Journal of Modern Languages
Vol. 35(1) 2025
https://doi.org/10.22452/jml.vol35no1.7

Challenges and Strategies in Post-Editing English into Arabic Neural Machine Translations of Movie Subtitles

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Received: 21 February 2025 Accepted: 26 June 2025

Abstract

This study investigates the challenges and strategies involved in post-editing (PE) Neural Machine Translation (NMT) subtitles for the Netflix movie *La La Land* from English to Arabic, utilizing Gottlieb's ten subtitling strategies. By adopting a descriptive-qualitative approach, this study identified issues related to linguistic fidelity, cultural adaptation, and technical constraints. The findings also revealed an enhanced understanding of audiovisual translation workflows, emphasizing the role of human expertise in refining machine-generated outputs. Among these, paraphrasing was the most frequently used strategy as many dialogues required localization and modification to enhance clarity for an Arabic audience. In contrast, transcription, cultural substitution, and deletion were employed less often. The study highlights the importance of human expertise in refining machine-generated output and offers recommendations for optimizing Arabic subtitle PE in NMT environments.

Keywords: Arabic Subtitles, Audiovisual Translation, Neural Machine Translation, Post-editing, Subtitling Strategies

1. Introduction

The demand for high-quality subtitles in global entertainment has significantly increased with the rise of streaming platforms like Netflix. To address this demand, neural machine translation (NMT) systems have increasingly been integrated into audiovisual translation (AVT) workflows, offering rapid and cost-effective solutions for generating multilingual subtitles (Bellés-Calvera & Quintana, 2021). Subtitling is a sophisticated translation process that converts the spoken dialogue of a film (source language) into written text for the audience (target language). It plays a crucial role in films by enabling viewers to comprehend the content more effectively. According to Gambier (1993, cited in Hastuti, 2015, p. 59), subtitling is one of two possible methods for providing the translation of a movie dialogue, where the original dialogue soundtrack is left in place, and the translation is printed along the bottom of the film. This means that through subtitling, audiences can enjoy the film in different languages by reading the translated text at the bottom of the screen.

Challenges in post-editing (PE) NMT subtitles encompass any linguistic, cultural, or technical obstacles to subtitles that impede achieving fidelity, naturalness, or compliance with subtitling constraints. Arabic subtitling presents unique challenges due to its morphological complexity, cultural specificity, and technical constraints, such as the right-to-left (RTL) script (Sawi & Allam, 2024). Addressing these challenges requires specific strategies to ensure that the subtitled content resonates with Arabic-speaking audiences (Abdullah Naeem, 2023; Al Sawi and Allam, 2024; Olimat et al., 2023). In this context, strategies refer to systematic techniques, such as paraphrasing and cultural substitution, employed to resolve these challenges, as outlined by Gottlieb (1992). These techniques have been validated in Arabic contexts by Farghal (2022), and Hassan and Haider (2024), who emphasize the necessity for adaptive strategies to bridge linguistic and cultural gaps.

PE in AVT involves correcting and adapting machine-generated subtitles to meet linguistic and technical standards. This process includes addressing grammatical and syntactic errors, preserving the register and tone of the source text (ST), and ensuring alignment with cultural expectations. Technical constraints, such as character limits and synchronization with on-screen dialogue, complicate the subtitling process, requiring specialized strategies to maintain coherence and readability without compromising the integrity of the original content (Gambier,

2014; O'Brien and Krings, 2018). Among these strategies, Gottlieb's ten subtitling techniques – paraphrase, imitation, condensation, transcription, transfer, dislocation, decimation, expansion, deletion, and resignation – are widely recognized for their effectiveness in addressing AVT challenges (Gottlieb, 1992).

Given the increasing reliance on NMT for subtitle production, it is essential to understand how post-editors refine machine-generated subtitles to enhance their linguistic accuracy and cultural appropriateness. While previous studies acknowledge challenges, none systematically apply Gottlieb's framework to a culturally rich film like *La La Land*, which showcases idiomatic dialogue and emotional depth. These characteristics make it both a challenging and ideal case study for evaluating the limitations and potential of NMT in AVT workflows (Mudawe, 2024). Consequently, this study addressed this gap by

(i) employing a descriptive-qualitative approach to identify the linguistic, cultural, and technical challenges of post-editing English-to-Arabic Google Neural Machine Translation (GNMT) generated subtitles.

(ii) evaluating the effectiveness of Gottlieb's subtitling strategies in resolving linguistic, cultural, and technical issues to enhance the quality and comprehensibility of subtitles for Arabic-speaking audiences.

GNMT subtitles were used because they are a widely accessible and representative NMT tool, enabling reproducibility and real-world relevance. GNMT's common limitations, such as literal translations and cultural mismatches, effectively highlight challenges in Arabic subtitling, aligning with the study's aim to analyse PE needs in MT workflows.

2. Literature Review

The following sections synthesize foundational and contemporary research on PE and NMT in AVT, with a focus on Arabic subtitling. In particular, the role of PE in refining machine-generated output is examined, and the capabilities and limitations of NMT systems for Arabic are evaluated. Additionally, the cultural challenges unique to Arabic subtitle translations are discussed. Thus, both the theoretical framework and practical insights from recent Arabic-specific studies are explored in this section.

2.1 Post-Editing in Audiovisual Translation

PE has emerged as a critical process in AVT, aiming to refine the raw output of NMT systems to meet linguistic, cultural, and technical standards (O'Brien, 2011). Recent studies conducted between 2020 and 2024 highlight the challenges of Arabic subtitling but lack granularity in strategy application. For example, Olimat et al. (2023) emphasize cultural substitution for sensitive content, while Hassan and Haider (2024) analyse lyric subtitling. However, none quantify the frequency or contextual efficacy of Gottlieb's strategies in mainstream films. Additionally, Al Sawi and Allam (2024) compare human and AI-generated subtitles but do not link technical challenges (e.g., synchronization) to specific strategies. The primary goals of PE in AVT include addressing grammatical and syntactic errors, preserving the tone and register of the original dialogue, and ensuring cultural and emotional resonance. Subtitles are not merely textual renderings; they play a crucial role in conveying meaning, emotions, and cultural nuances to the target audience (Farghal, 2022). This makes PE essential for bridging the gap between machine output and human expectations, particularly when dealing with complex language pairs such as English and Arabic. For example, NMT often misinterprets Arabic's root-pattern morphology, as demonstrated by Matusov, Wilken and Georgakopoulou (2019, p.17), where collocations like make history were rendered verbosely as [تحقيق التاريخ] (taḥqīq al-tārīkh) instead of the idiomatic [صنع التاريخ] (ṣanʿ al-tārīkh).

PE in AVT presents a unique technical challenge due to the interplay of linguistic, cultural, and technical constraints (Munday, 2022). Subtitles face limitations from spatial and temporal restrictions, typically allowing only two lines of text with a maximum of 35 to 40 characters per line. Additionally, subtitles must be synchronized with on-screen dialogue, requiring post-editors to condense or rephrase translations without compromising meaning. For instance, idiomatic expressions and culturally specific references often lack direct equivalents in the target language, necessitating creative solutions such as paraphrasing or cultural adaptation.

Cultural mismatches are among the most significant challenges in PE for subtitles. NMT systems frequently render idiomatic phrases and colloquialisms literally, resulting in awkward or alienating translations that fail to resonate with the target audience. Mismatches in idioms, humour, or cultural references often necessitate adaptive strategies. For instance, translating 'Grinch' as [كاره عيد الميلاد] (kārih ʿīd al-mīlād, Christmas hater)—rather than retaining the

culturally opaque transliteration [غرينش] (ġrīnsh)—enhances audience resonance (Al Sawi & Allam, 2024, p. 24). For Arabic subtitling, the task becomes even more complex, as the morphological complexity and syntactic flexibility of Arabic require nuanced adaptations to maintain fluency and coherence (Zhao, 2023; Zhaoxia, 2024).

Gottlieb's ten subtitling strategies offer a structured framework for addressing the multifaceted challenges of PE in AVT. These strategies enable post-editors to tailor subtitles to the linguistic and cultural needs of the target audience while adhering to technical constraints Gottlieb (1992). For example, paraphrasing and expansion are often used to clarify idiomatic expressions and culturally embedded references, whereas deletion and condensation help meet spatial limitations without sacrificing essential meaning.

Research suggests that successful PE in AVT requires tailored workflows that integrate human expertise with machine capabilities. The potential of advanced technologies, such as semantic information entropy, to enhance the efficiency of PE processes have been highlighted (O'Brien & Krings, 2018). The need for specialized training and guidelines to equip post-editors with the skills necessary to handle the technical and cultural demands of subtitling has also been emphasized (O'Brien & Krings, 2018) the. However, these approaches must be complemented by human supervision to address subtleties that machine algorithms cannot fully grasp (Kelly, 2023).

In the context of English-to-Arabic subtitling, PE is indispensable for achieving translations that are both linguistically accurate and culturally relevant. The characteristics of Arabic, such as its morphological complexity, RTL script, and cultural nuances, pose significant challenges for NMT systems. By employing strategies like cultural substitution and adaptation, post-editors can mitigate these issues and ensure that subtitles resonate with Arabic-speaking audiences (Farghal, 2022). This highlights the critical role of PE in maintaining the accessibility and quality of subtitled content for diverse audiences. Automatic PE techniques such as utilizing semantic information entropy technology, have shown promising results in correcting common MT errors, thereby improving translation accuracy and addressing efficiency constraints that often require significant human intervention during the PE process. This underscores the importance of integrating human expertise into NMT workflows to address technical deficiencies and ensure that subtitles are both functional and aesthetically pleasing (Alharthi, 2023).

2.2 Neural Machine Translation in Audiovisual Translation

NMT has revolutionized the field of AVT by providing rapid, cost-effective solutions for generating multilingual subtitles. Unlike rule-based or statistical machine translation (SMT) systems, NMT employs deep learning algorithms to model complex language patterns, resulting in more accurate and contextually appropriate translations (Nair et al., 2023). However, despite its advancements, NMT faces significant limitations, especially when dealing with morphologically rich and culturally complex languages like Arabic. This section examines the advantages and limitations of NMT in AVT, with a particular focus on the challenges associated with English-Arabic subtitle translation.

One of the primary advantages of NMT is its ability to efficiently handle large volumes of text while maintaining fluency and grammatical correctness. This capability leads to faster subtitle production in AVT workflows, allowing streaming platforms like Netflix and YouTube to meet the increasing demand for multilingual content and audiences (Bellés-Calvera & Quintana, 2021). Furthermore, NMT systems are highly adaptable and can integrate multimodal inputs, such as audio and video, which enhances their contextual awareness and suitability for AVT tasks (Nair et al., 2023).

Additionally, NMT systems excel in achieving high levels of fluency by leveraging large-scale datasets to predict natural sentence structures. This advantage is particularly evident in translating dialogue-driven content, where preserving conversational tone and register is crucial. Studies, such as Matusov et al. (2019), highlight the ability of NMT systems to produce linguistically coherent translations, marking a significant improvement over earlier machine translation models. From a practical standpoint, NMT reduces the workload for human translators by generating draft translations that can be refined through PE (Bogucki & Deckert, 2021). This integration of machine-generated outputs with human expertise not only speeds up the subtitling process but also enhances cost-efficiency, making it an attractive solution for AVT in commercial contexts. Despite these advantages, NMT systems face considerable challenges when applied to English-Arabic subtitling. The linguistic challenges of Arabic, characterized by its morphology, free word order, and context-dependent diacritical marks, pose significant difficulties for machine algorithms (Javed, 2013). Unlike English, Arabic relies heavily on

contextual and cultural cues to convey meaning, which NMT systems often struggle to interpret accurately.

Technical challenges with the RTL script and diacritical marks require specialized formatting which NMT systems overlook (Al Sawi & Allam, 2024). Cultural challenges represent a critical limitation of NMT in AVT. Studies comparing NMT-generated subtitles with human-translated or PE subtitles reveal notable disparities in quality. Bellés-Calvera and Quintana (2021), for example, found that while NMT systems produce grammatically correct outputs, they often lack the cultural adaptability needed for effective subtitling. In English-to-Arabic pairs, the challenge of translating culturally specific references, humour, and emotional tones is particularly pronounced. NMT systems tend to prioritize statistical probabilities over cultural sensitivity, resulting in translations that may be linguistically accurate but fail to resonate with Arabic-speaking audiences. For instance, Western metaphors, idioms or colloquialisms are often rendered literally, obscuring their intended meaning and alienating viewers (Fargha, 2022). This issue is further compounded for Arabic subtitles by the absence of standardized conventions for translating culturally sensitive or idiomatic content.

Studies such as Matusov et al. (2019) emphasize the importance of integrating human expertise into NMT workflows to address these shortcomings. Post-editors play a vital role in correcting errors, ensuring cultural relevance, and aligning subtitles with technical constraints. Without this intervention, NMT outputs are unlikely to meet the high standards expected in professional AVT settings. Thus, the limitations of NMT in English-Arabic AVT highlight the critical need for hybrid workflows that combine machine efficiency with human creativity. By employing advanced algorithms alongside PE strategies, it is possible to address linguistic inaccuracies, cultural mismatches, and technical deficiencies in NMT-generated subtitles (O'Brien & Krings, 2018). For example, utilizing Gottlieb's subtitling strategies, such as paraphrasing and cultural substitution, can significantly enhance the quality and accessibility of subtitles for Arabic-speaking audiences.

Significant research has explored the application of NMT across various contexts, including literary works (Hansen & Esperança-Rodier, 2022; Matusov, 2019), language education (Klimova et al., 2023; Lee, 2023; Paterson, 2023), economics texts (Boumparis & Giannoutsos, 2022), civil engineering (Yao, 2023), and the medical domain (Hayakawa & Arase, 2020). Over the last decade, subtitling has undergone drastic changes, shifting from traditional

workflows to a new framework that incorporates MT, greatly enhancing productivity in this field Varga (2021). Numerous studies have examined the integration of NMT into the subtitling process, focusing on quality assessment (Bell´es Calvera & Quintana, 2021; Karakanta et al., 2022; Koglin et al., 2022), user experience and accessibility (Hu et al., 2019), and PE (Almaaytah, 2022; Al Sammarraie & Ghassemiazghandi, 2024; Huang & Wang, 2022; Xue, 2022).

2.3 Cultural Challenges in Arabic Subtitling

Cultural challenges are among the most significant obstacles in Arabic subtitling, primarily due to the linguistic and sociocultural disparities between Arabic and source languages such as English (Hassan & Haider, 2024). As previously mentioned, Arabic is a morphologically rich and context-sensitive language with deep ties to its cultural and religious heritage, which influences idiomatic expressions and other communicative norms. When subtitles fail to account for these cultural nuances, they risk alienating Arabic-speaking audiences or misrepresenting the source material Farghal (2022). One common challenge arises from the translation of idiomatic expressions and culturally specific references. For example, idioms rooted in Western cultural contexts often lack direct equivalents in Arabic, requiring translators to employ creative strategies such as cultural adaptation or functional equivalence to convey the intended meaning while maintaining viewer engagement (Subramaniam & Zainal, 2023).

PE strategies for subtitles are essential to ensuring precise translations that satisfy viewers. To increase readability and understanding, effective solutions typically call for a close investigation of both the subtitle time and the translated text Gambier (2014). Gottlieb describes subtitling as the translation of media communications into another language, which is represented by a line or lines of text written on the screen alongside the original verbal message Gottlieb (2005). Linguistically, there are two types of subtitles: interlingual subtitles, which transfer from the source language (SL) to the target language (TL), and intralingual subtitles, which shift the language within the same language Cintas (2020). Interlingual subtitling, according to Gottlieb (1997), is literally the subtitling between two languages encompassing a transfer from the SL to TL. In other words,, interlinguistic subtitles, occur where there is a translation (Bartoll, 2006).

Additionally, Gottlieb (1992) distinguished between two kinds of subtitling constraints: textual (qualitative) and formal (quantitative). Textual limitations are those placed on subtitles by the visual context of the program, while traditional constraints are of a technical origin, including time and space restrictions. The Arabic language, which uses distinct characters, a separate writing system, and a different culture, has not had these limitations fully examined. Formal restrictions were the space and the time factor, whereas textual constraints were those imposed on the subtitles by the visual environment of the movie. Moreover, moviegoers do not go to theatres or sit in front of TVs to read subtitles; they go to watch and enjoy movies. To put it another way, they might be able to read a paragraph or two of subtitles quickly but not the entire movie.

3. Methodology

This study employed a descriptive qualitative approach, chosen to align with the studies addressing the research gap, systematically analysing PE strategies in a high-context Arabic film.

3.1 Selection of *La La Land*

This study focused on the movie *La La Land* (Arabic: لا لا لاند), written and directed by Damien Chazelle. It is a 128-minute movie containing 1,359 translation units, with each sentence being an independent translation unit. Its complex narrative and emotional depth highlight the intricate demands of subtitling, particularly for NMT systems. Furthermore, the availability of high-quality Netflix subtitles provides a robust benchmark for evaluating NMT output and the impact of PE interventions, solidifying the film's suitability in this study.

By focusing on *La La Land (2016),* which features dense cultural references, the methodology ensures relevance to real-world AVT challenges. Concentrating on a single movie, this approach allowed for a detailed case study of the challenges and strategies involved in English-to-Arabic subtitle PE specifically in relation to examining the interplay between linguistic, cultural, and technical factors, generating findings that can potentially inform best practices in NMT-based AVT workflow. The combination of quantitative insights (e.g., frequency of strategy usage) and qualitative analysis (e.g., specific examples of strategy application) enabled a comprehensive understanding of the research problem.

The study established credibility through triangulation by comparing ST, TT-Netflix, and TT-GNMT along with a detailed description of contextual factors, such as the idiomatic dialogue in *La La Land* idiomatic dialogue). Transferability was enhanced by outlining the film's cultural complexity and Arabic audience expectations, while dependability was achieved through a systematic methodology (Hossein, 2015), including annotated translation units and alignment with Gottlieb's framework. Confirmability was addressed through reflexivity; the author's expertise in Arabic linguistics informed strategy selection and peer validation was sought for contentious examples, such as the cultural substitution of 'jam'.

3.2 Research Design

As shown in Figure 1, the research design of this study comprised three steps: data preparation, data analysis, and discussion.

3.2.1 *Data Preparation*

The data for this study were sourced from the movie's English ST and NMT-generated Arabic TT. Both ST and TT-Netflix were obtained from Netflix in SubRip Subtitles (SRT) format, which is considered of good quality due to Netflix's strong reputation and broad user base. There were 1,359 translation units, with each sentence being an independent translation unit. Each translation unit could contain different categories, which were individually annotated within the respective translation units. Given that GNMT has been considered the most widely used system (Rivera-Trigueros, 2022), the open GNMT was employed to generate the target texts (TT-GNMT) using the ST as the input. Subsequently, the ST, TT-NMT, and TT-Netflix were manually aligned and organized into a table with three columns for the convenience of comparison. Additional columns were included to annotate challenges, along with their severity levels and strategies.

3.2.2 *Data Analysis*

Each translation unit was annotated with observed challenges. The challenges were classified into three broad categories:

- Linguistic Challenges: Errors in grammar, syntax, and lexical accuracy, including the mistranslation of idiomatic expressions.
- Cultural Challenges: Issues related to culturally embedded references, colloquialisms, and emotional tone that did not align with the target audience's expectations.
- Technical Challenges: Violations of subtitling constraints, such as character limits, line breaks, or improper synchronization with on-screen dialogue.

Each translation unit was also analysed to determine the subtitling strategy used or required to address specific challenges (see Figure 1).

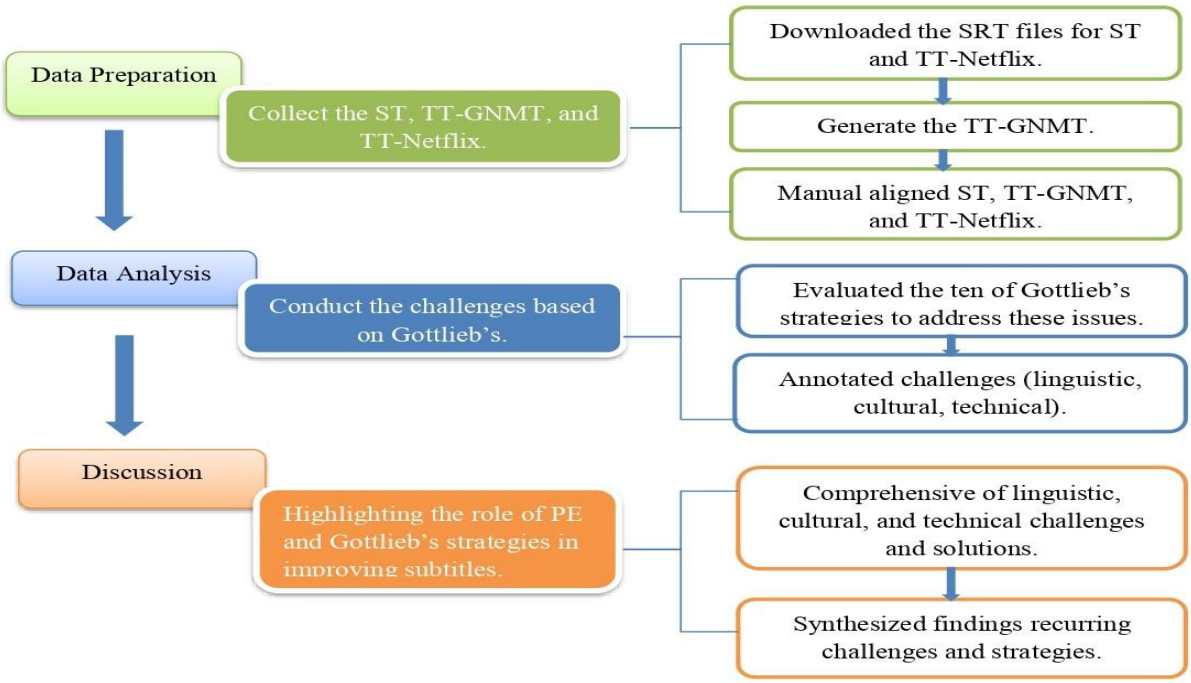

Figure 1. Research Design

As previously mentioned, this study adopted Gottlieb's (1992) ten subtitling strategies as the primary analytical framework. These strategies offered a systematic approach to evaluating the effectiveness of PE interventions in addressing the challenges posed by NMT-generated subtitles.

i. Evaluation Criteria: The effectiveness of each strategy was assessed based on the following criteria:
   - Fidelity: The extent to which the translation preserved the meaning and intent of the source text.
   - Naturalness: The linguistic fluency and cultural resonance of the subtitles in Arabic.
   - Compliance: Adherence to technical constraints, such as character limits and synchronization.
   - Comparison with Netflix Subtitles: To validate the findings, the TT-GNMT outputs were compared with TT-Netflix, which served as a gold standard. This comparison highlighted the strengths and weaknesses of the GNMT outputs and demonstrated the improvements achieved through PE interventions guided by Gottlieb's strategies.

4. Findings

This section presents the findings from the analysis of *La La Land,* focusing on the application of Gottlieb's subtitling strategies during PE of NMT output from English to Arabic.

4.1 Frequency of Subtitling Strategies

Table 1 summarizes the percentage of each of Gottlieb's ten subtitling strategies. The most frequently applied strategies were paraphrasing (20%) and expansion (15%), while transcription, deletion, and cultural substitution were used less frequently (5% each). These results highlight the necessity of adapting MT output for linguistic clarity and cultural resonance in Arabic subtitling contexts.

Table 1. Subtitling Strategies in *La La Land*

Type of strategy	Number of verbal segments	Frequency
Expansion	203	15%
Paraphrasing	271	20%
Transfer	135	10%
Imitation maintains	108	8%
Transcription	68	5%
Cultural Substitution	68	5%
Condensation would	162	12%
Decimation	135	10%
Deletion	68	5%
Adaptation	135	10%
Total	**1, 353**	**100%**

4.2 Comparison of Netflix and GNMT Outputs

The qualitative analysis compared TT-Netflix and TT-GNMT subtitles across linguistic, cultural, and technical dimensions. The following sections present the findings on specific challenges.

4.2.1 *Linguistic Challenges*

Linguistic issues in TT-GNMT included mistranslations, grammatical inaccuracies, and loss of nuances. In contrast, human-translated Netflix subtitles exhibited superior linguistic fluency and tone preservation.

Example: Grammatical Accuracy

Source Text (ST): You can’t just rush to make history.

TT-GNMT: لا يمكنك الإسراع في تحقيق التاريخ. (Literal and verbose; lacks natural flow in Arabic.)

TT-Netflix: لا يمكنك التسرع لصنع التاريخ. (Concise and idiomatic, aligning with Arabic syntax.)

4.2.2 *Cultural Challenges*

Cultural mismatches were prominent in TT-GNMT, especially in idiomatic expressions and references. Netflix subtitles effectively employed paraphrasing and cultural substitution to ensure cultural relevance.

Example: Idiomatic Expressions

ST: That's my jam!

TT-GNMT: هذا هو الموسيقى المفضلة لي! (Literal translation, losing the informal, colloquial tone.)

TT-Netflix: هذا هو مقطعي المفضل! (Accurate cultural adaptation, capturing the intended meaning.)

4.2.3 *Technical Challenges*

Technical issues in TT-GNMT included violations of character limits, improper synchronization, and verbosity. Netflix subtitles, constrained by strict guidelines, excelled in achieving conciseness and readability.

Example: Brevity and Synchronization

ST: You know, I was just thinking about how crazy life is.

TT-GNMT: كنت أفكر في مدى جنون الحياة أحيانًا. (Verbose and unsynchronized with on-screen dialogue.)

TT-Netflix: أحيانًا الحياة جنونية. (Condensed, aligning with subtitle constraints.)

4.3 Subtitling Strategies

The following subsections provide the findings related to each subtitling strategy implementation, including specific examples that demonstrate the differences between machine-generated and human-edited output.

4.3.1 *Paraphrase*

The paraphrase strategy, as Gottlieb (1992) defined it, involves reformulating ST to make it more accessible, comprehensible, or culturally appropriate for the target audience. Paraphrasing may be necessary when the source dialogue contains idioms, cultural references, or expressions that do not have a direct equivalent in Arabic or when the NMT output does not adequately convey the original meaning.

As shown in the example in Table 2, Netflix's translation maintains the poetic tone and aspirational quality of the source text by employing the paraphrase إلى أولئك الذين يحلمون, ('iilaa 'uwlayik aladhin yahlumun). In contrast, GNMT oversimplifies the expression, losing the artistic nuance of the original. This demonstrates Netflix's advantage in preserving the source text's emotive impact, which is essential for lyrical content. In the second sentence, the phrase يعظمون (yueazimun) they glorify is culturally and contextually more appropriate than يعبدون (yaebudun) they worship. The reformulated sentence captures the critical tone and emotional undertone of the original while ensuring clarity for Arabic-speaking audiences.

Table 2. **Example of Paraphrasing**

ST	TT-Netflix	TT-GNMT
00:01:45 - 00:01:50 Here's to the ones who dream	إلى أولئك الذين يحلمون.	هذا لمن يحلم.
00:00:15 - 00:00:17 They worship everything and they value nothing	إنهم يعبدون كل شيء ولا يقدرون أي شيء.	يعظمون كل شيء ولا يعطون أي شيء قيمة حقيقية.

4.3.2 *Transfer*

According to Gottlieb (1992), the transfer strategy is most suitable for texts where linguistic equivalence between SL and TL can be achieved with minimal distortion. It represents the closest adherence to literal translation within the subtitling (p.28). As illustrated in Table 3, both versions use transfer, but Netflix's translation (لصنع, sune) is more idiomatic and concise. GNMT's phrase (تحقيق التاريخ) feels verbose and less natural in Arabic, demonstrating that human involvement refines linguistic choices for clarity and style. The NMT output is an accurate reflection of the original dialogue. The terms صراع, sirae (conflict) and تنازل, tanazul

(compromise) match their English counterparts. The concepts of conflict and compromise are culturally and linguistically universal, making a direct transfer effective.

Table 3. Example of Transfer

ST	TT-Netflix	TT-GNMT
00:15:30 - 00:15:35 I love jazz because it's conflict and its compromise	أنا أحب الجاز لأنه صراع وتنازل	أنا أحب الجاز لأنه صراع وتنازل.
00:07:10 - 00:07:15 You can't just rush to make history	لا يمكنك التسرع لصنع التاريخ.	لا يمكنك الإسراع في تحقيق التاريخ.
00:42:30 - 00:42:35 I can't believe you brought me here	لا أصدق أنك أحضرتني إلى هنا.	لا أصدق أنك جلبتني هنا.

4.3.3 *Condensation*

According to Gottlieb (1992), condensation aligns with the principle of reducing content while maintaining meaning, which is vital in subtitling due to the medium's inherent limitations. It helps prioritize the essence of dialogue over word-for-word translation. An example of this is shown in Table 4 where Netflix's translation of 'This is the dream! It's conflict and compromise, and it's very, very exciting!' as هذا هو الحلم! إنه صراع وتسوية وهو مثير للغاية! condenses the repetition (very exciting → مثير للغاية) while retaining semantic fidelity. In contrast, GNMT's literal output إنه نزاع وحل وسط، وهو مثير جدًا! preserves the redundant very, very (جدًا), violating subtitle brevity norms. Notably, both approaches retain هل نرقص؟ for 'Shall we dance?'. These examples underscore NMT's limitations in context-sensitive condensation, reinforcing the necessity of PE to align with industry standards.

Table 4. Example of Condensation

ST	TT-Netflix	TT-GNMT
00:10:15 - 00:10:20 This is the dream! It's conflict and compromise, and it's very, very exciting! 00:18:45 - 00:18:50 Shall we dance?	!هذا هو الحلم! إنه صراع وتسوية وهو مثير للغاية هل نرقص؟	هذا هو الحلم! إنه نزاع وحل وسط، وهو مثير جدًا جدًا! هل نرقص؟

4.3.4 *Deletion*

Gottlieb (1992) notes that deletion is often a pragmatic choice in subtitling due to the medium's spatial and temporal limitations. It requires a careful balance to avoid losing essential narrative or emotional content as illustrated in Table 5. The phrase, أتعلم *ataealam* (you know) is unnecessary, and the rhetorical question أليس كذلك؟ (don't you think?) is omitted as they do not contribute significantly to the meaning. The central thought about life being crazy and unpredictable is retained.

Table 5. Example of Deletion

ST	TT-Netflix	TT-GNMT
01:02:30 - 01:02:35 You know, I was just thinking about how crazy life is. Sometimes it's just so unpredictable, don't you think?	أتعلم، كنت أفكر فقط في مدى جنون الحياة. أحيانًا تكون غير متوقعة للغاية، أليس كذلك؟	كنت أفكر في مدى جنون الحياة أحيانًا.

4.3.5 *Imitation*

According to Gottlieb (1992), imitation ensures the preservation of elements that do not require translation, as their recognition of the target audience's culture or context is vital. This strategy avoids the risk of over-localization, which can distort the narrative or reduce the cultural authenticity of the subtitles. For example, in Table 6, The name 'Lighthouse' is retained in its original English form, as it is a proper noun and a significant cultural reference. Translating Lighthouse into *manaratan*, منارة could obscure its significance as a specific location known for jazz. The subtitle retains the intended cultural and narrative context by keeping 'Lighthouse' in its original form.

Table 6. Example of Imitation

ST	TT-Netflix	TT-GNMT
00:12:30 - 00:12:35 Let's go to the Lighthouse Café for some jazz.	دعنا نذهب إلى مقهى لايتهاوس للاستماع إلى موسيقى الجاز.	دعنا نذهب إلى مقهى Lighthouse للاستماع إلى موسيقى الجاز.

4.3.6 *Expansion*

According to Gottlieb (1992), expansion addresses the challenge of implicitness in subtitling. It compensates for cultural or linguistic gaps between ST and TT, ensuring that the audience fully understands the message. An example of expansion is shown in Table 7, where Netflix's version uses expansion (الالتقاء, alialtiqa) to clarify running into each other, aligning it with Arabic cultural expectations. GNMT's literal translation (نصطدم, nastadim) introduces an unintended meaning of physical collision, showing the limitations of MT in capturing contextual subtleties. The expanded subtitle remains faithful to the source text while ensuring accessibility.

Table 7. Example of Expansion

ST	TT-Netflix	TT-GNMT
00:03:20 - 00:03:25 It's pretty strange that we keep running into each other.	من الغريب أننا نستمر في الالتقاء.	من الغريب أننا نصطدم ببعضنا باستمرار.

4.3.7 *Cultural Substitution*

Cultural substitution aligns with Gottlieb's focus on dislocation or the replacement of culture-bound terms with analogous terms in the target culture (p. 166). This strategy aims to maintain the narrative's impact while adapting it to the audience's cultural expectations. As illustrated in Table 8, Netflix's cultural substitution adapts the idiomatic expression jam to مقطعي المفضل, which is a familiar and natural equivalent in Arabic. GNMT's literal rendering (الموسيقى المفضلة, almusiqaa almufadala) fails to capture the informal, colloquial tone of the original.

Table 8. Example of Cultural Substitution

ST	TT-Netflix	TT-GNMT
00:25:40 - 00:25:45 You're a barista? Cool, me too! 00:55:50 - 00:55:55 That's my jam!	!أنت تعمل في المقهى؟ رائع، وأنا كذلك !هذا هو مقطعي المفضل	!أنت نادل؟ هذا رائع، وأنا كذلك !هذا هو الموسيقى المفضلة لي

4.3.8 *Decimation*

According to Gottlieb (1992), decimation is an extreme form of condensation that serves as a pragmatic solution in cases where full translation is not feasible. It reflects the subtitle's ability to balance linguistic fidelity with the functional requirements of the medium. In the Arabic translation filler words like you know and secondary clauses that do not contribute to the core meaning are removed. (see Table 9). Instead, the focus us on the unexpected nature of life and its dreamlike quality, preserving the essence of the dialogue. The shorter text ensures that the subtitle is legible and comprehensible.

Table 9. Example of Decimation

ST	TT-Netflix	TT-GNMT
00:22:10 - 00:22:15 You know, I've been thinking about how life takes us to these unexpected places, and sometimes, it's like a dream you didn't even know you had.	أتعلم، كنت أفكر في كيف تأخذنا الحياة إلى أماكن غير متوقعة، وأحيانًا يكون الأمر وكأنه حلم لم تكن تعرف أنه لديك.	الحياة تأخذنا إلى أماكن غير متوقعة وكأنها حلم.

4.3.9 *Adaption*

Gottlieb (1992) defines adaptation as a cultural substitution that emphasizes functional equivalence over literal translation. The goal is to maintain the narrative and emotional intent of ST while making it relatable and engaging TT audience. In Table 10, the term غرينش (Grinch) is replaced with كاره لعيد الميلاد (a Christmas hater) to convey the intended meaning in a culturally neutral manner. The emotional tone and are preserved, while the cultural barrier is removed.

Table 10. Example of Adaptation

ST	TT-Netflix	TT-GNMT
00:30:05 - 00:30:10 He's such a Grinch during Christmas.	إنه مثل غرينش خلال عيد الميلاد.	إنه كاره لعيد الميلاد دائمًا.

4.3.10 *Condensation*

Gottlieb (1992) defines condensation as shortening the original dialogue while maintaining the meaning. This strategy is crucial for subtitling because of time and space constraints, ensuring readability. An illustrative example is shown in Table 11, where the source text (ST), 'I've been dreaming about this moment for my whole life' is condensed in the Netflix version to بهذه حلمت حياتي طوال اللحظة (I've been dreaming about this moment for my whole life). Compared to the GNMT output كنت أحلم بهذه اللحظة طوال حياتي (I was dreaming of this moment my whole life), the Netflix version is shorter, more natural, and better timed, demonstrating how condensation reduces linguistic load while preserving semantic content.

Table 11. Example of Condensation

ST	TT-Netflix	TT-GNMT
00:50:15 - 00:50:17 I've been dreaming about this moment for my whole life.	حلمت بهذه اللحظة طوال حياتي.	كنت أحلم بهذه اللحظة طوال حياتي.

5. Discussion

The results demonstrate that paraphrasing and expansion are the most frequently employed strategies. These strategies effectively address the challenges of cultural and linguistic differences, allowing for greater accessibility and relatability for Arabic-speaking audiences. In contrast, strategies such as deletion and decimation, were less common, as they risk losing critical elements of the source material's meaning or tone. The results indicate that Netflix translations achieve cultural and contextual relevance compared to GNMT, which relies heavily on literal translations (see Table 12). This underscores the importance of human intervention in

preserving the artistic and emotional integrity of audiovisual content, highlighting the value of tailored translation approaches for Arabic audiences.

Table 12. Strengths of Netflix and GNMT Subtitles

Dimension	Netflix (TT-Netflix)	GNMT (TT-GNMT)
Linguistic Accuracy	Grammatically sound	Frequent errors
Cultural Adaptation	Culturally resonant	Literal translations
Technical Compliance	Meets constraints	Requires significant edits

The predominant use of paraphrasing and expansion strategies aligns closely with Farghal (2022), who argued that the morphological complexity of Arabic necessitates adaptive translation strategies that prioritize meaning over literal correspondence. This study provides empirical support for that claim, demonstrating that MT output requires extensive adaptation for Arabic subtitling contexts. The moderate use of cultural substitution contrasts with Olimat et al. (2023), who reported higher rates in films with explicit content. This suggests that genre characteristics significantly influence strategy selection, with the musical and romantic elements in *La La Land* requiring less cultural modification than action-oriented content. This finding extends previous research by demonstrating genre-dependency in subtitling strategy application. The superior performance of Netflix's human-edited subtitles supports Bellés-Calvera and Quintana's (2021) claim that human post-editors serve as essential bridges between machine output and audience expectations. Moreover, the current study quantifies specific areas where human intervention is most valuable, providing empirical evidence for continued human oversight. The findings also challenge Nair et al.'s (2023) claim that advanced NMT systems approach human-level performance in certain language pairs. The persistent limitations in English-Arabic translation, particularly regarding culturally embedded expressions, highlight the crucial role of human expertise in professional translation contexts.

The successful application of Gottlieb's (1992) framework to PE contexts demonstrates its ongoing relevance and reveals new applications in AI-mediated translation workflows. The high frequency of paraphrasing and expansion in PE suggests these strategies serve dual functions: addressing ST complexity and correcting MT errors. This research contributes to subtitling theory by showing that PE involves transformative adaptation rather than merely corrective processes. This challenges traditional views of PE and indicates that training programs should

emphasize creative and cultural competencies beyond linguistic accuracy. For NMT development, the findings highlight specific improvement areas in English-Arabic translation. The persistent challenges with idiomatic expressions and cultural references indicate that future systems should incorporate enhanced cultural knowledge bases and context-aware translation models.

6. Conclusion

This study examined the key challenges and strategies involved in PE NMT for subtitling *La La Land* from English to Arabic, focusing on linguistic accuracy, cultural adaptation, and technical constraints. It validates Gottlieb's (1992) framework within Arabic AVT contexts, demonstrating that paraphrasing and cultural substitution are essential for balancing fidelity and cultural resonance. Additionally, it extends Farghal's (2022) work by mapping strategy efficacy to Arabic's diglossic and morphologically rich structure, offering a refined model for AVT research in Semitic languages. Subtitles should prioritize paraphrasing to adapt idiomatic expressions (e.g., [مقطعي المفضل] for That's my jam!) and employ condensation to align with Arabic's preference for brevity. This suggests that developers of NMT systems should incorporate Arabic-specific morphological rules and cultural lexicons to minimize PE efforts. Future research should explore advanced technologies and interdisciplinary approaches to address NMT limitations and enhance the efficiency and quality of subtitling for diverse audiences.

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