(P4)

However, participants also implied that standardization is not always sufficiently "formalized" in the way work is executed day-to-day. This was captured in a direct call for clearer process documentation:

"We must have a written process." (P6)

Taken together, these accounts suggest that misclassification risk can increase when verification discipline becomes inconsistent across staff/shifts, or when process expectations exist but are not reinforced through sufficiently clear, shared, and written guidance.

4.5.4 Staffing/resources and supervision controls

Interview question focus: How do resourcing levels, staffing decisions, and supervisory controls shape classification conditions and error risk?

Participants linked resourcing constraints to quality risk. One participant stated plainly that insufficient staffing affects outcomes:

"*If there's a shortage of staff, it will have an effect*…" (P5)

Improvement suggestions repeatedly returned to staffing increases:

"*Increase manpower*." (P1, P4 & P5)

"*Increase workman (headcount)*." (P6)

Participants also connected managerial controls to capability inputs suggesting that supervision is not only about monitoring output, but also about controlling who is allowed to do the work and with what baseline preparation. For example, one participant recommended hiring with prior exposure and requiring formal course attendance as a baseline condition:

"*In terms of hiring, make sure new staff have experience… and require them to have attended KEK (the Customs Agent Course)*." (P6)

These statements imply that staffing adequacy and supervisory "input controls" (hiring criteria, baseline qualifications) are perceived as organizational levers that can reduce variability in classification quality.

4.5.5 Post-error learning mechanisms as organizational control and feedback

Interview question focus: When misclassification happens, what feedback or corrective mechanisms are used, and how consistent are they?

Within the findings structure, organizational responses to errors were framed as corrective and learning controls (e.g., coaching and performance follow-up mechanisms).

A participant's comment also indicates that feedback discussions may vary depending on the supervisor, which can lead to uneven learning and inconsistent reinforcement:

"*In every PD (performance dialogue), the supervisor's discussion topic sometimes differs*." (P1)

When misclassification is detected, participants reported that feedback is typically provided through coaching and performance management mechanisms (e.g., PIP), indicating that post-error correction is formalized as part of organizational learning and control.

"*Coaching, PIP… (All)" / "Yes.*" (All participants)

This suggests that even when post-error feedback exists, misclassification risk may persist if learning loops are not consistent, structured, and aligned (i.e., if corrective conversations differ widely across supervisors or do not reliably translate into improved practice).

Supervisors were described as central to escalation handling and dispute review, including determining validity (PRS), indicating that misclassification becomes most visible when it reaches customer-facing conflict or formal verification review.

4.5.6 Training as an organizational practice embedded across RQ2 themes

Although training is discussed as a "human capability" issue elsewhere, participants framed it strongly as an organizational practice (i.e., something management should design, standardize, and resource). They gave direct, improvement-oriented responses emphasizing training:

"*Training*." (P1)

"*Training, training*." (P2 & P5)

"*…must enter (proper/formal) training*." (P6)

In addition, participants' recommendations implied that informal onboarding (e.g., buddy-based learning) may not consistently build deep competence, reinforcing the view that training quality and structure function as organizational controls that shape classification reliability.

4.6 RQ3: Technology tools and operational pressures influencing classification accuracy.

This section addresses RQ3 by examining how system design, automation, and interface/workflow integration shape verification behaviour and classification accuracy. Participants also noted that high-tempo clearance conditions influence how these tools are used, often reducing the depth of system-based checks.

4.6.1 System differences (manual vs faster tools) and their accuracy trade-offs

Interview question focus: "What digital tools or systems do you use, and how do they affect your speed and accuracy?"

Participants differentiated between a slower, manual declaration workflow and a faster system that reduces processing time. The perceived trade-off was not described as "accuracy vs inaccuracy" in a direct way, but rather as how system speed shapes the time

and attention available for verification. For example, one participant contrasted manual work "one by one" with a faster system while noting functional differences:

"…*eDeclare is slow because we have to do it manually… one by one… but DCE is faster. Even though eDeclare is manual, it can still input taxes, including excise duty*…" (P1)

Participants framed this difference as affecting the time available for checking and cross-referencing, rather than describing one system as inherently inaccurate. Interpreting this in the context of express clearance, participants' comparison implies that system design can indirectly affect accuracy by compressing or expanding the feasible time budget for checking, especially when workload is high.

4.6.2 System/tooling and workflow friction

Interview question focus: What tools/systems are used, and how do they affect speed/accuracy? What system features contribute to mistakes (autofill/history, dropdowns, exemption handling, manual entry, buffering/clicking)?

System interaction was described as a mixed influence: tools can speed processing yet create new error pathways through autofill/history dependence, manual rework, and UI friction. One participant noted that history-driven prompts in DCE can "auto-suggest" HS codes based on past declarations; when users "overlook" verification, wrong codes can be carried forward.

"…*The HS code already comes up in the DCE system, but if it's overlooked if you don't check it properly it can be wrong*." (P1, P2 & P5)

Automation/robot entry (GTS) was repeatedly characterized as requiring human correction and potentially encouraging "skip" behavior when rushing.

"*Hmm, the robot (GTS) is also a problem… a lot of things we have to correct afterwards…*" (P4)

"*…There's a robot (GTS) that inputs the HS code. If we want to be fast, we can just skip it*." (P1)

Workflow friction also appeared in practical details buffer/loading time, heavy clicking, and frequent manual processing. Export-side participants also highlighted that not all shipments are automated, resulting in more manual work.

"*…there is buffer, sometimes loading…*" (P1)

"*Need a lot of clicking…*" (P3, P4)

"*Not all shipments are automated…" / "Most of them have to be done manual*." (P5)

Finally, exemption handling was described (by a supervisor) as a system-related confusion point due to many exemption options and uncertainty over which applies linking option complexity directly to misclassification or misdeclaration risk.

4.6.3 Automation and historical suggestions: efficiency gains and pattern reinforcement risk

Interview question focus: "Are there design or system features that you feel contribute to mistakes (e.g., dropdown lists, too many shipment lines, vague descriptions)?"

Participants described features that "make classification easier" by surfacing HS codes from historical declarations, but they also emphasized a risk when staff overlook verification and accept the suggested code as correct by default:

"*…The system makes classification easier by identifying the HS code based on historical data items we've declared before, so the HS code comes up in the DCE system. However, if the classifier overlooks it or doesn't check, the HS code could be right or wrong.*" (P1)

Concerns about automation were also raised through comments about "robot"/auto-classification needing correction:

"*Hmm, the robot (GTS- Global Trade Service) is also a problem… there are many HS code classifications that we have to correct afterward…*" (P1)

"*The robot (GTS)… if it's based only on history, I don't think it's accurate… unless it can integrate the shipper's category…*" (P1)

Together, these accounts support a socio-technical explanation: automation can support speed and consistency, but it may also reinforce prior patterns and increase misclassification vulnerability when verification is shortened or bypassed.

4.6.4 Documentation quality and system visibility constraints (invoice readability, language, HS visibility)

Interview question focus: Are there documentation features (vague descriptions, invoice readability/language, HS visibility) that contribute to mistakes? How often are descriptions unclear, and how do staff decide when information is incomplete?

Participants described documentation clarity and invoice readability as frequent contributors to misclassification. Issues included (i) HS codes on invoices being too small to notice, (ii) invoices in non-English languages, and (iii) abbreviated or "short form" item descriptions that distort meaning.

"*Another thing is that sometimes we don't notice that the HS code provided by the shipper on the invoice is too short… invoices from Europe are given in their own language*." (P1 & P3)

"*The description isn't clear… DCC doesn't fully itemize the description… it's in short form… when you write it out in full, it means something else*…" (P1, P2, P4 & P6)

Unclear descriptions were described as occurring regularly ("*a lot…", "we encounter it every day…", "quite frequent*…"), implying that misclassification risk is partly *input-driven* rather than solely classifier-driven. When information is incomplete, participants reported coping through escalation to customer-query channels, requesting catalog/specification, or inferring from shipper nature of business each of which introduces variability and potential bias under time pressure.

Overall, these issues show that misclassification risk can arise from how information is displayed and translated into usable attributes within the workflow, not only from the classifier's knowledge

4.6.5 System integration, delays, and context switching as workflow constraints.

Interview question focus: "Do the systems you use feel compatible with your work style or do they slow you down?" and "What part of the system workflow requires the most mental effort?"

Participants highlighted workflow friction that can disrupt concentration and increase cognitive load, including buffer/loading delays and high-click navigation:

"…*There's a buffer, there's loading… sometimes loading*." (P1)

"*Need a lot of clicking (e.g: next, next) 'Ye betul*." (P3)

"*Loading… sometimes 2 minutes.*" (P2)

They also described switching between automated and manual handling, implying interruptions and additional steps:

"*If you notice, not all shipments here are automated*." (P5)

"*So it means most of it has to be done manually.*" (P5)

In addition, interface and presentation issues (e.g., line items and lists) were perceived as error-prone:

"*Drop down list & multiple line items not according to sequence*." (P2 & P3)

Overall, these system and integration constraints are described as practical conditions that can increase misclassification vulnerability by slowing navigation, fragmenting attention,

and forcing frequent switching between modes (auto/manual) while work is time-bound. Loading delays, high-click navigation, and frequent switching fragment attention and increase the chance of overlooking line-item detail or sequence, especially when multiple shipments must be processed quickly

4.7 RQ4: Participant improvement recommendations and suggestions

4.7.1 Suggestions addressing human capability (RQ1)

Interview question focus: "If you could improve anything to reduce HS misclassification, what would you change (training, knowledge support, capability development)?"

Participants repeatedly emphasized training as the primary capability intervention, indicating a need for more structured and sufficient learning beyond informal exposure.

"*Training*." (P1)

"*Training, training*." (P2 & P5)

"…*must enter (proper/formal) training*." (P6)

At the supervisory/organizational level, capability improvement was also framed as a recruitment and qualification baseline issue, with participants proposing that new staff should enter the role with prior classification experience and recognized training attendance.

"…*In terms of hiring, make sure new staff have experience… and require them to have attended KEK (the Customs Agent Course)*." (P6)

Participants also suggested cross-exposure/rotation as a way to strengthen judgement and broaden classification understanding across functions.

"*In my opinion, we can try to swap task (task rotation/cross function)*." (P1, P2, P4 & P5)

Taken together, these inputs point to capability-building actions that strengthen HS knowledge and judgement, reduce variability in competence, and support more consistent sensemaking under ambiguity (RQ1).

4.7.2 Suggestions addressing process, SOP, and workload design (RQ2)

Interview question focus: "What process, workflow, or workload changes would reduce mistakes (SOP clarity, verification steps, staffing, work allocation)?"

Participants proposed improvements aimed at strengthening process standardization and verification discipline, including explicit calls for clearer written guidance.

"*We must have a written process*." (P6)

Workload design was repeatedly raised as a practical lever for reducing errors. Participants suggested increasing resources and staffing to better match volume demands and reduce rushed decisions.

"*Increase manpower*." (P1, P4 & P5)

"*Increase workman (headcount)*." (P6)

"*"If there's a shortage of staff, it will have an effect*…" (P5)

Participants also highlighted the importance of verification routines as part of process discipline, encouraging staff to avoid uncritical reliance and to confirm HS decisions.

"*Do not rely on others blindly; double-check first*." (P4)

These suggestions align with RQ2 by emphasizing that misclassification risk can be reduced through clearer SOPs, stronger verification expectations, and workload controls that protect the time and attention needed for careful classification.

4.7.3 Suggestions addressing system and tooling support (RQ3 & R4).

Interview question focus: "What improvements to systems/tools or information access would help reduce misclassification (system search, decision aids, integration, usability)?"

Participants suggested strengthening system support so that classifiers can search and retrieve relevant information directly within operational systems, reducing friction and dependence on external workarounds.

"*Why can't we just search directly in the DCC/DCE system? It would make the work easier if we could do it straight from there*." (P2 & P4)

Relatedly, participants described interest in enhanced decision-support features, including "AI-like" suggestions that help propose HS codes while still framing it as a support tool rather than full automation.

"*Maybe it's kind of like AI, but more as a suggestion… a HS code suggestion…*" (P1, P2 & P5)

At the same time, participants' broader comments about "robot"/history-based entries imply that system improvements should not only make work faster but should also support verification and reduce the chance of carrying forward historical errors (RQ3).

Overall, the system/tooling suggestions point toward usability and information-access upgrades such as in-system search and structured decision aids that can reduce misclassification risk by lowering workflow friction and strengthening the quality of decision support under time pressure.

4.8 Chapter Summary

This chapter presented interview findings on HS classification work and misclassification risk in an express customs clearance environment, organized in the sequence of RQ1–RQ4. Participants described misclassification as arising from interacting conditions, including high operational tempo and COA/KPI pressure, uneven documentation quality, system and workflow friction, variability in capability, and the way errors become visible through downstream triggers and feedback.

The findings also showed how human factors shape classification decisions, as participants relied on informal learning pathways, differed in reference and verification habits, reported varying confidence, and engaged in sensemaking under ambiguity particularly when item descriptions were unclear or when later-digit refinement was

required. Organizational influences were evident in how work is segmented and controlled through workflow design, the clarity and enforcement of SOP and verification discipline, staffing and supervision constraints, and post-error learning mechanisms (e.g., coaching and performance dialogues) that affect consistency over time.

Finally, participants highlighted that system features and automation (including history-based suggestions and "robot" entries), operational pressures, and usability/integration constraints influence accuracy by shaping attention and verification depth and by increasing the likelihood that prior patterns are carried forward. Participant improvement suggestions were then summarized and linked to RQ1–RQ4 to inform the recommendations developed in Chapter 5, reinforcing that HS misclassification in express clearance is best understood as a socio-technical outcome produced by the interaction of human judgement, organizational arrangements, and technology-mediated workflows under time-sensitive conditions.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter discusses the key findings of the study in relation to the predefined research objectives and the study's conceptual framework. Drawing on the thematic analysis presented in Chapter 4, the discussion examines how interacting human, organizational, and technological conditions shape HS classification behaviour and misclassification risk within express customs clearance operations. The findings are interpreted considering the operational realities of expedited clearance, including time pressure, workload intensity, information quality, training pathways (including buddy-session onboarding), supervisory controls, and the influence of digital systems and automation tools on classification decisions.

In this chapter, theory is used as an interpretive lens rather than as a source of themes. While the themes were developed through deductive, theory-informed thematic analysis grounded in participants' accounts, relevant theoretical perspectives such as cognitive load theory, human error theory, sensemaking, and socio-technical systems thinking are engaged here to explain the mechanisms through which operational pressure, ambiguity, and system design influence classification judgement and verification practices. Theory therefore supports analytical explanation and contextualization of findings, rather than predetermining them.

The discussion is structured according to the research questions. For each research objective, the chapter relates empirical findings to existing literature and considers their implications for organizational practice in express customs clearance environments. Based

on this synthesis, practical recommendations are proposed to reduce misclassification risk and strengthen classification accuracy, including improvements in training and competency assurance, process standardization, workload and KPI design, verification controls, and decision-support tool governance. The chapter concludes by acknowledging the study's limitations and outlining directions for future research to further examine HS misclassification dynamics across different operators, shipment types, and regulatory or technological conditions.

5.2 Summary of Findings

This section synthesizes the study's key findings as presented in Chapter 4, consolidating the major themes that emerged from participants' accounts of HS classification work within an express customs clearance environment. Overall, the findings indicate that HS misclassification in express clearance is rarely attributable to a single factor or isolated error. Rather, misclassification emerges from a constellation of interacting human, organizational, and technological conditions that shape how classification decisions are made under time-critical operational constraints.

Across participants' narratives, HS classification was consistently situated within a high-tempo workflow in which clearance speed, workload intensity, information quality, and system support jointly influence decision quality. In this context, classifiers frequently face a trade-off between applying careful HS reasoning and meeting COA-driven throughput expectations. Consequently, misclassification is best understood not as an individual lapse, but as a socio-technical outcome produced by the interaction of people, processes, and systems within an environment that structurally prioritizes rapid release.

With respect to RQ1, participants described misclassification risk as highest during periods of elevated operational tempo, particularly when COA urgency compresses the time available for verification during peak queues or backlog carryover. Under these conditions, verification activities compete directly with the imperative to clear shipments, increasing the likelihood that critical details are overlooked. This risk is amplified when commodities are ambiguous where products could plausibly fall under multiple headings or when shipment documentation is incomplete, vague, or poorly itemized. In such cases, insufficient informational clarity limits the classifier's ability to differentiate accurately between close headings or subheadings. Taken together, the findings suggest that misclassification becomes more probable when high speed demands coincide with low information quality, leaving limited space for careful differentiation and justification.

Regarding RQ2, HS classification was consistently portrayed as an interpretive and sensemaking task rather than a purely mechanical or rule-based activity. Participants emphasized that decisions often require inferring product function, material composition, or processing stage from imperfect descriptions and translating this understanding into the appropriate HS logic. Variations in knowledge depth and confidence were evident across personnel, and these differences were closely linked to informal, production-embedded learning pathways such as buddy-session onboarding that rely heavily on exposure and individual initiative rather than standardized capability development. In addition to judgement-based errors, participants also identified routine "slip" risks, including incorrect digit entry or field placement, particularly when attention is strained. Fatigue and cognitive load were repeatedly associated with reduced attentional capacity, indicating that even

experienced and knowledgeable staff may become error-prone when mental resources are depleted under sustained time pressure.

In relation to RQ3, participants highlighted how organizational design features shape both the opportunity to verify classifications and the consistency of decision standards across staff and shifts. Work segmentation and workflow arrangements influence where verification occurs, who bears responsibility for uncertainty, and whether escalation is feasible without disrupting clearance timelines. While participants acknowledged the importance of SOPs and verification discipline, they suggested that these controls are not always reinforced consistently under day-to-day production pressures. Staffing adequacy and supervisory capacity were identified as enabling conditions for quality: when staffing is constrained and performance targets are elevated, organizations tend to rely more heavily on downstream or after-the-fact controls rather than preventive checks at the point of decision. Although post-error feedback mechanisms such as coaching or performance dialogues were visible, participants noted that these often become salient only after misclassification has escalated into downstream consequences, including disputes, rework, or write-offs. This pattern underscores the importance of strengthening preventive controls closer to the moment of classification.

Finally, addressing RQ4, participants viewed technology as both an enabler of efficiency and a potential source of risk. System features and decision aids were recognized for supporting speed and consistency; however, participants cautioned that reliance on history-based entries, automated prompts, or default selections particularly under COA urgency can elevate misclassification risk when not accompanied by adequate verification. Workflow designs that require frequent context switching, high-click navigation, or manual

rework were also seen to fragment attention and increase vulnerability to error. Importantly, participants emphasized that system outputs are fundamentally dependent on the quality of upstream data and documentation: when shipment descriptions are unclear or supporting documents are weak, technology may accelerate processing but cannot resolve underlying ambiguity. Overall, the findings suggest that improving HS classification accuracy requires not only enhanced technological tools, but also stronger information quality, verification discipline, and organizational conditions that protect time and attention for careful decision-making.

5.3 Discussion of findings

This section discusses the study's findings in relation to the four research questions. Consistent with Chapter 4, the discussion frames HS misclassification in express customs clearance as an outcome shaped by interacting human, organizational/operational, and technological conditions. Rather than treating misclassification as a single-point failure (e.g., individual carelessness or system limitation), the findings indicate that risk increases when uncertainty in classification coincides with weak information inputs and high-tempo production expectations, thereby narrowing the time and cognitive space needed for careful HS reasoning and disciplined verification.

5.3.1 RQ1: Human factors influencing HS classification and misclassification risk

The findings indicate that HS classification in express customs clearance functions primarily as a process of sensemaking under uncertainty, rather than as a straightforward recall of fixed rules or mechanical code lookup. Participants consistently described classification as beginning with an interpretive step in which classifiers attempt to

determine what the product is its function, category, typical use, and distinguishing characteristics based on commercial descriptions that are often limited, uneven, or incomplete (Wagner, 2023; DHL Express, 2023). This interpretive framing is consequential because it shapes how HS logic is subsequently applied. Once a product is understood in a particular way, subsequent searches and comparisons tend to be confined to a narrowed set of headings and subheadings consistent with that initial interpretation.

The findings further indicate that this anchoring effect becomes more influential under time pressure. When operational tempo is high, the threshold for decision-making shifts toward selecting classifications that appear plausible given available cues, rather than exhaustively testing alternative interpretations or fully justifying choices (Naujokė, 2023). In this context, misclassification risk emerges not simply from incorrect application of HS rules, but from the interaction between imperfect information, early sensemaking, and constrained opportunities for verification.

The study also indicates that knowledge and skill development related to HS classification is uneven and exposure-dependent, shaped largely through informal learning mechanisms such as buddy sessions and learning-by-doing within live production environments (Naujokė, 2023). While these pathways support practical familiarity with common shipment types and workflows, the findings suggest that they do not always ensure consistent development of deeper HS reasoning capabilities, including later-digit differentiation, systematic handling of borderline cases, and disciplined use of authoritative references. As a result, the depth and consistency with which HS logic is applied may vary across individuals and operational contexts, depending on experiential exposure and access to guidance at the point of decision.

Beyond interpretive judgement and knowledge depth, the findings also highlight routine execution-related vulnerabilities associated with time-compressed work. These include digit-entry slips, incorrect field placement, and acceptance of system suggestions or historical entries without sufficient validation. Importantly, these errors are not framed as simple deficiencies in HS knowledge, but as attention-related vulnerabilities that become more likely in repetitive, multi-tasked environments where classifiers must rapidly shift focus across multiple shipments, item lines, and system interfaces (Pooladvand & Hasanzadeh, 2023). In such settings, micro-level actions typing, selecting fields, or confirming prompts are performed at speed, increasing susceptibility to small but consequential mistakes.

Fatigue and cognitive load further exacerbate these vulnerabilities by reducing sustained attention and weakening the consistency of checking behaviour over time. The findings indicate that prolonged concentration demands, and operational pressure can lead to greater reliance on defaults, reduced re-checking of uncertain details, and increased likelihood of overlooking subtle but HS-relevant differences in product descriptions (Min et al., 2021). Overall, RQ1 suggests that misclassification risk is shaped not only by what personnel know, but by the human conditions under which that knowledge is applied, including attentional capacity, time availability, and cognitive energy.

5.3.2 RQ2: Organizational and operational factors affecting verification discipline and misclassification risk

The findings indicate that HS misclassification in express customs clearance is amplified by the combined effects of classification ambiguity, information-quality

constraints, and operational tempo, all of which directly shape the organization's capacity to sustain consistent verification discipline. These factors operate interactively, structuring when verification is feasible, how deeply it can be applied, and whether uncertainty is escalated or absorbed through inference-based judgement.

First, classification ambiguity is structurally embedded in certain commodities, particularly where goods can plausibly fall under more than one heading depending on fine distinctions in composition, function, design, or form at import. In such borderline cases, accurate outcomes depend on disciplined application of HS logic and, where uncertainty persists, escalation to authoritative references or specialist confirmation. The findings indicate that ambiguity becomes significantly more difficult to resolve when shipment documentation does not contain the precise differentiating attributes required to justify a classification decision. Under these conditions, verification becomes fragile because the evidentiary basis for resolving competing interpretations is weak.

Second, information quality emerged as a routine organizational constraint rather than an occasional anomaly. Shipment descriptions were frequently characterized as vague, abbreviated, inconsistent, or insufficiently itemized, shifting the classification process from evidence-based reasoning toward inference-based judgement (Gupta et al., 2023). In practice, classifiers may select codes that appear reasonable based on limited cues, even though correct classification may depend on attributes rarely stated on invoices or airway bills, such as composition, technical specifications, intended use, or processing stage. This constraint is particularly consequential at subheading and national-digit levels, where relatively small product differences can alter duty and tax treatment or trigger additional regulatory requirements. From an organizational perspective, weak information inputs

systematically erode verification discipline by limiting the scope for defensible differentiation.

Third, the findings highlight a persistent speed–accuracy tension as a defining operational feature of express customs clearance. Verification time narrows during peak queues, volatile volumes, or backlog carryover, while accountability for correct HS classification remains unchanged. This tension is especially significant because externally supplied HS codes from shippers or customers are not treated as consistently reliable, meaning that verification cannot be safely omitted even when time is constrained. Under these conditions, misclassification risk increases not simply due to insufficient knowledge, but because operational design compresses verification capacity and implicitly encourages shortcuts to sustain throughput. These shortcuts include accepting default or historical codes, inferring classifications from minimal descriptors, or limiting cross-checking activities to meet clearance expectations (Grainger, 2024; Blegen, 2023; Gupta et al., 2023).

Taken together, the findings suggest that verification discipline is not solely a matter of individual diligence, but a function of how organizational and operational conditions allocate time, information, and procedural space for checking activities. When ambiguity and weak documentation coincide with high operational tempo, the organization effectively reduces the evidence, time, and procedural support required for careful HS reasoning. Under such conditions, misclassification risk becomes a predictable outcome of system design rather than an isolated failure of compliance behaviour.

5.3.3 RQ3: The Influence of Technological Systems and Decision-Support Tools on HS Classification Behaviour and Misclassification Risk

The findings indicate that technological systems and tools influence HS classification behaviour in a dual and indirect manner. Participants described technology as both an enabler of efficiency and a potential source of vulnerability, depending on how system features interact with operational pressure and verification routines. Rather than replacing human judgement, technology shapes how judgement is exercised by influencing work pace, attention allocation, and the depth of checking applied to each shipment (DHL Express, 2023; Grainger, 2024).

System features such as historical references, automated prompts, and pre-filled entries were described as supporting speed and consistency by reducing manual effort and providing initial directional cues. These features are particularly valuable in high-volume express environments, where standardized workflows and automation are essential for sustaining clearance throughput (DHL Express, 2023). However, the findings suggest that under COA-driven urgency and peak workload conditions, these same features can amplify misclassification risk when relied upon without sufficient independent verification. In such contexts, historical codes or system-suggested classifications may be accepted as plausible defaults, especially when operational pressure narrows the time available to question or revalidate prior decisions (Gupta et al., 2023; Grainger, 2024). Importantly, this does not imply that technology causes misclassification directly; rather, it influences behavioural tendencies by lowering the perceived cost of accepting system-generated cues when verification capacity is constrained.

Participants also highlighted workflow friction associated with system design and integration characteristics. Differences between platforms, limited interoperability, and frequent context switching such as moving between declaration systems, document viewers, and external reference sources were described as fragmenting attention and disrupting cognitive continuity during classification work. The findings suggest that such fragmentation can shorten verification routines, particularly when combined with time pressure and high task-switching demands. This observation aligns with prior work indicating that complex digital workflows and interface burden can increase error exposure in time-critical administrative environments by increasing cognitive load and reducing checking consistency (Gupta et al., 2023).

Crucially, the findings indicate that the effectiveness of decision-support tools remains fundamentally bounded by input quality. Where shipment descriptions and supporting documents are incomplete, vague, or inconsistent, even well-designed systems are unable to resolve underlying classification ambiguity. In these situations, technology may accelerate throughput by facilitating faster processing, but it cannot compensate for missing evidentiary detail or substitute for disciplined escalation and human judgement (Grainger, 2024). This reinforces the finding that automation supports efficiency but does not eliminate the interpretive demands inherent in HS classification.

Taken together, the findings under RQ3 suggest that technological systems influence misclassification risk primarily through their interaction with organizational conditions and operational design. Technology affects how quickly decisions are made, where attention is directed, and which verification steps are prioritized, but accountability for HS classification accuracy remains with human actors operating within these systems

(DHL Express, 2023). The key implication is therefore not whether decision aids should be used, but how they are governed, integrated, and embedded within workflows to reinforce verification discipline, support escalation where uncertainty persists, and preserve clear accountability for the final HS decision.

5.3.4 RQ4: Practical recommendations to reduce HS misclassification risk

Drawing together the findings from RQ1 to RQ3, the study indicates that effective reduction of HS misclassification risk in express customs clearance requires multi-level, socio-technical interventions rather than isolated corrective actions. Misclassification emerges from the interaction of human sensemaking constraints, organizational and operational pressures, and the design and governance of technological systems. Accordingly, practical recommendations must address capability development, verification discipline, and technology governance in an integrated manner.

First, the findings suggest that strengthening human capability beyond informal onboarding is a critical lever for risk reduction. While buddy sessions and learning-by-doing support rapid operational integration, they do not consistently ensure deep HS reasoning competence, particularly for later-digit differentiation and recurring ambiguity points (Naujokė, 2023; Wagner, 2023). Practical improvement therefore lies in complementing informal learning with more structured capability assurance mechanisms, such as staged authorization, targeted refresher training, and systematic reinforcement of authoritative reference use. These measures are particularly important in high-tempo

environments where early interpretive framing strongly anchors subsequent classification decisions and where time pressure encourages “good enough” reasoning (Naujokė, 2023).

Second, the findings highlight the importance of organizational and operational design in protecting verification discipline. Verification failures were shown to arise not from indifference to compliance, but from conditions in which operational tempo, queue volatility, and weak documentation compress the time and procedural space available for careful checking (Gupta et al., 2023; Blegen, 2023). Practical recommendations therefore include redesigning workflows and control structures to support preventive verification, especially for ambiguous or higher-risk commodities. This may involve clearer SOP escalation triggers, risk-based peer or supervisory checks, and workload arrangements that preserve verification capacity during peak periods, rather than relying predominantly on downstream corrective controls (Grainger, 2024). Such measures align with the study’s finding that misclassification risk is most acute when ambiguity and weak information coincide with high throughput pressure.

Third, the findings under RQ3 indicate that technology governance, rather than technology adoption alone, is central to improving classification accuracy. While automation, historical references, and system prompts support efficiency and consistency, they also shape behaviour by influencing work pace and attention allocation (DHL Express, 2023; Grainger, 2024). Practical improvement therefore lies in embedding decision-support tools in ways that reinforce verification rather than shortcut it. This includes clarifying expectations around validation of system-generated suggestions, reducing workflow friction that fragments attention, and ensuring that accountability for final HS decisions remains clearly assigned to human actors. Importantly, because system

effectiveness is bounded by input quality, parallel efforts to improve documentation standards and information completeness are essential if technology is to support, rather than mask, sound classification judgement (Gupta et al., 2023).

Finally, the findings suggest that learning from misclassification events should be more systematically integrated into organizational practice. While post-error feedback and coaching mechanisms exist, they tend to become visible only after misclassification has escalated into disputes, rework, or financial exposure. Practical recommendations therefore include strengthening feedback loops that capture resolved ambiguity cases and translate them into shared organizational learning, thereby reducing repeated exposure to the same classification uncertainties. Such feedback mechanisms support capability development and help stabilize decision standards over time, particularly in environments characterized by staff rotation, workload volatility, and sustained performance pressure (Min et al., 2021).

Overall, RQ4 demonstrates that reducing HS misclassification risk in express customs clearance is not achievable through isolated interventions targeting individuals, systems, or procedures alone. Instead, effective risk mitigation requires coordinated improvements across human capability, operational design, and technology governance, aligned with the realities of high-tempo clearance environments. By addressing these interacting conditions, organizations can strengthen verification discipline, improve classification consistency, and reduce downstream compliance and operational exposure without undermining the speed imperatives that define express logistics operations.

5.4 Research Contributions

This section states the significance of this study's contribution by distinguishing what was discovered (empirical contribution), how the study reframes HS misclassification (conceptual contribution), and what actionable interventions are suggested (practical contribution). Together, these contributions address the gap in empirical understanding of HS classification decision-making in time-critical express customs clearance environments.

5.4.1 Empirical contributions

1. This study provides grounded evidence that HS misclassification risk in express clearance rises systematically when verification time is compressed by high shipment volume and clearance-on-arrival (COA) performance pressure. Participants described a speed–accuracy trade-off in which the depth of checking varies with queue volatility, disruption periods, and backlog spillover making error risk an operationally predictable outcome rather than an isolated individual lapse.

2. The study documents how competency formation in express classification is often shaped by informal onboarding (buddy-session learning) and uneven exposure to complex commodities. This produces variation in the depth of HS knowledge especially at subheading and national digit levels and contributes to inconsistent application of interpretive reasoning and documentation checks across staff.

3. The findings show that misclassification is distributed across the workflow, involving not only classifiers but also supervisory escalation routes and downstream

correction/quality roles. This role-based evidence clarifies where misclassification is detected, corrected, or reinforced, and shows that prevention depends on how responsibilities, feedback, and escalation are organized across the clearance chain.

4. The study provides detailed insight into how technology tools (history-based suggestions, auto-classification prompts, and digital declaration systems) simultaneously support throughput and create new risk pathways (e.g., automation bias, repetition of historical misclassification, and reduced critical scrutiny). The empirical account indicates that the impact of these tools depends on governance such as the availability of spot checks, error feedback loops, curated reference data, and clear accountability for overrides.

5. Finally, participants' accounts demonstrate that information quality at the point of declaration is a recurring driver of misclassification. Poor or incomplete product descriptions, unclear invoices, and language/visibility constraints increase sensemaking burden and shorten the effective time available for disciplined HS reasoning, especially in fast-moving express environments.

5.4.2 Conceptual contributions

Conceptually, this study reframes HS misclassification in express customs clearance as a socio-technical and organizational phenomenon rather than a problem of isolated individual mistakes. It advances an integrated view in which misclassification emerges from the interaction between technical ambiguity and information gaps, human sensemaking and capability, organizational controls and workload design, and the

governance of technology-assisted decision support shifting analytical attention toward the conditions that systematically shape classification decision quality.

Building on this framing, the study introduces verification capacity as a key mechanism linking operational pressure to error exposure: misclassification risk is mediated by the time, tools, and procedural triggers available for verification (such as cross-checks, escalation pathways, and consultation of references), and when these are eroded by queue pressure, disruptions, or system friction, staff are more likely to rely on shortcuts, prior-history patterns, or assumptions.

Finally, the study extends sensemaking and cognitive load perspectives into HS classification work by explaining how ambiguity, incomplete information, and frequent context switching intensify cognitive load under time pressure, thereby clarifying why misclassification tends to cluster in particular operational states and commodity situations even among experienced practitioners.

5.4.3 Practical contributions

1. Competency assurance package: The study offers a concrete set of interventions to strengthen HS capability beyond informal mentoring, including structured onboarding content, staged competency checks, curated reference materials, and targeted learning loops based on recurring error types and higher-risk commodity clusters.

2. Verification control design: The findings translate into practical verification triggers for higher-risk situations (e.g., poor descriptions, borderline headings, new/rare commodities,

high-duty or regulated goods), supported by escalation pathways and feasible supervisory review under express time constraints.

3. Governance of technology-assisted classification: The study proposes governance measures that preserve speed while protecting accuracy, such as risk-based spot checks on auto-classified shipments, mandatory confirmation steps for selected risk categories, transparent rules for overrides, and feedback mechanisms that correct reference data and improve tool performance over time.

4. Workload and process interventions: Practical recommendations include protecting time for verification in peak periods, reducing context switching and workflow friction, and using rotation/exposure-building to broaden judgement and reduce over-dependence on narrow routines.

Overall, these contributions provide a transferable, practice-facing account of how HS misclassification risk is produced and can be reduced in high-volume express customs clearance settings, while also strengthening the academic understanding of classification as a socio-technical decision process.

5.5 Implications of the Study

5.5.1 Academic and theoretical implications

This study reinforces that HS misclassification in express clearance is best understood as a socio-technical and organizational phenomenon rather than a purely individual "mistake." At the technical level, HS classification requires adequate product information and disciplined reasoning about what the item is, what it is made of, and what it does, because

goods can plausibly fall under headings based on material composition and/or function (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021; Weerth, 2008).

This aligns with practical HS decision logic that prioritizes identifying the product, its material/substance, primary function or intended use, the condition/form in which it is imported (e.g., finished/set/part/bulk), and checking for more appropriate alternative headings under the General Rules of Interpretation (Santana, 2023). When these information elements are incomplete or unclear, the classifier's sensemaking load increases consistent with this study's results showing that ambiguity in descriptions and technical attributes elevates misclassification risk.

The broader literature also supports the interpretation that misclassification is structurally "enabled" by HS complexity. HS classification commonly involves borderline categories, context-dependent interpretation, and the need to keep up with HS updates and shifting interpretive guidance (Grainger, 2024). This implies that even motivated and experienced personnel remain vulnerable to error when product characteristics are complex and the documentation available at the point of decision is insufficiently technical.

5.5.2 Operational and managerial implications for express operators

A key operational implication is that classification quality at scale cannot depend only on experience or informal knowledge transfer. Evidence summarized in the training literature indicates that integrating formal training with peer mentoring generally produces stronger skill development than relying on peer mentoring alone; mentoring can support confidence

and tacit workplace adjustment, but structured training provides the technical foundation and consistency needed for reliable performance (Data et al., 2022; Lluch et al., 2021; Lorenzetti et al., 2020; Cornelius et al., 2016; Darden & Pesina, 2025). Applied to an express-classification setting, this strengthens the argument that buddy-session onboarding if not reinforced by formal content, competency checks, and standardized reference materials can lead to uneven capability development and inconsistent HS decisions across staff performance (Data et al., 2022; Lluch et al., 2021; Lorenzetti et al., 2020; Cornelius et al., 2016; Darden & Pesina, 2025).

Process design also needs to protect verification capacity under volume and urgency. The WCO HS Classification Handbook cautions that intensive front-end checking (e.g., "100% checks") can create work accumulation that undermines examination quality and can generate delays, pointing to the need for balanced control designs that do not overload declaration processing (World Customs Organization, 2013). This supports the study's findings that verification depth varies under backlog and time compression: the risk is not simply human error, but a predictable outcome of work accumulation interacting with performance pressure.

At the governance level, the implications extend to staffing qualifications and quality control for automation. DHL's internal customs compliance policy explicitly assigns responsibility to the Country Operations Head to ensure customs agents/employees have appropriate qualifications and, where required, maintain country-specific licenses (DHL Express, 2023). The same policy also states that where shipments are auto classified using DHL applications, spot checks and feedback loops should be in place so inaccuracies can be identified and the application enhanced (DHL Express, 2023).

Complementing this, WCO guidance on customs brokers emphasizes that licensing, examinations, training, and assessment/verification systems help reduce avoidable errors and prevent clearance delays and backlogs especially where insufficient HS knowledge contributes to mistakes (World Customs Organization, 2018). Together, these sources reinforce a managerial implication consistent with this study's results: downstream correction and coaching are necessary but insufficient on their own; prevention must be embedded earlier through competency assurance, verification design, and feedback mechanisms.

5.5.3 Implications for technology use and governance

The findings imply that technology in HS classification is not neutral. It can increase speed and consistency, but it can also amplify risk through over-reliance, repetition of historical errors, and shortened verification under time pressure patterns consistent with literature discussing how clearance performance pressures interact with system dependence and decision quality (Blegen, 2023; Yi & Moon, 2019; Gupta et al., 2023). This positions HS accuracy as a socio-technical outcome: system prompts, autofill/history features, and auto-classification outputs shape human behaviour, particularly when operational urgency narrows the time available for scrutiny.

The supporting literature also strengthens the governance argument around AI/advanced analytics. WCO–WTO work notes that customs authorities increasingly use or plan to use big data/AI/ML for risk management, profiling, and compliance-related targeting, including classification-related applications; however, effectiveness depends

heavily on data quality, integration, and governance of how outputs are interpreted and acted upon (World Customs Organization & World Trade Organization, 2022). Related work highlights that digitizing classification decision-making is constrained by the need to apply the General Rules of Interpretation systematically, meaning that automation cannot simply "replace" interpretive judgment without carefully designed controls (Fedotova, 2020). More recent applied work also indicates that data-driven models can support classification and misclassification detection at scale, particularly where explainability approaches clarify why a specific output is produced supporting the study's implication that decision support should strengthen verification behaviour rather than reduce accountability (Vijayakumar, 2025).

5.5.4 Policy and regulatory implications

At the policy level, the findings reinforce the facilitation–control tension that is central to express environments. The WTO Trade Facilitation Agreement calls for expedited procedures for express shipments while maintaining appropriate customs control (World Trade Organization, 2017). In practice, this means that when operational KPIs compress decision time, "appropriate control" depends increasingly on risk-based controls, competent declarants, and reliable information at the time of declaration rather than exhaustive manual checking of every shipment.

Regulators may consider recognizing or encouraging auditable competency-assurance systems as part of industry compliance expectations, particularly for high-volume express declarants, as a practical mechanism to strengthen declarant capability

without imposing overly rigid operational burdens. This approach is consistent with international guidance from the World Customs Organization, which emphasizes that deficiencies in brokers' knowledge of customs procedures and the Harmonized System can lead to declaration delays and clearance backlogs and therefore supports structured capacity building and periodic verification of broker competence as part of customs modernization efforts (World Customs Organization, 2018).

A further implication is that inconsistency and uncertainty in tariff classification are not only firm-level issues but also ecosystem-level capacity and coordination challenges. Industry commentary notes that differences of opinion and disputes about tariff classification occur within countries as well as internationally and highlights the role of advance rulings (under the Revised Kyoto Convention framework) and other guidance mechanisms to support predictability (International Federation of Customs Brokers Associations, 2018).

In addition, institutional studies on customs capability development emphasize the importance of human resource development and specialization in classification work, given the scale and technical breadth of HS coverage (Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021). These points support the implication that sustainable HS accuracy requires both internal controls at operator level and external mechanisms (e.g., advance rulings, consistent guidance, capability-building) that reduce interpretive variance across the wider compliance ecosystem.

5.6 Study Limitations

This study has several limitations that should be considered when interpreting the findings and their implications. First, the study is based on a qualitative approach and relies primarily on participants' accounts of HS classification work in an express customs clearance environment. As such, the findings reflect perceptions, experiences, and self-reported practices, which may be influenced by recall bias, selective emphasis, or social desirability effects. While the interviews provide rich insight into how misclassification risk is experienced in practice, they do not measure the frequency of misclassification events or quantify the contribution of each factor to error outcomes.

Second, the scope of the study is context specific. The findings were generated from a particular operational setting within express logistics and therefore reflect the workflow structure, system environment, and performance expectations relevant to that setting. As a result, the transferability of the findings to other contexts such as seaport or airfreight general cargo operations, different brokerage models, or organizations with different system configurations and training infrastructures may be limited. Variations in regulatory arrangements, commodity profiles, and organizational maturity may also lead to different misclassification dynamics.

Third, the study's evidence base is constrained by the participant sample and data sources. The number of participants and their roles may not represent the full diversity of perspectives across the express clearance ecosystem, including external factors such as importers/shippers, licensed brokers from other firms, software vendors, or customs officers. In addition, the study did not triangulate interview data systematically with operational datasets (e.g., audit results, post-clearance amendments, write-off statistics,

error logs, or KPI dashboards). This limits the ability to validate participant accounts against objective performance records or to identify patterns across commodity groups and time periods.

Fourth, the study focuses on the human and organizational dimensions of misclassification and therefore does not provide a detailed legal analysis of HS interpretive disputes, or the technical correctness of specific HS decisions discussed by participants. While participants highlighted ambiguity and complexity in classification practice, the study did not attempt to verify individual HS codes against tariff rulings or Explanatory Notes. Accordingly, the emphasis is on understanding the conditions that shape decision-making and risk exposure rather than adjudicating technical classification outcomes.

Finally, the timing and operational context of interviews may have influenced the findings. Express clearance is sensitive to seasonal volume peaks, staffing conditions, and disruption events (e.g., backlog periods). Participants' descriptions may therefore reflect the operational realities of the periods most salient to them, which may not fully capture variation across quieter periods or different shipment mixes.

Despite these limitations, the study provides credible qualitative insights into how HS misclassification risk is produced in time-sensitive express clearance work, offering a grounded basis for practical recommendations and directions for future research.

5.7 Recommendations

Based on the findings, the recommendations below aim to reduce HS misclassification risk by strengthening capability inputs, reinforcing verification discipline, improving workload and process controls, improving information quality, and governing technology-assisted classification. These recommendations are framed for an express customs clearance environment, where speed targets and queue volatility must be managed alongside compliance expectations.

5.7.1 Strengthen onboarding and competency assurance beyond buddy-session learning

A structured onboarding pathway should be implemented to complement buddy-session learning and reduce variability (Data et al., 2022; Lluch et al., 2021; Lorenzetti et al., 2020; Cornelius et al., 2016; Darden & Pesina, 2025) in how foundational HS knowledge is developed.

"*It's not enough. It's more like… you have to self-motivate to learn this… it's not enough. It's not enough. I strongly disagree, because this isn't something you can treat it lightly*." (P1)

"*Ah, just one buddy session…" / "No. There was never any proper or formal training*." (P1)

"*For me, it's a bit lacking (proper/formal training). You're the one who has to learn it yourself… it's not enough*." (P2)

"…*There needs to be proper or formal training*." (P6)

This pathway should include a standardized induction curriculum covering HS logic (chapter–heading–subheading reasoning and common ambiguity points), consistent

use of authoritative references (Hao, 2013; Koh J., 2020; Japan International Cooperation Agency & Oriental Consultants Global Co., Ltd., 2021), and clear internal decision rules for recurring commodities. Competency assurance can be strengthened through staged authorization, where new staff begin with lower-complexity items and progressively handle higher-risk or technically demanding commodities after meeting defined proficiency criteria (Grainger, 2024). Refresher sessions and brief periodic assessments can further support knowledge retention, maintain alignment across shifts, and strengthen consistency in national-digit refinement and commodity groups frequently associated with disputes or write-offs (WCO, 2018; Li, G. & Li, Na., 2019, Naujokė, 2023).

5.7.2 Formalize SOPs and embed verification triggers for higher-risk situations

SOPs should be strengthened to reduce inconsistency in how verification is applied, particularly during peak periods (Rahmawati, 2024).

"We must have a written process." (P6)

"*Before, we just followed the HS code on the invoice. But now, we must double-check*." (P4)

A practical control is to define explicit "verification triggers" that require additional checks or escalation. Examples include vague or short item descriptions, non-English invoices without adequate translation, goods requiring technical attributes (e.g., composition or function) (Weerth, 2008; Wagner, 2023), mixed multi-line shipments (Spichakova & Haav, 2020), exemption-related scenarios, and cases where system

history/autofill suggests an HS code that is not clearly supported by current documentation (Blegen, 2023; Nelson, 2021). Standardized checklists for such cases can protect verification quality under time constraints while making expectations explicit across staff, mentors, and supervisors.

5.7.3 Improve workload design to protect verification time and reduce fatigue exposure

Since workload intensity and fatigue were repeatedly linked to reduced checking discipline, staffing and queue management should be designed to protect verification capacity (Min et al., 2021).

"*When our volume is high, our quality drops*." (P1, P4 & P5).

"*We really have to continue the work at home… there just isn't enough time*." (P1 & P5)

Practical measures include allocating dedicated time blocks or roles for complex commodities (Paas & Van Merriënboer, 2020; Howard et al., 2020), rotating staff between high-intensity and lower-intensity tasks to reduce cognitive overload and ensuring adequate coverage during predictable peak windows (Mixter et al., 2019). When disruptions create backlog spillover, a structured backlog recovery approach (e.g., temporary reinforcement, prioritization rules, and risk-based checking) can prevent prolonged overload that increases error likelihood. Fatigue exposure can also be reduced by reviewing shift patterns and backup arrangements to avoid sustained periods of high cognitive demand without adequate recovery.

5.7.4 Strengthen preventive controls and tighten feedback loops from errors.

Corrective responses such as coaching and performance dialogue should be complemented with stronger preventive controls that operate closer to the point of decision.

"*Coaching, PIP… (All)" / "Yes.*" (All participants)

Routine peer review or supervisory sampling should be applied to higher-risk shipments and commodity groups commonly linked to misclassification (Dunham et. al, 2023). In addition, learning from disputes, write-offs, and post-clearance corrections should be captured systematically and converted into updated internal guidance such as searchable "common pitfalls" notes, revised commodity interpretations, and decision examples that explain why specific codes apply (WCO, 2013; IFCBA, 2018; Squirrell, 2020). Feedback should be delivered timely and specific manner (Lechermeier et al., 2020) and explicitly linked to the decision context, so that staff can understand the reasoning gap between their judgement and the desired standard, rather than only the being informed of the final outcome. Practically, this can be operationalized through a recurring "classification learning huddle" (e.g., monthly): brief legal updates, review of internal audit findings/mistakes, and rotating staff case-sharing paired with written capture into an internal knowledge base (Naujokė, 2023).

5.7.5 Improve information quality at source through minimum description standards and clarification routes

Because classification accuracy depends heavily on shipment descriptions and technical details, upstream information quality management should be strengthened.

> "*The description isn't clear… DCC doesn't fully itemize the description… it's in short form… when you write it out in full, it means something else*…" (P1, P2, P4 & P6)

This may include minimum description standards for selected product groups (e.g., requiring material, function, model/specification fields) (Santana, 2023), standardized templates for frequent shipper profiles, and clear escalation routes to request clarification when critical information is missing. Where feasible, account-level guidance and targeted shipper education can reduce repeated ambiguity for common commodities. Improving description quality reduces assumption-driven decisions and shortens verification time by making HS-relevant attributes more visible at the point of classification (Wood, n.d.).

5.7.6 Enhance system usability and integrate decision support to reduce context switching

System usability improvements should focus on reducing friction that increases cognitive burden and encourages external workarounds.

> "*Why can't we just search directly in the DCC/DCE system? It would make the work easier if we could do it straight from there*." (P2 & P4)

Enhancements may include faster in-system search for HS references and internal precedents, structured prompts that request missing technical attributes for specific commodity groups, and clearer display of the basis for historical codes used in prior cases. Reducing unnecessary clicking (Balasm et al., 2025), loading delays, and context switching can improve consistency in interpretation and make verification easier to execute within the clearance workflow (Yin et al.,2025).

5.7.7 Govern automation and AI-assisted classification through accountability and quality controls

Where automation or AI-like suggestions are used, they should function as decision-support tools rather than substitutes for verification.

> "*The HS code already comes up in the DCE system, but if it's overlooked… it can be wrong.*" (P1, P2 & P5)

Accountability should be explicitly defined: the system may suggest, but the classifier remains responsible for the final HS code decision (Wagner, 2023; Gupta et. al, 2023; Grainger, 2024). Spot checks, exception reporting, and structured feedback loops should be implemented so that auto-classification performance is monitored and continuously improved. High-risk categories and ambiguous descriptions should be routed for additional checks rather than accepted automatically (DHL Express, 2023 & 2024). This reduces automation bias and ensures that technology supports accuracy rather than accelerating error propagation.

5.7.8 Use rotation and exposure-building to broaden classification judgement

Cross-function rotation can be implemented as a controlled exposure program to strengthen classification judgement and reduce over-dependence on narrow routines.

"*In my opinion, we can try to swap task (task rotation/cross function)*." (P1, P2, P4 & P5)

Rotating staff across import/export contexts, commodity clusters, and support roles (e.g., clarification handling, exception processing) can broaden situational awareness and improve escalation judgement (Mixter et al., 2019). Exposure-building also supports longer-term resilience by developing staff who can manage ambiguity, apply verification discipline consistently, and maintain decision quality under time pressure.

5.8 Future Research Directions

Future research can extend this study by strengthening empirical breadth, triangulation, and explanatory depth on HS misclassification in express customs clearance. First, additional qualitative work across multiple express operators and brokerage models would help assess whether the factors identified in this study are consistent across different organizational designs, system environments, and governance arrangements. Comparative studies across firms, hubs, or countries could clarify how variations in KPI regimes, staffing models, and training structures shape classification behaviour and misclassification exposure.

Second, future studies should incorporate data triangulation to complement interview findings with operational evidence. This may include analysis of post-clearance amendments, audit results, error logs, write-off records, escalation tickets, or rework volumes, linked to time-of-day, queue intensity, and shipment characteristics. Such triangulation would allow researchers to examine how misclassification patterns vary across commodity groups and operational conditions and would strengthen causal inference beyond self-reported perceptions.

Third, future research could develop more detailed analysis of commodity complexity and information quality as drivers of misclassification. This could include identifying which product categories most frequently require technical attributes (composition, function, performance specification), mapping common ambiguity types (e.g., borderline headings, kit/part distinctions), and evaluating how missing description elements affect decision pathways. Studies that operationalize "description completeness" and test its association with amendments or disputes would be especially valuable for designing upstream interventions.

Fourth, research on training effectiveness and competency assurance in customs classification contexts would be highly relevant, particularly studies comparing onboarding designs (formal training, mentoring, blended approaches) and measuring outcomes such as decision accuracy, speed–accuracy trade-offs, and retention over time. Longitudinal designs could track how classifiers' judgement and verification behaviour evolve from onboarding through advanced specialization, and what organizational supports accelerate competence development without increasing operational risk.

Fifth, future work should examine technology and decision-support governance more directly. This includes evaluating how history-based prompts, autofill, and auto-classification tools influence verification behaviour, as well as testing interventions to reduce automation bias (e.g., explainability features, mandatory confirmation steps for high-risk categories, risk-based routing). Studies could also explore the effectiveness of AI/ML models for HS suggestion or misclassification detection under real-world data constraints, including how model outputs are integrated into workflow and how feedback loops improve performance.

Finally, future research could broaden the lens to include external stakeholders in the express clearance ecosystem, such as importers, shippers, platform sellers, customs officers, and system vendors. Including these perspectives would help clarify upstream sources of description ambiguity, the feasibility of improving data quality at origin, and the regulatory mechanisms (e.g., advance rulings, guidance harmonization) that can reduce interpretive variance and strengthen compliance outcomes in high-volume express environments.

5.9 Conclusion

This study set out to understand the human and organizational factors contributing to HS misclassification in express customs clearance operations. The findings show that misclassification risk in an express environment is not driven by a single weakness or a single “error point.” Instead, it is produced through the interaction of technical classification complexity, uneven or incomplete shipment information, high-tempo

operating conditions, and the way classification work is supported and governed within the organization.

Across the interviews, HS classification was described as a judgement-intensive task performed under uncertainty. Participants highlighted that correct classification often depends on product-specific attributes and detailed distinctions at subheading and national-digit levels, yet these details are frequently unclear or missing in commercial documentation. In response, classifiers rely on practical sensemaking strategies and a hybrid set of references to orient decisions quickly, then confirm them when time and information permit. Where operational pressure compresses verification time, the risk of assumption-driven decisions and execution slips increases, particularly for complex commodities and multi-item shipments.

The study also indicates that organizational arrangements meaningfully shape classification accuracy. Reliance on buddy-session learning without sufficiently structured formal training can lead to uneven competency development, while workload design, staffing sufficiency, and shift-related fatigue influence attention, checking discipline, and the capacity to handle ambiguity consistently. Technology further shapes outcomes: history prompts, autofill, and auto-classification features can support throughput and consistency, but they also introduce vulnerabilities when verification routines are shortened or when automation is accepted without critical validation. These patterns emphasize that HS misclassification is best understood as a socio-technical risk embedded in real workflow conditions rather than as a purely individual performance problem.

Overall, the study contributes a practice-grounded account of how HS misclassification risk emerges in express customs clearance and why it persists despite

awareness of compliance importance. By clarifying the operational realities that shape decision behaviour especially time pressure, information quality limitations, training pathways, fatigue exposure, and technology reliance the study provides a basis for targeted interventions. Strengthening structured onboarding, formalizing verification triggers and SOPs, improving information quality at source, protecting verification time through workload design, and governing technology-assisted classification through accountability and feedback loops are central directions for improving classification reliability while sustaining the speed requirements of express clearance operations.

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