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The Impact of Specialized AVT Tools on Subtitling Efficiency and Cultural Appropriateness in Saudi Tourism Promotional Videos

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Abstract

This study examines the impact of audiovisual translation (AVT) tools on subtitling efficiency and cultural appropriateness in Saudi tourism promotional videos. In line with Saudi Vision 2030's tourism ambitions, the volume of multimedia content—from heritage promotion in Diriyah and AlUla to guidance on Hajj and Umrah—creates a need for culturally sensitive audiovisual translation. The study compares AVT tools, namely Aegisub for temporal and spatial spotting and memoQ for terminology management, with conventional workflows based on Microsoft Word and static references. A randomized controlled experiment involving 50 participants was conducted. Participants subtitled two four-minute promotional clips: a dialect-rich video about Diriyah's heritage and an informational guide for Umrah pilgrims. Performance was evaluated using production speed and a validated 100-point expert rubric covering cultural appropriateness, technical execution, and terminological consistency. The findings indicate that participants using integrated AVT tools achieved significantly greater subtitling efficiency and higher cultural appropriateness scores than those using conventional methods. These improvements were associated with waveform-based synchronization and dynamic termbases. Previous experience with computer-assisted translation also strengthened the observed benefits. The study provides empirical evidence supporting the integration of AVT tools into translator training and the development of scalable subtitling workflows for Saudi Arabia's tourism and media sectors.

Keywords: Audiovisual translation, AVT tools, Subtitling efficiency, Cultural appropriateness, Saudi Vision 2030.

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الآداب
للدراسات اللغوية والأدبية

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تأثير أدوات الترجمة السمعية البصرية على كفاءة الترجمة التوضيحية وملاءمتها الثقافية في مقاطع الفيديو الترويجية للسياحة السعودية

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الملخص:

يهدف البحث إلى تقصي أثر أدوات الترجمة السمعية البصرية في كفاءة الترجمة التوضيحية وملاءمتها الثقافية في مقاطع الفيديو الترويجية للسياحة السعودية، مع التركيز على دقة الترجمة، والتزامن، وفاعلية نقل المضامين الثقافية إلى الجمهور المستهدف. وفي إطار خارطة طريق التنويع الاقتصادي لرؤية السعودية 2030، تطمح المملكة إلى استقطاب 100 مليون زائر سنويًا، مما يولد حجمًا غير مسبوق من المواد الترويجية المتعددة الوسائط. وتتطلب هذه المواد، بدءًا من الحملات التراثية في الدرعية والعلا وصولًا إلى الأدلة الإجرائية للحج والعمرة، ترجمة سمعية بصرية دقيقة. ومع ذلك، لا تزال الممارسات الإقليمية مقيدة بأساليب الترجمة اليدوية، مما يسبب اختناقات إجرائية وأخطاء ترجمية. تبحث هذه الدراسة التأثير المباشر لاستخدام حزم برمجيات الترجمة السمعية البصرية المتخصصة (مثل Aegisub للضبط الزمني والمكاني وMemoQ لإدارة المصطلحات) مقارنة بأساليب العمل اليدوية التقليدية باستخدام معالج النصوص. أُجريت تجربة عشوائية محكومة (N=50) قام خلالها المشاركون بترجمة مقطعي فيديو ترويجيين مدة كل منهما 4 دقائق. وقُيِّم الأداء عبر سرعة الإنتاج الموضوعية ومقياس تحكيم معتمد من الخبراء من 100 نقطة يقيس الملاءمة الثقافية والتنفيذ التقني والاتساق المصطلحي. أظهرت النتائج أن مستخدمي أدوات الترجمة المتكاملة حققوا كفاءة عالية ودرجات تفوق في الملاءمة الثقافية مدعومة بالضبط الصوتي وقواعد المصطلحات الديناميكية. كما أن الخبرة السابقة في أدوات الترجمة ساهمت في تعزيز هذه المكاسب، مما يقدم أساسًا لتحديث برامج تدريب المترجمين وبناء مسارات عمل رقمية مستدامة في قطاعي الإعلام والسياحة.

الكلمات المفتاحية: الترجمة السمعية البصرية، أدوات الترجمة السمعية البصرية، كفاءة الترجمة التوضيحية، الملاءمة الثقافية، رؤية السعودية 2030.

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1. Introduction

1.1 Background

Saudi Arabia's national transformation agenda, Vision 2030, places tourism and cultural heritage as key sectors for sustainable economic diversification (Kingdom of Saudi Arabia, 2026). The Kingdom's strategic plan to welcome 100 million domestic and international visitors every year has led the development of large marketing channels managed by organisations like the Ministry of Tourism, Saudi Tourism Authority (STA), and the General Entertainment Authority (GEA) (Kingdom of Saudi Arabia, 2026; Vision 2030 Tracker, 2026). Promotional campaigns both within and outside the country through international media and national media like Visit Saudi regularly feature a variety of destination profiles (Alharbi, 2025; Kingdom of Saudi Arabia, 2026). These projects include the At-Turaif district in Diriyah, a UNESCO World Heritage Site; the monumental sandstone heritage of AlUla; luxury coastal developments along the Red Sea; and logistical orientation materials for millions of annual Hajj and Umrah pilgrims (Alharbi, 2025; Kingdom of Saudi Arabia, 2026).

Furthermore, the domestic market in Saudi Arabia is made up of more than 35% expatriates (Resala Translation Services, 2025). The use of English-subtitled media is very important for residents in the neighborhood in making domestic travel plans, navigating civic spaces, and orienting to the culture (Resala Translation Services, 2025). Audiovisual media assets, therefore, demand accurate, high-volume localization that fits within a fast time frame while maintaining cultural fidelity (Alharbi, 2025; Saudisoft, 2025).

The subtitling process, in turn, is a multimodal transfer process that is subject to specific spatial, temporal, and semiotic constraints in audiovisual translation (AVT) (Bogucki, 2023; Díaz-Cintas, 2021). Subtitled assets need to match the viewer's reading tempo, the line limits, and the cuts of the visual scene with the audio in spoken dialogue. (Pedersen, 2011). For the making of promotional tourism videos, subtitling requires not only technical accuracy, but also dynamic cultural mediation (Alangari, 2022; Díaz-Cintas, 2021). Rather than just being meant to receive linguistic transfers, viewers are expected to analyse and interpret a country's history, norms, and religious practices within a streamlined line of translated text (Alharbi, 2025; Pedersen, 2011).

Special translation technologies are needed to achieve this standard (Alkhatnai, 2021; Al-Rumaih, 2021). The specialized subtitling software, such as Aegisub, offers an audio waveform visualization, automatic time-code generation, and characters per second (CPS) tracking during subtitle display, which helps to stabilize the subtitle display time and line distribution (Díaz-Cintas, 2021). At the same time, computer-assisted translation (CAT) systems like MemoQ bring in centralized termbases and translation memories that enforce lexical standardization on the episodic media campaigns (Al Qahtani, 2023; Saudisoft, 2025). When combined, these tools form a cohesive workflow that optimizes the time and effort required to process complex video sequences, while minimizing cognitive strain and manual formatting issues, ensuring a seamless, coherent narrative (Díaz-Cintas, 2021; Saudisoft, 2025).

1.2 Problem Formulation: Technological Disconnect and Cultural Vulnerability

Although there are platforms dedicated to media localization, there is still an apparent gap between the technological capacity and the current practices of translation in the Saudi media localization market (Alangari, 2022;

Aldossary, 2023). The studies conducted in the field reveal that about 45% of the commercial localization companies and institutional translation offices in the Kingdom still use manual and non-assisted workflows (Aldossary, 2023). In such contexts, the translator types the subtitles in a general word processor (e.g. Microsoft Word), inserts the time codes manually by employing consumer video players, and searches for domain-specific expressions in different types of scattered reference material (digital and print versions) (Al-Jarf, 2017; Althbaity, 2024).

The manual operational model creates systemic workflow blocks (Saudisoft, 2025). A lot of time is wasted by translators in calculating the boundaries of the spots, and the terminology must be retyped, which increases the production turnaround time and costs of labor (Althbaity, 2024; Díaz-Cintas, 2021). These procedural inefficiencies often result in technical glitches, such as the use of too-short subtitles on screen, segment reading times that are too long to be comfortable, or awkward line breaks across cuts that are not syntactically correct (Díaz-Cintas, 2021; Pedersen, 2011).

Most importantly, manual subtitling processes violate cultural appropriateness (Alharbi, 2025; Althbaity, 2024). Saudi Arabia tourism promotional material is characterized by the presence of Culture-Specific Items (CSIs), regional dialect, and sacred Islamic terminology (Alharbi, 2025). For instance, a promotional video for historical Diriyah usually contains expressions that are typical of the Najdi linguistic environment, terms used to describe architecture and refer to traditional mud-brick buildings (e.g., *Al-Malazz* or *Manfuhah* structural idioms), and local social formulas with no direct equivalents in Western target languages (Alangari, 2022; Pedersen, 2011).

Likewise, the vocabulary of the rite of Ihram, Tawaf, Sa'i, and boundary designations (Miqat) associated with the holy cities of Makkah and Madinah is a non-negotiable aspect of the instruction provided in the content. In situations where translators work under tight deadlines and without access to centralized and automated databases, they often resort to semantic reductions or inappropriate calques (Alharbi, 2025; Díaz-Cintas, 2021). Errors in rendering sacred rituals or oversimplification of a regional dialect phrase do not just confuse the viewer, but also ruin the religious protocol and diminish the true cultural representation that the campaign intends to portray (Alharbi, 2025; Pedersen, 2011).

This disconnect represents a critical challenge for both academic training and professional practice (Al-Jarf, 2017; Alkhatnai, 2021). Moreover, empirical research conducted at the translation faculties of universities in Saudi Arabia reveals that specialized training in AVT is still not a major focus of study (Alangari, 2022; Alenzi, 2022). The majority of undergraduate and postgraduate programs cover audiovisual translation within the scope of a general media translation elective, with a focus on theory and little practical experience with the software commonly used in the industry, such as Aegisub, EZTitles or MemoQ (Al-Rumaih, 2021; Alhatnai, 2021; Alangari, 2022).

Graduates of this program are introduced to the concept of translation, but the software they use to produce media is still limited (Aldossary, 2023; Althbaity, 2024). Those who do not have technical tools for spotting will spend twice the industry-standard time to complete a subtitling task and will deliver subtitles with a cultural fidelity of around 30% lower than others, because of manual intervention and formatting fatigue (Althbaity, 2024; Díaz-Cintas, 2021). This educational deficit presents a continuous operational challenge, especially given the need to build localization capacity (Alharbi, 2025; Digital Government Authority, 2025) in the Kingdom's media infrastructure.

1.3 Research Gap

A literature survey was performed to determine the research gap based on targeted research of the existing relevant literature in the primary academic indexes and databases, such as Scopus, Web of Science, ScienceDirect, and Google Scholar, targeting trends in audiovisual translation, localization, and the adoption of translation technology in Saudi Arabia and across the Gulf Cooperation Council (GCC) region. Previous studies have identified trends in technological adoption, models of translation curricula, and, in general, localization concerns (Alamri, 2023; Al Qahtani, 2023; Al-Jarf, 2017; Alkhatnai, 2021), but a critical examination of the previous studies shows that they are mostly descriptive, qualitative, or perceptual self-report surveys and curricular audits (Alangari, 2022; Alenzi, 2022). There have been previous studies on the attitudes of translators towards CAT tools (Alharbi, 2025; Al-Rumaih, 2021) and on the errors of machine translation in journalistic corpora (Saudisoft, 2025). However, the extensive literature review shows that there are no controlled experimental studies to measure the functional effectiveness of integrated AVT tools in terms of objective production speed and the blind-evaluated cultural appropriateness of authentic Saudi promotional tourism media (Al Qahtani, 2023; Althbaity, 2024). Further, there is no comparative experimental data in the current literature that can be used to compare the performance of the dedicated temporal synchronization software (Aegisub) and that of the dynamic terminology management (MemoQ) under realistic agency constraints (Al-Rumaih, 2021; Saudisoft, 2025). The field requires empirical data, control and experimental environments, to evaluate whether using special software environments will diminish the cognitive-procedural load of the translator and enable him/her to produce culturally appropriate subtitles, without sacrificing turn-around time (Díaz-Cintas, 2021; Pedersen, 2011).

1.4 Research Questions and Hypotheses

To address this empirical gap mentioned above, this study investigates the effect of using specialized AVT tools on Saudi translation trainees and Media Professionals subtitling the promotional video materials. The study aims to answer three main research questions:

RQ1: To what extent do specialized AVT tools improve subtitling efficiency compared to conventional manual methods?

RQ2: How do specialized AVT tools enhance the cultural appropriateness of subtitles?

RQ3: How does prior software experience moderate the performance advantages of AVT tools?

This investigation is based on cognitive load models in multimedia localization and translation technology theories (Díaz-Cintas, 2021) to test three formal hypotheses:

- **Hypothesis 1 (H1):** Participants utilizing specialized AVT tools (Aegisub and MemoQ) will exhibit significantly higher subtitling efficiency (shorter completion times per video minute) than participants using conventional manual methods.
- **Hypothesis 2 (H2):** Subtitles generated via specialized AVT tools will receive significantly higher cultural appropriateness ratings on a validated expert rubric than those generated via manual methods.

- **Hypothesis 3 (H3):** Prior CAT/AVT software experience will significantly moderate the performance advantages of AVT tools, such that experienced participants will demonstrate greater gains in efficiency and cultural appropriateness than novice participants.

1.5 Significance of the Study

The findings of this study fit well with the strategy of the creative digital economy in Saudi Arabia and the Vision 2030 (Digital Government Authority, 2025; Kingdom of Saudi Arabia, 2026), demonstrating direct alignment across the following key dimensions:

- Pedagogical Significance: The empirical results offer evidence for the effect of the use of a dedicated AVT software in a university translation course (Alangari, 2022; Alkhatnai, 2021). The present work goes beyond a descriptive recommendation and illustrates how experiential tool-based instruction connects academic preparation and commercial media localization requirements (Aldossary, 2023; Alenzi, 2022).
- Industrial & Economic Significance: For the national tourism boards, media production agencies, and public communication authorities (MOI, STA, GEA), the study provides operational references for organizing localization pipelines (Alharbi, 2025; Saudisoft, 2025). When specialized software can be proven to enhance turnaround times while maintaining cultural and religious nuances, it gives institutions a reason for investing in technology (Kingdom of Saudi Arabia, 2026; Resala Translation Services, 2025).
- The study contributes to the national goals of Saudisation in the media and digital communications industry (Digital Government Authority, 2025; Kingdom of Saudi Arabia, 2026). Investing in Saudi translators with specific technical skills will help preserve cultural heritage and religious expressions in international promotional media, ensuring that the Kingdom's message is genuine, professional, and scalable (Alharbi, 2025; Althbaity, 2024).

2. Literature Review and Conceptual Framework

2.1 Multimodal AVT Paradigms and the Cultural Turn

Audiovisual translation (AVT) falls somewhere between the semiotic systems, as it demands the simultaneous management of verbal-auditory dialogue, non-verbal auditory cues, verbal-visual text, and non-verbal pictorial movements (Chaume, 2004; Díaz-Cintas & Remael, 2021). The typologies developed by Gottlieb (1992, 1998) are all the basis for the definition of subtitling as a form of intercultural mediation that is overt, diamesic, and constrained. When spoken discourse is dynamic and multi-register, the subtitles must be rendered in a way that makes them easy to read, that is, in a two-line orthographic segment at the bottom of the screen (Gottlieb, 1998).

In contrast to the loose spatial-temporal requirements of literary/expository text translation, subtitling is constrained by strict spatial-temporal requirements (Díaz-Cintas & Remael, 2021; Georgakopoulou, 2019). Limiting the number of characters per line (CPL) of subtitles to 35 and 42 characters, respectively, is a spatial restriction that prevents the visual occlusion of compositions on the screen. (Díaz-Cintas & Remael, 2021) Subtitles should follow the "six-second rule", or 12-17 characters per second (CPS), to align with the average reading speed of viewers, and to ensure uninterrupted visual engagement (Díaz-Cintas, 2021; Pedersen, 2011).

These technical boundaries are directly connected to the "cultural turn" in translation studies (Bassnett & Lefevere, 1990; Snell-Hornby, 1990) in the context of promotional tourism discourse. Promotional tourism videos are not just about telling the facts; they also spread national identity, create sensory immersion, and attempt to sell the country to potential foreign tourists (Bogucki, 2023; Valdés, 2013). These semiotic transfers can be examined in the light of the taxonomy by Pedersen (2005, 2011) of Extralinguistic Cultural References (ECRs). According to Pedersen (2005, 2011), ECRs can be defined as culture-bound expressions, which occur when the associated physical object, custom, historical event, or geographical landmark is not known by the target-language audience without prior source-culture encyclopedic knowledge.

When it comes to audiovisual marketing campaigns, the problem with ECR transfer must be solved by the subtitlers, who have to create a balance between cognitive legibility and cultural authenticity (Agost, 2020; Pedersen, 2011). Manual handling of technical spotting and/or character counts often means that subtitlers resort to textual condensation, omission strategies, and over-generalization (Díaz-Cintas & Remael, 2021). These decisions remove cultural substance from promotional media, which is important for destination branding (Bogucki, 2023; Valdés, 2013). Thus, technical spotting and cultural mediation can no longer be seen as two facets of the same work, but as two systems that must be considered together rather than separately (Chaume, 2004; Pedersen, 2011).

2.2 Cultural Mediation in Tourism Discourse and Religious Nuances

Localizing Saudi tourism campaigns is a specific challenge because of the use of regional dialect markers, culture-specific items (CSIs), and sacred Islamic liturgical vocabulary (Alharbi, 2025; Alangari, 2022). In a theoretical sense, the issue of foreignization/domestication (Venuti, 1995) is one of the key questions that translators are confronted with in this regard (Alangari, 2022).

Domestication is the process of integrating cultural differences by substituting the markers in the source with their equivalents in the target culture (Venuti, 1995). Such a tactic may reduce cognitive strain for international travelers, but it can also result in the loss of the authentic heritage that is the goal of promotion campaigns (Agost, 2020; Valdés, 2013). On the other hand, foreignization is a deliberate approach that involves the maintenance of elements from the source language (SL) and culture (Venuti, 1995). However, when it comes to subtitling, radical foreignization (e.g. unglossed transliterations) may not help comprehension if the reading speeds are above CPS limits (Díaz-Cintas & Remael, 2021; Pedersen, 2011).

This dynamic can be seen in Saudi promotional videos, where materials about historic places like Diriyah, AlUla, and old Jeddah are dominated by the accessibility of this aspect (Alharbi, 2025; Resala Translation Services, 2025). These materials integrate common words and phrases of Najdi and Hejazi Arabic such as traditional architectural terms, customary greetings, and historical idioms that cannot be literally translated (Alangari, 2022; Alharbi, 2025). If terms such as Al-Turaif, Al-Dirwazah, and Al-Bujairi are translated into English as "old quarter", "historic gate," or "historic gate", the subtitler is not providing cultural information. These neutralizations remove the local cultural element from promotional materials (Alangari, 2022; Valdés, 2013).

Based on the above, Table 1 presents the matrix of cultural mediation pathways in Saudi tourism subtitling, illustrating the operational and cognitive dimensions underlying the empirical comparison. This framework compares the current manual procedures with the procedure that is supported by a tool, along four main aspects: cognitive load and time pressure, handling of Culture-Specific Items (CSIs), liturgical and dialectal precision, and technical-spatial execution. The automation of waveforms, termbase integration, and other features in tools such as Aegisub and MemoQ reduces the cognitive burden of translation by allowing the translator to concentrate on the cultural aspects of the translation, which include the ability to balance domestication and general tourist accessibility with foreignization for authenticity and religious representation.

Table 1

Conceptual Matrix of Cultural Mediation Pathways in Saudi Tourism Subtitling

Dimension / Parameter	Manual Workflow Pathway	Tool-Assisted Workflow Pathway (Aegisub / MemoQ)	Strategic Outcome
Cognitive Load & Time Pressure	High extraneous cognitive load due to manual waveform spotting and character-per-second (CPS) calculations.	Minimized cognitive load through automated waveform visualization and real-time CPS monitoring.	Greater allocation of cognitive resources to cultural and liturgical transfer.
Culture-Specific Items (CSIs)	Frequently resorts to textual condensation, omission, or over-generalization due to tight deadlines.	Leverages integrated termbases (.sdltb/.tbx) and translation memories for consistent rendering.	Balanced application of **Domestication** (for general tourism appeal) and **Foreignization** (for authentic heritage context).
Liturgical & Dialectal Terms	Risk of mistranslation or flattening of Najdi dialectal markers and Islamic ritual terms (e.g., Miqat, Tawaf).	Preserves canonical religious terminology and regional markers accurately via stored glossary entries.	High **Liturgical Precision** and **Dialect Authenticity** without violating reading rate constraints.
Syntactic & Spatial Execution	Sub-optimal subtitle segmentation, frequent line-break errors, and uneven reading speed compliance.	Precise temporal-spatial spotting, automated cue alignment, and strict adherence to segmentation rules.	Superior **Technical Execution** and smooth cognitive legibility for the target audience.

It is even more precise to localise sacred Islamic terms in promotional and educational guides for the Umrah and Hajj (Alharbi, 2025). The doctrine of the ritual actions of Islam such as Tawaf, Sa'i, Ihram, Tahallul, and canonical geographic stationing (Miqat), is doctrinally bounded (Alharbi, 2025; Saudisoft, 2025). Inappropriate cultural adaptations or lexical calques, such as translating the term Tawaf into "encircling", or Ihram into "pilgrim costume" may result in ritual ambiguity and misprovision of ritual directions for non-Arabic-speaking pilgrims (Alharbi, 2025; Resala Translation Services, 2025).

Alangari (2022) points out that the successful localization of a tourism product in the Saudi Arabian context must take balanced approaches: whilst maintaining the source authenticity by following the transliteration conventions, the subtitlers should also include explications that are as few and as context-sensitive as possible, and should be limited

to the time required to complete the process (Pedersen, 2011). This balance can only be maintained consistently with integrated terminology management systems that provide guidance on the choices of terms in real time (Bowker, 2020; Saudisoft, 2025).

2.3 AVT Software vs. Generic CAT Workflows

The cognitive and mechanical requirements of the subtitling task give a theoretical justification to compare specialized AVT tools with the traditional manual process (Al-Rumaih, 2021; Díaz-Cintas, 2021). The Cognitive Load Theory (CLT) developed by Sweller (1988, 2011), suggests that the working memory capacity of the human mind is limited and divided into three parts: intrinsic load (complexity of information present in the task); extraneous load (procedural or presentation format of the information); germane load (acquisition of the schemas and deep processing of the information).

Translators have to deal with a higher level of extraneous cognitive load (ECL) in an unassisted or generic word-processing workflow (WPW), such as Microsoft Word and media players (Al-Jarf, 2017; O'Hagan, 2020). The translator should speak and repeat the following:

1. Manually pause, rewind, and fast-forward media to identify scene cuts and dialogue boundaries.
2. Calculate time codes down to the millisecond to generate in- and out-points.
3. Count line characters manually to prevent visual overflow.
4. Alt-tab between disparate windows to access electronic or printed reference dictionaries for terminological queries.

For further understanding of the differences in operation, Table 2 compares the cognitive load and operational workflow in the case of using a conventional manual practice with that of using an integrated audiovisual translation suite. The breakdown helps to better demonstrate how manual processes force cognitive resources to be split across the different timing, character counting, and lookup tasks that are required to complete them, often leading to time-pressure-related omissions. On the other hand, integrated AVT environments allow the subtitler to focus on higher-level cultural and liturgical mediation while removing any cognitive load from having to keep up with multiple sources of wave shape information, multiple real-time characters-per-second (CPS) reports, and multiple terminology databases.

Table 2

Comparative Cognitive Load and Operational Flow Between Conventional Manual Workflows and Integrated AVT Suites

Conventional Manual Workflow (High Cognitive Load)	Integrated AVT Suite workflow (Optimized Cognitive Load)
1. Video & Script Input	1. Video & Script Input
2. Manual Waveform/Time spotting	2. Automated Waveform & Sync
3. Manual CPS & Character Check	3. Real-Time CPS & Character Monitoring
4. Omission & Condensation under Pressure	4. Termbase & TM Integration
Outcome: High extraneous cognitive load, increased error rate, and cultural flattening	Outcome: Minimized cognitive load, high technical precision, and cultural authenticity

This mechanical fragmentation has an effect on cognitive resources that are needed for other higher-order cognitive processes in decision-making, including dialectal adaptation and terminological verification (Althbaity, 2024; O'Hagan, 2020).

In contrast, specialized AVT tools such as Aegisub integrate temporal spotting with spatial visualization (Díaz-Cintas, 2021). The dynamic audio visualization and markers for visual scenes provided by Aegisub allow the translator to align the in- and out-cues of the subtitles with the speech patterns with a single click (Díaz-Cintas & Remael, 2021). Automated character counters are used to check line limits and inform the translator in real time if the CPS thresholds are being exceeded, thus avoiding subtitle timing errors (Díaz-Cintas, 2021).

In combination with sophisticated computer-assisted translation (CAT) software packages, such as MemoQ, translators can access interactive concordance databases, translation memories and domain-specific termbases (Al Qahtani, 2023; Bowker, 2020). In MemoQ, pre-approved translations for the target language are automatically highlighted, and dialectal markers or words of sacred religious dimension are highlighted in the user interface (Al Qahtani, 2023; Bowker, 2020).

Integrated AVT suites reduce extraneous cognitive load (O'Hagan, 2020; Sweller, 2011) by automating task synchronization and terminology retrieval. The procedural relief enables translators to focus their working memory on the extralinguistic complexities, such as the dialectal nuances, liturgical terms, and numerous other references that may arise in the translation process (Alharbi, 2025; Pedersen, 2011).

2.4 Translation Technology Pedagogy and Industry Practice in Saudi Arabia

Part of the operational gap in the Saudi Arabian media localization industry is due to pedagogical and institutional structures (Alangari 2022; Alkhatnai 2021). Aldossary (2023) and Al-Jarf (2017) provide further evidence of this tension between universities and localization in the industry in the Riyadh region and the wider GCC, respectively.

According to Al-Rumaih (2021) and Alkhatnai (2021), translation departments in Saudi Arabia have evolved translation technology modules, but coursework is still dominated by the general CAT architectures (e.g., SDL Trados Studio or Wordfast) and is still being taught using static expository prose. Specialized AVT software like Aegisub, Subtitle Edit or EZTitles is often an elective late topic, where students are expected to learn it theoretically without actual practical applications and lab sessions (Alangari, 2022; Alenzi, 2022).

Thus, upon completion of the program, translation graduates will have theoretical knowledge of the constraints of audio-visual translation, but not much procedural knowledge of waveform spotting, shot-change boundaries, and the interface of subtitling software. (Aldossary, 2023; Al-Rumaih, 2021). Such a disconnect has repercussions for professional practice. According to Althbaity (2024), the study on freelance and agency translation practices in the Kingdom of Saudi Arabia (KSA) found that more than 45% of the respondents were still using general word processors or text spreadsheets to handle subtitling orders (Aldossary, 2023). High commercial license fees for proprietary broadcast subtitling suites, steep learning curve and lack of formal training are issues commonly reported by practitioners in their studies of why they do or do not use software for subtitling (Al Qahtani, 2023; Althbaity, 2024).

Manual translators indicated that the translation of multimedia assets took almost twice the time that was required for text-based documents, and that the subtitles were full of frequent time lapses and use of different terms in different scenes of the series (Al Qahtani, 2023; Althbaity, 2024). Manual subtitling techniques produce bottlenecks in the tourism sector because of the constrained timeframe of promotional campaigns and institutional marketing strategies, which are seasonal in nature (Alharbi, 2025; Saudisoft, 2025).

In response, regional scholars have called for pedagogical and structural realignments within Saudi translation programs (Alangari, 2022; Aldossary, 2023). Alangari (2022) emphasizes the need to embed open-source and modular AVT suites into undergraduate curricula to develop industry-ready skills that support the cultural and tourism initiatives of Vision 2030 (Digital Government Authority, 2025). Similarly, Al Qahtani (2023) and Alamri (2023) highlight the pedagogical value of combining terminology management tools with multimedia platforms to foster terminological consistency and cultural awareness among trainees.

However, existing regional literature remains largely reliant on perceptual surveys, curricular audits, and self-report evaluations (Alangari, 2022; Alkhatnai, 2021; Al-Rumaih, 2021). Controlled experimental studies that measure how specialized AVT tools influence objective production speed and blind-evaluated cultural appropriateness within authentic Saudi tourism promotional campaigns remain absent from the literature (Althbaity, 2024). This study addresses that empirical gap by investigating these variables through a controlled, laboratory-based experiment (Díaz-Cintas, 2021; Pedersen, 2011).

3. Methodology and Experimental Design

3.1 Research Design

This study employs a randomized, post-test between-subjects controlled experimental design to quantify the functional effects of dedicated audiovisual translation (AVT) tools on subtitling efficiency and cultural appropriateness (Díaz-Cintas, 2021; Saldanha & O'Brien, 2014). The experimental architecture compares two distinct operational environments under simulated media agency conditions:

1. **Experimental Group:** An integrated AVT technological suite combining Aegisub (v3.4.2) for temporal spotting, waveform audio synchronization, and visual line-break restrictions, paired with MemoQ (v10.2) for automated terminology management and translation memory lookups.
2. **Control Group:** A conventional, unassisted manual workflow consisting of Microsoft Word (v365) alongside a basic standalone media player (VLC Media Player v3.0) and conventional lexicographical resources (printed and static online reference dictionaries).

Both groups were exposed to identical authentic audiovisual stimuli under standardized, timed laboratory conditions (Díaz-Cintas, 2021; Saldanha & O'Brien, 2014). The laboratory workstations were standardized regarding hardware configuration, operating environment, display resolution, and peripheral acoustic monitoring equipment to eliminate extraneous environmental variance.

To map the operational progression of the empirical investigation, Table 3 illustrates the randomized experimental design and multi-tiered evaluation architecture. The framework outlines the sequential phases of the study: beginning with the random sampling and equal allocation of the 50 professional translators, proceeding through the controlled administration of the two distinct tourism stimuli (Diriyah heritage marketing and Umrah pilgrimage guidance), contrasting the tool-assisted experimental group against the manual control group, and finally culminating in the multi-tiered blinded evaluation measuring both efficiency metrics and qualitative rubric scores across technical execution and cultural appropriateness.

Table 3

The Randomised Experimental Design and Multi-Tiered Evaluation Architecture for Saudi Tourism Audiovisual Localization

Stage 1: Participant Sampling & Randomization	**Stage 2: Stimulus Administration (Controlled Environment)**	**Stage 3: Workflow Intervention**	**Stage 4: Multi-Tiered Blinded Evaluation**
Cohort: 50 Professional Translators ($M = 2.7$ yrs exp). Split: Random assignment into two equal groups ($n = 25$ each).	Stimulus A: Diriyah Heritage Promotional Video (Culture-Specific Items & Dialect). Stimulus B: Umrah Pilgrimage Guidance Video (Liturgical & Canonical Terminology).	Experimental Group ($n = 25$): Utilized integrated AVT suites (Aegisub & MemoQ) with automated waveform and termbases. Control Group ($n = 25$): Utilized conventional manual workflows and standard text editors.	Efficiency Metrics: Combined turnaround time (min/video min). Technical Rubric (35 pts): Spotting, reading rate, segmentation. Cultural Rubric (45 pts): Dialect, liturgical precision, explicitation & tone.

As for the operational procedure, all the participants in both cohorts were given the translation task for both stimulus videos, namely, Clip 1 (Diriyah Heritage), followed by Clip 2 (Umrah Guide), in the same order. Before the data collection, the participants were given a compulsory briefing of 45 minutes that introduced them to the goals of the experiment and to the time management parameters. In particular, the experimental group was given a 30-minute technical walkthrough session with emphasis on the Aegisub waveform synchronization features and MemoQ automated terminology management, while the control group was given an orientation session on normal use of Microsoft Word and VLC media player. The control group participants used conventional (print and static online) reference dictionaries during the task window (45 minutes per clip), while the experimental group participants used MemoQ integrated dynamic termbases and translation memories in addition to a digital contextual lexicon.

3.2 Participants and Sampling

A total cohort of $N = 50$ bilingual Arabic-English translators was recruited from higher education institutions (e.g., King Saud University and Princess Nourah bint Abdulrahman University) and commercial localization agencies operating within the Riyadh metropolitan area. Inclusion criteria required participants to hold a minimum of two years of verified academic or professional translation practice and to possess demonstrated upper-intermediate to advanced English language proficiency (minimum Level B2/C1 on the Common European Framework of Reference for Languages, verified via institutional TOEFL/IELTS certification or standardized departmental placement records).

To balance technical exposure, participants' baseline familiarity with computer-assisted translation (CAT) suites was cataloged, distinguishing between participants with prior CAT software exposure and software novices. Participants were assigned via stratified random sampling to either the Experimental Group ($n = 25$) or the Control Group ($n = 25$). Stratified random sampling was carried out in order to have a balanced distribution of some technical skills: first, the participants were divided into two strata, according to their prior experience of computer-assisted translation (CAT) (experienced translators vs. novices). A computer-generated random sequence, generated using the same random number algorithm (random seed generator in SPSS v28.0) and matched 1:1 with the same number of participants assigned to either the Experimental Group or the Control Group, was used within each stratum to assign participants to one of these two groups according to their baseline technical proficiency. Demographic analysis established baseline equivalence across both cohorts regarding age ($M = 23.8$ years, $SD = 2.4$), gender distribution (62% female, 38% male), translation experience ($M = 2.7$ years, $SD = 0.8$), and formal linguistic qualification ($p > .05$ across all baseline demographic covariates).

Ethical compliance adhered to international standards for empirical research involving human subjects. Institutional Review Board (IRB) approval was secured through the Al-Baha University, Saudi Arabia ethics committee before data collection. All participants were informed of the experimental objectives, experimental parameters, data anonymization mechanisms, and their right to withdraw without institutional prejudice. Written informed consent was obtained from each subject prior to session commencement. All performance datasets and demographic records were pseudonymized through alphanumeric identifier codes to preserve strict subject confidentiality.

3.3 Stimulus Materials

The experimental stimuli comprised two standardized 4-minute audiovisual clips selected from official public promotional archives (Visit Saudi and the Ministry of Hajj and Umrah) (Kingdom of Saudi Arabia, 2026; Resala Translation Services, 2025). These video assets represent approximately 75% of high-volume tourism media localization output in Saudi Arabia, encompassing both historical-cultural marketing and procedural-liturgical orientation (Alharbi, 2025; Saudisoft, 2025):

1. **Stimulus Clip 1 (Diriyah UNESCO Heritage Feature):** A 4-minute promotional clip displaying the mud-brick architecture, cultural restoration, and historical heritage of the At-Turaif district in Diriyah. This clip is linguistically characterized by Najdi vernacular expressions, culture-specific architectural terminology (e.g., *Al-*

Malazz, *Dirwazah*, *Al-Bujairi*), and culturally bound idiomatic formulas requiring contextual explicitation without exceeding subtitle reading limits.

2. **Stimulus Clip 2 (Umrah Pilgrim Preparation Guide):** A 4-minute instructional video detailing administrative and devotional procedures for international pilgrims arriving in Makkah. This asset contains canonical Islamic liturgical terminology (e.g., *Ihram*, *Tawaf*, *Sa'i*, *Talbiyah*, *Miqat*, *Tahallul*) and procedural legal-theological expressions where translation inaccuracies distort religious protocol.

Each clip exhibited comparable dialogue density (M = 482 spoken Arabic words per clip), dynamic audio quality, and visual scene-cut frequencies (M = 38 shot changes per clip). The maximum permissible task duration was capped at 45 minutes per clip, replicating the compressed turnaround demands typical of commercial localization agencies (Althbaity, 2024).

3.4 Operationalization of Variables

3.4.1 Subtitling Efficiency

Subtitling efficiency was operationalized as an objective temporal quotient indicating the labor time invested per unit of finished audiovisual material (Díaz-Cintas, 2021; Saldanha & O'Brien, 2014). Automated tracking software logged task initiation and file export times. Efficiency (E) is formally calculated as:

$$E = T_{comp} / V_{dur}$$

Where T_{comp} represents the total elapsed working time in minutes required to produce, spot, and review the target subtitle file, and V_{dur} denotes the standardized runtime of the source video clip (V_{dur} = 4.0 minutes). Lower efficiency index values indicate higher productivity (i.e., fewer operational minutes required per subtitled video minute).

3.4.2 Cultural Appropriateness and Technical Quality

Subtitling quality was evaluated using a validated 100-point rubric developed from the translation quality assessment frameworks of Pedersen (2011) and Díaz-Cintas and Remael (2021), modified for Saudi tourism discourse. The rubric partitions translation competence across three explicit evaluation dimensions:

- **Cultural Appropriateness (45 Points):** Measures the precision and contextual fidelity of localized Extralinguistic Cultural References (ECRs), dialectal preservation of Najdi idioms, and canonical accuracy in translating sacred Islamic liturgical terminology without over-domestication or semantic erasure (Alangari, 2022; Pedersen, 2011).
- **Technical Execution (35 Points):** Assesses conformity with audiovisual subtitling constraints, including line division syntax, characters-per-second (CPS) adherence within the 12–17 CPS window, characters-per-line (CPL) thresholds (≤ 37 CPL), and temporal synchronization with spoken acoustic cues and cinematographic scene cuts (Díaz-Cintas, 2021).
- **Terminology Consistency (20 Points):** Evaluates internal coherence across recurring institutional, historical, and sacred lexical items throughout the multi-scene promotional sequence (Bowker, 2020; Saudisoft, 2025).

The complete breakdown of scoring parameters, criteria distributions, and assessment benchmarks is detailed in Table 4.

Table 4. The 100-Point Subtitling Quality Assessment Rubric for Saudi Tourism Audiovisual Localization

Dimension	Points	Core Assessment Parameters	Evaluation Benchmarks
Cultural Appropriateness	**45**	**A. Dialect Authenticity (15 pts):** Fidelity to Najdi regional idioms, vernacular expressions, and traditional cultural nuance (Alangari, 2022). **B. Liturgical Precision (15 pts):** Accuracy in rendering sacred Islamic terminology (*Ihram*, *Miqat*, *Tawaf*), avoiding misleading calques (Alharbi, 2025). **C. Explicitation & Tone (15 pts):** Calibrated cultural mediation for non-Arabic international audiences without semantic dilution (Pedersen, 2011).	**40–45:** Flawless cultural mediation; preserves heritage nuance and sacred terminology with exact contextual alignment. **30–39:** Minor cultural omissions; slight over-domestication that does not impair meaning. **20–29:** Recurring cultural distortions; inappropriate calques of religious terms. **<20:** Severe cultural dissonance or misleading lexical substitutions.
Technical Execution	**35**	**A. Spatial-Temporal Spotting (15 pts):** Accurate in/out cue synchronization matching acoustic speech boundaries and visual shot changes (Díaz-Cintas, 2021). **B. Reading Rate Compliance (10 pts):** Strict enforcement of reading speed (12–17 CPS; max 37 CPL) (Pedersen, 2011). **C. Syntactic Segmentation (10 pts):** Natural grammatical line-breaks across line 1 and line 2 (Díaz-Cintas & Remael, 2021).	**30–35:** Frame-accurate spotting; zero visual bleed across cuts; reading rates fully compliant. **22–29:** Occasional timing lags (≤ 500 ms); minor CPS violations on dense dialogue. **15–21:** Frequent desynchronization; awkward grammatical splits. **<15:** Unsynchronized spotting; subtitles unreadable or occluding image composition.
Terminology Consistency	**20**	**A. Institutional Naming (10 pts):** Uniform rendering of destination titles, historical figures, and governmental entities (Kingdom of Saudi Arabia, 2026; Saudisoft, 2025). **B. Lexical Uniformity (10 pts):** Consistent cross-subtitle application of agreed-upon theological and cultural target equivalents (Bowker, 2020).	**18–20:** 100% lexical concordance across both promotional clips. **14–17:** Minor lexical divergence on non-essential secondary terminology. **10–13:** Inconsistent translations of primary historical/religious terms. **<10:** Random terminological variation throughout subtitles.

3.4.3 Usability and Implementation Barriers

Following task completion, all participants completed a 12-item post-task survey on a 5-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree) adapted from the Computer System Usability Questionnaire (Al Qahtani, 2023). The survey measured three latent dimensions: perceived cognitive load, software ease-of-use/spotting fluidity, and structural implementation barriers (e.g., lack of curricular training, software licensing costs, technical infrastructure limitations) (Alkhatnai, 2021; Althbaity, 2024).

3.5 Evaluation Protocol and Inter-Rater Reliability

The establishment of the rubric weights, the allocation of points, Cultural Appropriateness (45 points), the Technical Execution (35 points), and the Terminology Consistency (20 points) were determined according to the adapted translation quality assessment frameworks (Pedersen, 2011; Diaz-Cintas & Remael, 2021) suitable for the communicative and cultural

requirements, regional requirements, and religious requirements of Saudi tourism media. In this context, cultural and liturgical fidelity is given much more weight than mechanical restrictions, and there is a strong need to avoid religious misrepresentation and/or semantic erosion of sacred and dialectal signs. In addition, before formal scoring, the rubric validity and reliability of the scoring variance thresholds were thoroughly tested with an independent sample of five non-experimental subtitled clips, during which the expert panel scored samples and high inter-rater concordance (ICC = 0.89) was found.

To eliminate evaluation bias, all final subtitled outputs were pseudonymized, stripped of software metadata, and converted into standardized SubRip (.srt) and plain text transcripts. Submissions were evaluated independently by a panel of three senior Saudi audiovisual translation experts (each possessing over 10 years of professional subtitling experience in regional media institutions and holding master's degrees in translation technologies). The evaluators were blind to participant identity, institutional affiliation, and experimental condition (Experimental vs. Control).

The typographic error in the confidence interval (CI should be 9% instead of 95%) was corrected, and the Fleiss' Kappa (κ) was properly formatted on the original statistical output when audited. Intraclass correlation coefficient (ICC, two-way mixed model, absolute agreement) and Fleiss' Kappa (κ) were used for inter-rater reliability. High inter-rater concordance (ICC = 0.89, 95% CI [0.84, 0.93], $\kappa = 0.87$] was achieved during the calibration phase, which was over the required > 0.86 threshold, before proceeding to main scoring.

3.6 Statistical Analysis Plan

Quantitative analyses were performed using IBM SPSS Statistics (v28.0). Statistical significance was established at $\alpha = .05$ (two-tailed). Prior to parametric analysis, the distributional properties of the dependent variables were assessed using the Shapiro-Wilk test for normality and Levene's test for homogeneity of variance.

The analytical workflow followed three stages:

1. Independent Samples t-Tests: Conducted to evaluate group differences between the experimental (AVT) and control (manual) cohorts across primary outcome metrics: Subtitling Efficiency (*E*), overall rubric scores, and sub-scores (Cultural Appropriateness, Technical Execution, and Terminology Consistency). Effect sizes were calculated via Cohen's *d* (*d* = 0.2 small, *d* = 0.5 medium, *d* ≥ 0.8 large).
2. Two-Way Factorial ANOVA: A 2 X 2 analysis of variance tested the interaction between Group Assignment (AVT vs. Manual) and Prior CAT Software Experience (Novice vs. Experienced) on subtitling efficiency and cultural appropriateness to evaluate Hypothesis 3 (H3). Partial eta-squared ($\eta p2$) served as the measure of effect magnitude.
3. Multiple Linear Regression Analysis: Estimated the predictive influence of usability factors and self-reported operational barriers (from the 12-item questionnaire) on overall subtitling quality, isolating specific cognitive and infrastructural determinants of performance variation (Al Qahtani, 2023; Althbaity, 2024).

4. Results and Data Analysis

4.1 Demographic Profile and Baseline Equivalence

Prior to hypothesis testing, parametric assumptions of normality and homogeneity of variance were verified. The Shapiro-Wilk test indicated that scores across subtitling efficiency and rubric assessment dimensions were normally distributed within each group ($p > .05$). Levene's test confirmed homogeneity of variance across experimental and

control cohorts for both completion time ($F(1, 48) = 1.42$, $p = .239$) and overall rubric performance ($F(1, 48) = 0.88$, $p = .353$).

To establish baseline equivalence between the experimental cohort (n = 25) and the control cohort (n = 25), demographic variables and baseline translation competencies were evaluated (Al Qahtani, 2023; Al-Rumaih, 2021). Table 5 presents participant demographics, language proficiency profiles, translation experience, and prior software familiarity levels.

Table 5

Demographic Characteristics and Baseline Equivalence of Participants (N = 50)

Characteristic	Experimental Group (n=25)	Control Group (n=25)	Test Statistic (t / χ^2)	p-value
Age (Years), *M* (*SD*)	23.92 (2.31)	23.68 (2.54)	$t(48) = 0.35$	.728
Gender, *n* (%)			$\chi^2 (1) = 0.08$	.774
Female	16 (64.0%)	15 (60.0%)		
Male	9 (36.0%)	10 (40.0%)		
Translation Experience (Years), *M* (*SD*)	2.76 (0.78)	2.64 (0.81)	$t(48) = 0.53$	.598
English Proficiency Score (TOEFL iBT / 120), *M* (*SD*)	98.40 (6.12)	97.88 (5.94)	$t(48) = 0.31$	.761
Prior CAT Software Exposure, *n* (%)			$\chi^2 (1) = 0.00$	1.000
Experienced (≥ 1 year verified practice)	12 (48.0%)	12 (48.0%)		
Novice (< 1 year / coursework only)	13 (52.0%)	13 (52.0%)		
Participant Category, *n* (%)			$\chi^2 (1) = 0.09$	.769
Advanced Translation Students	15 (60.0%)	16 (64.0%)		
Media Localization Professionals	10 (40.0%)	9 (36.0%)		

As detailed in Table 5, no statistically significant baseline differences emerged across cohorts regarding age, gender distribution, practical translation tenure, standardized linguistic proficiency, or prior software familiarity ($p > .05$), ensuring that subsequent variance in outcome variables reflects experimental intervention rather than pre-existing group disparities.

4.2 Subtitling Efficiency Outcomes

The efficiency of the subtitling was operationalized as the amount of time needed per minute's runtime of the subtitled video ($E = T_{comp} / 4.0$). Two independent samples t-tests were performed to assess the difference in performance between the two experimental clips (Díaz-Cintas, 2021). For each participant, the overall efficiency score was computed by averaging the individual efficiency scores from the two separate video tasks (Clip 1 and Clip 2). Within the integrated AVT suite, participants' production speed was statistically significantly lower than production speed for those participants restricted to manual Word-processor spotting (M = 6.42 min/video min, SD = 1.15 vs. M = 10.18 min/video min, SD = 1.62; $t(48) = -9.46$, $p < .001$, $d = 2.68$) representing a statistically significant reduction in labor expenditure. In the same way, for Stimulus Clip 2 (Umrah Pilgrim Preparation Guide), the experimental group took significantly less time to complete the task (M = 5.88 min/video min, SD = 0.98) than the control group (M = 9.85 min/video min, SD = 1.48), $t(48) = -11.18$, $p < .001$, $d = 3.16$. The mean efficiency for the AVT group across the two clips (M = 6.15 min/video min, SD = 0.94), and the combined index (M = 6.15 min/video min, SD = 0.94) was significantly lower than for the manual group (M = 10.02 min/video min, SD = 1.41), $t(48) = -11.44$, $p < .001$, $d = 3.24$. Manual translators needed 62.9% more production time per minute of video than did the dedicated software translators. Hypothesis 1 (H1) is supported by these empirical results as they offer strong statistical evidence.

4.3 Cultural Appropriateness and Technical Quality Assessment

Evaluation of localized deliverables was conducted via triple-blind assessment using the validated 100-point rubric (Al Qahtani, 2023; Pedersen, 2011). Table 6 details group performance across total rubric ratings and the three component dimensions: Cultural Appropriateness (45 points), Technical Execution (35 points), and Terminology Consistency (20 points).

Table 6

Comparative Performance Metrics Across Efficiency and Evaluative Dimensions (N = 50)

Performance Metric	Experimental Group (n=25) M (SD)	Control Group (n=25) M (SD)	t(48)	p-value	Cohen's d	95% CI of Difference
Combined Efficiency (Min/Video Min)	6.15 (0.94)	10.02 (1.41)	-11.44	< .001	3.24	[-4.55, -3.19]
Clip 1 Efficiency (Diriyah)	6.42 (1.15)	10.18 (1.62)	-9.46	< .001	2.68	[-4.56, -2.96]
Clip 2 Efficiency (Umrah)	5.88 (0.98)	9.85 (1.48)	-11.18	< .001	3.16	[-4.68, -3.26]
Total Rubric Score (100 Points)	86.72 (5.38)	61.40 (7.12)	14.18	< .001	4.01	[21.72, 28.92]

Cultural Appropriateness (45 Points)	39.44 (3.12)	27.68 (4.45)	10.82	< .001	3.06	[9.58, 13.94]
Dialect Authenticity (15 pts)	13.12 (1.24)	9.08 (1.89)	9.00	< .001	2.54	[3.14, 4.94]
Liturgical Precision (15 pts)	13.48 (1.19)	9.24 (1.81)	9.81	< .001	2.77	[3.37, 5.11]
Explicitation & Tone (15 pts)	12.84 (1.31)	9.36 (1.73)	8.01	< .001	2.27	[2.61, 4.35]
Technical Execution (35 Points)	30.16 (2.61)	20.80 (3.57)	10.59	< .001	2.99	[7.58, 11.14]
Spatial-Temporal Spotting (15 pts)	13.28 (1.14)	8.44 (1.92)	10.84	< .001	3.07	[3.94, 5.74]
Reading Rate Compliance (10 pts)	8.64 (0.95)	6.04 (1.31)	7.99	< .001	2.28	[1.94, 3.26]
Syntactic Segmentation (10 pts)	8.24 (0.97)	6.32 (1.18)	6.27	< .001	1.77	[1.30, 2.54]
Terminology Consistency (20 Points)	17.12 (1.48)	12.92 (2.16)	8.02	< .001	2.27	[3.14, 5.26]

The experimental cohort achieved significantly higher ratings on the composite rubric ($M = 86.72$, $SD = 5.38$) relative to the control cohort ($M = 61.40$, $SD = 7.12$), $t(48) = 14.18$, $p < .001$, $d = 4.01$, representing an overall quality premium of 41.2%.

Within the primary outcome dimension of Cultural Appropriateness (45 points), the AVT group scored significantly higher (M = 39.44, SD = 3.12) than the manual group ($M = 27.68$, $SD = 4.45$), t(48) = 10.82, $p < .001$, $d = 3.06$. Specifically, dialect authenticity ratings for Najdi expressions in Clip 1 were markedly superior in the AVT cohort ($M = 13.12$ vs. $M = 9.08$, $t(48) = 9.00$, $p < .001$, $d = 2.54$).

Liturgical precision for holy site conventions in Clip 2 also diverged significantly ($M = 13.48$ vs. $M = 9.24$, $t(48) = 9.81$, $p < .001$, $d = 2.77$). Control group outputs showed frequent mistranslations and liturgical ambiguities (e.g., rendering *Ihram* as "sacred robe" rather than "state of consecration/Ihram", or generalizing *Miqat* to "stopping point"), whereas the experimental group maintained uniform religious-legal designations. These results confirm empirical support for Hypothesis 2 (H2).

4.4 Interaction Effects of Prior Software Experience

To test Hypothesis 3 (H3), a 2 X 2 factorial ANOVA was executed examining the interaction between Group Assignment (AVT vs. Manual) and Prior Software Experience (Novice vs. Experienced) on Subtitling Efficiency and Cultural Appropriateness (Althbaity, 2024; Díaz-Cintas, 2021). Table 7 reports the ANOVA model parameters.

Table 7

Two-Way Factorial ANOVA Results for Group Assignment and Prior Software Experience Interaction

Source	Dependent Variable	SS	df	MS	F	p-value	Partial η2 (ηp2)
Group Assignment	Efficiency (Min/Video Min)	187.48	1	187.48	215.50	< .001	.824
	Cultural Appropriateness	1728.72	1	1728.72	168.66	< .001	.786
Prior Experience	Efficiency (Min/Video Min)	14.85	1	14.85	17.07	< .001	.271
	Cultural Appropriateness	96.33	1	96.33	9.40	.004	.170
Group X Experience	Efficiency (Min/Video Min)	7.92	1	7.92	9.10	.004	.165
	Cultural Appropriateness	48.16	1	48.16	4.70	.035	.093
Error	Efficiency (Min/Video Min)	39.99	46	0.87			
	Cultural Appropriateness	471.50	46	10.25			
Total	Efficiency (Min/Video Min)	250.24	49				
	Cultural Appropriateness	2344.71	49				

The two-way ANOVA revealed a statistically significant interaction effect between Group Assignment and Prior Software Experience on Subtitling Efficiency, $F(1, 46) = 9.10$, $p = .004$, $\eta p2 = .165$. Simple simple-effects analysis demonstrated that while novice participants using AVT software outperformed novice participants using manual methods ($M = 6.64$ vs. $M = 10.37$ min/video min, $p < .001$), experienced translators using the AVT suite achieved the highest efficiency gains ($M = 5.62$ vs. $M = 9.64$ min/video min, $p < .001$).

A significant interaction was also observed for Cultural Appropriateness scores, $F(1, 46) = 4.70$, $p = .035$, $\eta p2 = .093$. Experienced translators operating within the AVT condition leveraged automated termbases and waveform spotting to maximize cultural mediation scores ($M = 41.08$, $SD = 2.47$), compared to novice AVT users ($M = 37.92$, $SD = 2.87$) and experienced manual users ($M = 28.58$, $SD = 4.29$). These interaction patterns support Hypothesis 3 (H3).

4.5 Usability and Implementation Barriers

Analysis of the 12-item post-task survey (Cronbach's $\alpha = .88$) identified clear operational divergence between the workflows (Al Qahtani, 2023). Experimental group respondents reported lower perceived cognitive load (M = 2.12 / 5.0, SD = 0.65) than manual cohort respondents ($M = 4.28$ / 5.0, $SD = 0.54$), $t(48) = -12.76$, $p < .001$, $d = 3.61$.

Similarly, satisfaction with spotting precision was significantly higher among AVT users ($M = 4.56$ / 5.0, $SD = 0.51$) compared to manual time-code calculation users ($M = 1.84$ / 5.0, $SD = 0.69$), $t(48) = 15.89$, $p < .001$, $d = 4.50$.

Across the entire sample ($N = 50$), descriptive analysis of institutional and structural items revealed widespread agreement regarding existing operational obstacles (Alkhatnai, 2021; Althbaity, 2024):

- 82% ($n = 41$) agreed that academic translation curricula lacked sufficient hands-on training with professional subtitling software (Alangari, 2022).
- 74% ($n = 37$) identified proprietary software licensing fees as a substantial barrier to freelance tool adoption (Althbaity, 2024).
- 68% ($n = 34$) noted an absence of standardized institutional termbases for Saudi tourism and cultural concepts within commercial translation agencies (Alharbi, 2025; Saudisoft, 2025).

Multiple linear regression was conducted entering Perceived Usability, Technical Spotting Confidence, and Prior Exposure as predictors of Cultural Appropriateness scores across the full cohort ($F(3, 46) = 28.45$, $p < .001$, $R^2 = .650$). Technical Spotting Confidence emerged as the strongest positive predictor of cultural appropriateness ($\beta = .524$, $t = 4.88$, $p < .001$), followed by Perceived Usability ($\beta = .312$, $t = 2.94$, $p = .005$), confirming that software-enabled procedural relief directly enhances cultural translation performance.

5. Discussion

5.1 Technology-Mediated Efficiency vs. Cognitive Load

Results from the empirical data presented in Section 4 prove that the use of dedicated AVT tools makes subtitling more efficient, as illustrated by the production time that could be saved, from 10.02 to 6.15 minutes per video minute, $d = 3.24$. This quantitative enhancement is in accordance with Sweller (1988, 2011) CT and follows the translation technology models of Diaz-Cintas (2021) and O'Hagan (2020).

The manual condition had high extraneous cognitive load because of the fragmented procedures. To avoid visual overflow, translators were obliged to pause, resume, and video playback, take a best guess at millisecond timecodes, count characters per line, and move between different windows for lexicographical references. This procedural conflict occupied working memory resources, thus leaving less bandwidth to deal with the complex translation task.

On the other hand, the all-in-one package of Aegisub and MemoQ limited unnecessary mechanical effort. During the presentation, the participants were able to click anywhere on the audio waves of Aegisub to mark the acoustic speech boundaries and the visual shot changes, which meant that they did not need to do manual time calculations during the event (Díaz-Cintas & Remael, 2021). Visual feedback on reading speed thresholds, via real-time characters per second (CPS) indicators, automated compliance with spatial-temporal constraints.

At the same time, by detecting the domain-specific terminology, MemoQ automatically decreased retrieval time by displaying the terms in the interface and providing approved target words for them (Bowker, 2020). This was confirmed in the post-task survey: The experimental group had significantly lower cognitive load (M = 2.12 vs. 4.28, d = 3.61). Automating manual timing and retrieval allowed for quicker subtitling under simulated agency deadlines.

5.2 Cultural Fidelity, Dialectal Preservation, and Sacred Terms

Specialized software suites are also found to be more culturally appropriate than the operational speed of a single software tool (M = 39.44 vs. 27.68 on a 45-point scale, d = 3.06). This result confirms the theoretical models of Pedersen (2005, 2011) and Chaume (2004), which show that the technical spotting tool and cultural mediation are interconnected.

In cases where the translators need to do the timecode calculations in their heads, they are prone to condensation, omissions, or even unreflective semantic substitutions (Althbaity, 2024; Díaz-Cintas, 2021). This fatigue was expressed in the control group as a decrease in dialect authenticity (M = 9.08/15) and liturgical precision (M = 9.24/15). The control participants often used blunt domesticating strategies (Venuti, 1995) that involved rendering Najdi cultural items into another language, such as translating Al-Dirwazah as "old door", or Al-Bujairi as "district" in the Diriyah promotional video.

Theological errors were made and instructions in the Umrah guide were confusing, such as description of the sacred state Ihram as a “pilgrim costume,” and the translation of the spatial canonical boundary Miqat as a “checkpoint”. This lexical selection can be confusing in matters of religious protocol and benefit to the cultural branding of the translation firm (Alharbi, 2025; Resala Translation Services, 2025).

The experimental group, on the other hand, achieved significantly higher scores in the areas of dialect authenticity (M = 13.12/15) and liturgical precision (M = 13.48/15). The spatial layout in Aegisub allowed translators to ensure that lines were free from syntactically complex Najdi expressions without going over the 37 CPL limit (Díaz-Cintas & Remael, 2021).

At the same time, sacred vocabulary was standardized using MemoQ's integrated termbases, thereby preventing rituals from being mistranslated and being doctrinally inaccurate in video parts (Alharbi, 2025; Bowker,

2020). The use of dedicated translation software, therefore, facilitated a balanced approach in mediation, as it enabled the participants to maintain the cultural authenticity and the readability for the viewer in strict temporal windows (Alangari, 2022; Pedersen, 2011).

5.3 Bridging the Academic-Industry Pipeline in Saudi Arabia

An important interaction effect between tool use and software experience was found ($F(1, 46) = 9.10$, $p = .004$, $\eta p2 = .165$), illustrating the critical training challenges in the translation industry in Saudi Arabia. The best operational efficiencies ($M = 5.62$ min/video min) and cultural appropriateness scores ($M = 41.08/45$) were for the experienced translators, while novice users achieved the best scores with AVT software ($M = 6.64$ vs. 10.37 min/video min).

This performance gap is a result of the limitations identified by Alangari (2022), Alkhatnai (2021), and Al-Rumaih (2021), which reflect the structure of the performance gap. Saudi university translation programmes still continue to focus on theory over applying the skill in a lab with software. As 82% of the respondents highlighted, there is little to no translation software training provided in subtitling courses, and only some integrated CAT tools like MemoQ and Aegisub are taught.

This means that many graduates are sometimes introduced into the world of media localization without any practical experience in software and continue with manual practices in the commercial world (Aldossary, 2023; Althbaity, 2024). With Vision 2030's push for more Saudi Arabia exports in the international media, working without technology support sets up operational slowdowns and risks cultural mistranslations (Alharbi, 2025; Kingdom of Saudi Arabia, 2026).

It is crucial that the academic programs of translation be updated so that the specialized AVT software is included as part of the curriculum, not as an elective subject (Alangari, 2022; Díaz-Cintas, 2021). Practical training in subtitling tools develops translator competence, which translates into the productivity requirements of commercial localization companies (Aldossary, 2023; Al-Rumaih, 2021).

6. Conclusion

The present study examined the empirical effect of the use of dedicated audiovisual translation (AVT) tools such as Aegisub and MemoQ on the efficiency and cultural appropriateness of subtitling in Saudi tourism promotional campaigns. The results corroborate the existence of technical spotting mechanisms and cultural mediation as interdependent systems. Manual processes cause unnecessary mental strain on translators when working without assistance, and lead to compromises between timeliness and cultural adaptation. AVT software incorporated audio waveform spotting, automatic reading-speed monitoring and active terminology databases, resulting in a substantial savings of time, and a more accurate performance of regional Najdi dialectal markers and canonical Islamic terminology.

In addition, previous experience in computer-assisted translation (CAT) further accentuated these productivity and quality benefits, showing that computer-assisted translation environments can help translators maintain cultural fidelity and meet deadlines. Addressing this technological gap in support of the localization objectives of Vision 2030 underscores the necessity of embedding specialized AVT competencies within university curricula and institutional translation workflows.

6.1 Strategic Recommendations for Saudi Tourism Localization

The media localization needs of Vision 2030 can be supported by evaluating and adopting technology-based, standardized subtitling workflows in institutional and commercial environments where they improve efficiency and quality. The key recommendations are outlined below under three categories: policy, industry, and academic:

1. To establish termbases for Saudi Culture-Specific Items and Islamic liturgical terms, the Ministry of Tourism, the Saudi Tourism Authority (STA), and the Ministry of Hajj and Umrah could develop centralized open-access termbases (Alharbi, 2025; Resala Translation Services, 2025). Standardized termbase files (.sdltb/.tbx) will help provide consistent translations throughout marketing campaigns and pilgrimage materials.
2. Contracted localization agencies are encouraged to explore professional subtitling environments and automated timing verification and characters-per-second monitoring (Díaz-Cintas & Remael, 2021; Saudisoft, 2025) as supported by the General Entertainment Authority (GEA) and public broadcasting bodies. Evaluating suitable subtitling tools that improve workflow quality can help reduce turnaround time and formatting errors in subtitles.
3. Institutional support can help address licensing challenges identified by participants (Althbaity, 2024). Government agencies, such as the Digital Government Authority (2025), may collaborate with software providers to explore assistance or professional licenses for freelance translators and graduates, lowering entry barriers for the creative economy.
4. It is recommended that university translation departments integrate temporal spotting with cultural mediation in translation curricula (Alangari, 2022; Alkhatnai, 2021). Providing these practical skills supports Saudization goals by developing qualified technical human resources in the national localization sector (Digital Government Authority, 2025; Kingdom of Saudi Arabia, 2026).

6.2 Limitations of the Study

The results from the present study should be understood in the light of a number of methodological and contextual limitations that limit the generalizability of the findings:

1. Geographic and Institutional Scope: The participants were mainly translation programs and media agencies from Riyadh. These data are representative of the central administrative area, but do not necessarily represent practices in other media centers (e.g., Jeddah or Eastern Province) where workflows and/or regionally different dialects may exist.
2. Stimulus Material Constraints: Only two pre-recorded scripted promotional videos (heritage marketing and pilgrim guidance) were used in the experiment. These are a significant proportion of the output of institutional tourism localization, but the results here cannot be applied to unscripted live broadcasts, short-form dynamic social media reels, or interactive multimedia formats.
3. Experimental Duration vs. Longitudinal Adoption: The controlled laboratory design was used to measure immediate task performance under strict, standardized timed conditions, but not to the extended industrial

campaign cycles involved in software adoption. For this reason, efficiency curves and learning plateaus over a long period should be further studied in the context of real agency settings.

6.3 Future Research

In view of these experimental findings, future research should focus on the application of the newly emerging linguistic artificial intelligence in the localization of Gulf media. Depending on the specialized Arabic neural MT engines, the post-editing effort, cognitive pause thresholds, and error rates should be analyzed in empirical studies for localized tourism and cultural assets. Future studies could evaluate speech-to-text models trained with Gulf and Najdi dialects and explore the impact of automated transcription pipelines on subtitle spotting accuracy, especially with the increasing trend of live streaming and user-generated promotional videos. Studies of target audience response should also be conducted in the future to assess the reception of culturally mediated subtitles by different groups of people, such as international viewers and domestic expatriate communities, by means of eye-tracking and biometric response measurements, to provide data on how the viewers process the subtitles.

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