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Post-Editing a Google Translated Output: Experienced Translators vs. Trainees

Ogareet Khoury*
Translation Department, Al-Ahliyya Amman University, Amman, Jordan

Linda Alkhawaja
Translation Department, Al-Ahliyya Amman University, Amman, Jordan

Feda Ghnaim
Translation Department, Al-Ahliyya Amman University, Amman, Jordan

Sirine Awwad
Translation Department, Al-Ahliyya Amman University, Amman, Jordan

Haifa Dudeen
Translation Department, Al-Ahliyya Amman University, Amman, Jordan

***Abstract*—The present empirical study reports on an experiment in which 20 participants (actual job applicants) were asked to post-edit a 394-word legal Google translated text (GTT) to investigate the type of post edits done in relation to the quality of the product as assessed by the recruitment test assessors in the translation service provider. For the purposes of the empirical research, participants were categorized in two groups; translators with practical experience between 3-5 years and trainees (recent translation graduates) with no practical experience. Assessors at the translation service provider used LISA QA model 3.1 version for quality assessment. The three factors investigated by assessors were time spent on the task, number and type of changes (post-edits) as well as the quality of the final post-edited text based on errors committed in the post-editing (PE). Results reveal a correlation between the type and number of edits done by participants and the quality of the final output and consequently a correlation between practical experience and the quality of the post-edited output. The research unveils some areas that need to be improved in the study plans at the translator training programs in Jordan, particularly in relation to PE efficiency. Results also imply that general experience in translation may not be enough to excel in post-editing specialized texts that require special knowledge in a given subject matter.**

***Index Terms*—Google translate, LISA QA model, machine translation, PE, translation memory**

I. Introduction

Translation quality assessment for pedagogical purposes has been gaining momentum in recent decades (e.g. Brunette, 2000; PACTE, 2003; Colina 2008). With the development of translation technologies, software applications and programs such as *Translog* and *LISA QA* model started to be used in the assessment process as well as aid tools in translation empirical studies (e.g. Jakobsen, 2002; Temizöz, 2014). While some programs are used for translation assessment, others are used by practitioners as computer-assisted translation tools (e.g. *TRADOS* and *Omega T*, *Google Translate*, *DeepL*, *Reverso*). This development of translation technologies has changed the translation industry dramatically (e.g. Pym, 2006; Doherty, 2016). It led to creation of new jobs in the translation job market such as post-editors, revisers, terminologists, DTP specialists (e.g. Hartley, 2009; Carmo & Moorkens, 2020).

The first employment of technology in translation started more than 50 years ago with the use of computers in typing instead of scripting the target texts, followed subsequently by the emergence of digital dictionaries, terminology database, online dictionaries, web-based platforms in addition to translation memories and localization software (Alcina, 2009). As a result, manual translation solely -which is time-consuming- has become less-favored in the industry.

According to Hartley (2009) translation projects in the industry are no more practiced by individuals. It requires a teamwork comprising of translators, revisers, post-editors, subject matter experts, terminologists and DTP specialists. In response to the market needs, integrating translation technologies along with PE skills in translator training became a must (e.g. Optimale, 2013; PACTE, 2017; Pym, 2006; Fiederer & O'Brien, 2002).

O'Brien (2002) pointed out that in the beginning of the millennium, there were few translator training programs that teach PE as separate courses despite the growing need for these skills in the translation market. In the course of time,

* Corresponding Author. Email: o.khoury@ammanu.edu.jo

PE courses started to be integrated in translator training worldwide (Almaaytah, 2022). In the Jordanian context, recent research still reveals that computer-assisted translation in general and PE in particular are only integrated in few study plans (Khoury, 2021; Khoury, 2022). There have been several empirical studies investigating PE skills in terms of turnaround time and final quality of the post-edited output (e.g. Temizöz, 2014). However, to the best of the author's knowledge there have been no studies which compared between PE skills of experienced translators and trainees.

II. Significance of the Study

The significance of the present study lies in being the first study to look into PE in the Jordanian context and the first to compare PE performance between experienced translators and trainees. The findings of the present study tend to answer the following research question:

'How trainees differ from experienced translators in the way they post-edit a google translated text (GTT) in terms of type and number of post-edits made, type and number of errors committed and the overall quality of the final post-edited output.

III. Literature Review

There have been different types of studies on translation memory (TM) tools and machine translation (MT) in terms of the quality of the output. Several empirical studies have been conducted on the suitability of TM especially for technical texts due to the peculiarity of specialized texts in terms of structure and jargon. A study by Christensen (2003) investigated the usefulness of TM for translating a specialized legal translation revealing that while it saves time by allowing access to corresponding source and target segments translated previously, it was found to fall short of dealing with translational problems of legal discourse. The study suggested pre-editing the source text before using the matching correspondents. Translation of specialized texts, especially authoritative ones, has its complexities in human translation. This gets more complicated when performed on translation memories (TM) or machine translation (MT) as it needs high linguistic and domain competence (e.g. Camelia, 2014) not only as a factual matter but from the perspective of translators (Alshaikh, 2022).

Apart from studies which investigated the appropriateness of translation memories and machine translation, there were studies on how machine translated texts are post-edited (e.g. O'Brien, 2006; Temizöz, 2014). By employing direct observation and Translog eye-tracking, the study revealed that more cognitive efforts are exerted when no matches are found and eye dilation change when the translation process is accelerated.

From a different angle, Krings (2001) intended to investigate the processing speed of PE showing that processing pace is higher when the target text is post-edited with no reference to the source text; i.e. when it is performed as pure editing of a given text. Bowker and Ehgoetz (2007) worked on an empirical study on evaluation of GT texts pointing that google translated texts – if left unedited- do not meet the standards of acceptability, accuracy and readability. The study conducted by Sumiati et al. (2022) showed that accuracy of google translated texts cannot exceed 80 % in procedural and technical texts.

A research paper by Almaaytah (2022) investigated the skills required for efficient PE and how to develop a university course in PE which is becoming a crucial component in translator training programs. Stasimioti and Sosoni (2022) compared in their study between the efforts exerted in translating manually and those exerted in PE. It revealed that PE needs less effort than manual translation and showed that experience contributes positively to the efficiency of the process. The research conducted by Dede and Antonova-Ůnlů (2022) investigated the impact of having a formal training course of PE on the performance of post-editors. The findings showed that those who have been enrolled in PE courses were significantly more aware of the typical errors of machine translation than those who never had any formal training in PE. One of the studies tended to compare between two groups in PE a GTT in the domain of engineering. The two groups were engineers and professional translators where the former group showed more understanding of the subject-matter jargon and performed better at 33more than one level (Temizöz, 2014).

There have also been several empirical and theoretical studies on integrating and designing PE courses in translator training programs. There has been intensive work on the importance of learning PE skills to respond to the growing demand of translation market (e.g. O'Brien, 2002). Her study revealed that until the beginning of the millennium, there were few -if any- full PE courses in most translator training programs in Europe. O'Brien (ibid) suggests that PE needs to be taught in a separate module since it develops skills different from those developed in translation courses. Furthermore, PE courses need to be preceded by several courses as pre-requisites to guarantee proper development of PE skills. Those include but are not excluded to competence in specialized translation and machine translation (Wagner, 1987), technical instrumental competence in searching for information, use of sources and machine translation (PACTE, 2011; Gaspari et al., 2015) as well as domain text linguistics (Vasconcellos, 1986b). Kenny and Doherty (2014) showed that PE was incorporated in several courses, most of which were within the context of translation technology courses but not offered as full PE courses. According to O'Brien (2002), PE requires special skills which may be different from those required in translating. Therefore, PE needs to be developed in a separate module to develop different skills from those developed in translation courses.

The present study tends to research PE from a different angle which was overlooked in previous studies. It investigates the difference in PE performance between inexperienced graduates (named trainees throughout the research paper) and experienced translators. The aim is to investigate how practical experience can contribute to the type and number of post-edits, errors made, time spent on the task and the overall quality of the post-edited output. Results of the research are to provide indications on PE integration and efficiency in translator training programs.

IV. Methodology

The present empirical study was conducted by employing a mixed quantitative-qualitative approach (an experiment that is evaluated quantitatively and qualitatively). The experiment comprised of post-editing an English Google translated legal text from Arabic. The purpose of the experiment was to investigate two main performance factors; speed of the process and overall quality of the post-edited text. For the experiment to have pedagogical implication, participants were grouped into experienced translators and trainees. It was carried out in a service provider recruitment test for an actual job vacancy Assessors at the selected translation service provider monitored the experimental test, observed the time taken and subsequently carried out the assessment using LISA QA model 3.1. The assessment was based on error counting at the levels of accuracy, language, terminology, consistency and mistranslation in addition to investigating the type of changes made, which *LISA QA* cannot track.

A. Participants and Variables

In response to a translation job vacancy advertisement at a service provider in Jordan, forty-seven applications were received. For the purpose of the research, applicants selected for the recruitment test were categorized in two main groups; recent graduates of translation (trainees) with no practical experience and translators with general translation experience of 3 to 5 years. Applicants who did not meet either criterion were excluded. All participants were native speakers of Arabic whose first foreign language was English. The number of selected participants was twenty; ten trainees and ten experienced translators. The experiment was meant to be conducted in the same manner recruitment tests are.

As per the service provider, job applicants are normally asked to insert a given text to the web-based platform, Google translate it, conducting whatever post-edits it may need while time is being observed. The output text is then assessed by the in-house assessors. For objective judgement, assessors normally use *LISA QA* model 3.1. Best post-edited outputs are then short-listed for further evaluation such as face-to-face interviews. Gender and age were not found to be part of the selection criteria at the selected translation service provider. Thus, for the experiment to be authentic, it was conducted in the very same manner recruitment tests are without considerations of gender or age. The independent variable in the experiment was practical experience while the dependent variables were speed of PE and quality of the post-edited output.

B. Data Collection and Assessment Tools

A 394-word Arabic legal text (Appendix A) was typed and saved on 20 desktops to be inserted by applicants into Google Translate and post-edited afterwards. The choice of a legal text was made by the translation service provider which was an authentic text commissioned by an actual customer. It is worth mentioning that some previous studies conducted in Jordan found out that legal texts are demanded the most for translation in the Jordanian translation market (Yousef, 2004; Khoury, 2017).

Each participant was asked to insert the source text into Google Translate platform, post-edit it and then save the final output on the relevant desktop. Full access to internet sources was available while time spent on the task by each participant was observed. The post-edited texts were assessed by in-house assessors using LISA QA model 3.1 (software that provides data in a statistical form on error categories). It gives a quality mark of the processed document starting with a score of 100. The score decreases as it counts errors and recurring errors on an error log data. The minimum score acceptable to pass the recruitment test as set by the assessors was 80/100. LISA QA identifies errors according to *mistranslation*, *accuracy*, *terminology*, *language*, *style*, and *consistency* and *country norms*. However, it was found that the assessors normally exclude *style* and *country norms* in the recruitment test assessment. While LISA quality report (Appendix B) tracks the number of errors in each category, types of post-edits made are scrutinized manually by the assessors in terms of language and terminology. The translation service provider considers changes in capitalization, punctuation and restructuring as structure-related PE while additions and omissions are considered terminology-related PE. Differences between the type of post-edits and errors made by each group of participants were traced. No time restrictions were imposed but time spent on the task was calculated. No pre-experiment questionnaires were filled as personal data including academic qualifications and years of experience were mentioned in their submitted CVs, application forms and supporting documents.

V. Data Analysis and Results

Post-edited texts were submitted by participants for evaluation and marking by assessors. They were inserted into the system for counting of errors and marking the output out of 100 in which pass mark was given for any score of 80 and above. After oral instructions were given, participants were all required to start at a specific time. Time taken to

complete the task was observed for each participant based on the time the document was last saved and submitted. The following sub-sections discuss the results arrived at in terms of time, count and type of errors, count and type of post-edits and overall score of the output.

A. Time

Work speed of translation and PE was considered a major sub-competence in translation competence (PACTE, 2003, 2017; OPTIMALE, 2013) and for being an essential skill for competitive translation markets (e.g. Hartley, 2009; Carmo, 2020) among other studies. On average, trainees and experienced translators completed the PE task in 58.95 minutes. Tables 1 and 2 reflect the total time spent by each participant in each group after which a discussion is provided.

TABLE 1
TIME SPENT IN TRANSLATING USING (GT) AND PE (PE) TRAINEES

Participant	Total Time spent
Trainee 1	60.10
Trainee 2	57.20
Trainee 3	56.13
Trainee 4	54.19
Trainee 5	59.16
Trainee 6	56.01
Trainee 7	60.03
Trainee 8	56.17
Trainee 9	61.06
Trainee 10	60.15
Mean Time	58.02

TABLE 2
TIME SPENT IN TRANSLATING USING (GT) AND PE (PE): EXPERIENCED TRANSLATORS

Participant	Total Time spent
Experienced Translator	60.11
Experienced Translator	57.21
Experienced Translator	62.14
Experienced Translator	59.18
Experienced Translator	63.17
Experienced Translator	59.09
Experienced Translator	57.06
Experienced Translator	61.19
Experienced Translator	59.06
Experienced Translator	60.44
Mean Time	59.87

The results shown in the tables above reflect that the time spent on the PE task by experienced translators was slightly higher than the time spent by trainees. However, the difference was not found to be significant as it did not exceed 2 minutes between the mean times of the two groups. The lowest time spent was 54.19 minutes reflected in the trainees group while the highest time was 63.17 reflected in the group of experienced translators. However, the results show that time spent by all participants in the two groups is significantly below the standard proportion of word count to minutes. In an empirical study by O'Shea et al. (2022), it was revealed that translators with PE experience over three months tend to post-edit an average of 700 words per hour. Similarly, Albarino (2023) points out that translators can post-edit between 700 and 1000 words in an hour regardless of the language pair.

In comparison with the participants of the present research, it was noticed that trainees and experienced translators took around an hour to post-edit 394 words. Surprisingly, results of the study conducted by Jia et al. (2019) point out that PE domain-specific texts takes less pause duration than PE general language texts due to the fact that equivalent pairs may be more fixed and less flexible than it is the case in everyday language texts. Similar findings were reflected in a study on PE of medical texts where the pace was found to be 35.6 words per minute; i.e. 2,100 words per hour (Liang & Han, 2022). Taking these empirical studies into consideration reveals that participants of this study took longer time than counter participants in different contexts. However, speed of PE seems here of a more serious issue for experienced translators since practical experience was found -in previous studies- to contribute positively to PE speed.

B. Type of Changes

Types of changes performed were categorized by assessors as follows; punctuation, capitalization and reorganizing as structure-related PE while omissions and additions as terminology-related PE. In each category, the mean number of changes made by participants showed difference in the count and type of changes performed in each group. Highest number of post-edits was reflected in the category of additions and omissions in the two groups with lowest number of capitalization and punctuation in the trainees' group and reorganization in the group of experienced translators. The following tables reflect changes made by each participant in more detail, followed by discussion.

TABLE 3
POST-EDITS COUNT: TRAINEES

Trainees	Punctuation and capitalization	Additions and Omissions	Reorganization and Restructuring	Total
Trainee 1	0	35	3	38
Trainee 2	12	33	4	49
Trainee 3	12	46	6	64
Trainee 4	9	29	0	38
Trainee 5	6	48	2	56
Trainee 6	8	40	3	51
Trainee 7	0	36	5	41
Trainee 8	16	37	1	54
Trainee 9	15	68	4	87
Trainee 10	9	40	7	56
Mean	8.7	41.2	3.5	53.4

TABLE 4
POST-EDIT COUNT: EXPERIENCED TRANSLATORS

Experienced Translators	Punctuation and capitalization	Additions and Omissions	Reorganization and Restructuring	Total
Exp. Translator 1	16	43	7	66
Exp. Translator 2	21	51	11	83
Exp. Translator 3	15	45	14	88
Exp. Translator 4	12	31	10	53
Exp. Translator 5	14	49	13	76
Exp. Translator 6	17	42	9	68
Exp. Translator 7	13	39	12	64
Exp. Translator 8	13	38	16	67
Exp. Translator 9	20	46	12	78
Exp. Translator 10	11	65	12	88
Mean	*15.2*	*44.9*	*11.6*	*73.1*

The data shown in Tables 3 and 4 reflect that the total number of edits in the three categories performed by trainees was significantly lower than the number of edits performed by experienced translators. The difference was found to be remarkable in reorganization and restructuring post-edits. While trainees performed an average of 3.5 per trainee, experienced translators performed an average of 11.6 per translator which is more than three-folds. Number of post-edits related to punctuation and capitalization made by experienced translators was almost double the number of those made by trainees while number of omissions and additions made in the output was close in the two groups. Further discussion is provided on the relationship between the types of changes made, count of errors, time spent and the final quality score in the following section.

The fact that experienced translators performed more post-edits might be attributed to the specific lexico-grammatical nature of legal language. Maaß and Rink (2021) point out that in addition to the peculiarity of the jargon of legal discourse, legal translation requires highly-specific linguistic knowledge in terms of structure which is more of an archaic style (Hijazi, 2013). Lin et al. (2023) point out that legal discourse features complexity of structure and terminology which makes translation less flexible as to the appropriate equivalent for a given segment. In a study conducted by Vidhayasai et al. (2015), Google Translate was found to result in lexical, syntactic and discursive errors in translation of specialized texts. This explains why PE is needed more in specialized machine-translated texts. Section 5.3 discusses the quality of the output after it was post-edited by each participant based on errors committed.

C. Quality in Post-Editing

The quality of the output was evaluated by the assessors using LISA QA model. 3.1 in which errors are categorized according to five criteria; *accuracy, language, terminology, consistency* and *mistranslation.* To have a clear idea of each of the five criteria, a definition is provided for each especially in relation to translation of legal discourse. Starting with *accuracy* or *fidelity;* it was defined as 'rendering the message of the source text with exactitude (Flamand, 1983, p. 50). A*ccuracy* can be achieved when the message obtained by the target language reader is the same as the message obtained by the source language reader (Hui-Juan, 2007, p. 107). For domain-specific texts, which legal texts are part of, *fidelity* was considered so essential. It has been argued that in translation of legal texts the translator is responsible to maintain highest level of fidelity from the source text into the target text (Šarševic, 2003). *Language* errors in translation refer to grammatical (syntactic and morphological errors) in addition to spelling, capitalization and punctuation errors. Richard et al. (2002) define language errors as' use of a word, speech act or grammatical items in such a way that reveals imperfect or incomplete learning' (Richard et al., 2002, p. 184). *Terminology* in translation was defined by some scholars as 'set of terms used in specialized documents' (e.g. Arizpe, 2022, p. 2) pointing out that translating technical specialized texts may need a terminologist who is specialized in the subject-matter jargon unless the translator is specialized enough in the domain terminology.

According to the *American Translators Association* (ATA), a *terminology* error occurs when the translator chooses a word or phrase with an incorrect or inappropriate meaning in relation to the context of the source text (ATA, 2021).

Terminology error also applies when a term appropriate to a specific subject field is not used in the same sense its corresponding term is used in the source text. *Mistranslation* refers to incorrect translation in terms of content while *consistency* means 'the repeated use of words and lemmas' throughout the target text (Guillou, 2013). In an article on legal translation, Fouda (2019) states that providing different translations for the same source term at different places in the TT confuses the receptor and produces unprofessional translation. Based on the categorization of errors as identified above, errors related to *accuracy*, *language*, *terminology*, *consistency* and *mistranslation* performed by trainees and experienced translators are shown in Tables 5 and 6 below:

TABLE 5
COUNT OF ERRORS: TRAINEES

Subject	Accuracy	Language	Terminology	Consistency	Mistranslation
Trainee 1	1	2	14	2	5
Trainee 2	5	2	24	4	3
Trainee 3	4	22	19	6	0
Trainee 4	2	2	28	7	2
Trainee 5	1	21	18	4	2
Trainee 6	4	36	21	1	4
Trainee 7	4	8	26	0	6
Trainee 8	1	10	31	0	1
Trainee 9	3	14	17	3	3
Trainee 10	5	19	24	2	1
Mean	*2.6*	*13.6*	*22.2*	*2.9*	*2.7*

TABLE 6
COUNT OF ERRORS: EXPERIENCED TRANSLATORS

Subject	Accuracy	Language	Terminology	Consistency	Mistranslation
Exp. Translator 1	2	0	9	2	5
Exp. Translator 2	1	1	12	4	3
Exp. Translator 3	3	5	12	6	0
Exp. Translator 4	1	1	16	7	2
Exp. Translator 5	2	2	9	4	2
Exp. Translator 6	0	4	0	1	5
Exp. Translator 6	2	4	13	0	0
Exp. Translator 7	1	0	7	0	1
Exp. Translator 8	2	8	6	3	2
Exp. Translator 9	3	3	8	2	0
Exp. Translator 10	0	2	11	2	3
Mean	*1.7*	*3.0*	*10.3*	*2.9*	*2.3*

It was noticed that there is a remarkable difference in the number of errors committed by the two groups of participants in three of the five criteria investigated in LISA QA model. With reference to tables 5.5 and 5.6, it can be noticed that the errors made by trainees were almost double those made by experienced translators in the criteria of accuracy, terminology and more than four-folds in the criteria of language errors. There was no significant difference in the number of mistranslation and consistency errors between the two groups.

The data in Tables 5 and 6 reflect that the highest number of errors was made in the criteria of terminology by both, trainees and experienced translators which marked an average of 22.2 and 10.3 respectively. Translating terminology of specialized texts such as those of legal discourse requires high level of jargon knowledge to the extent that the aid of a terminologist may be needed in addition to the translator (Arizpe, 2022; Hartley, 2009). It is worth mentioning here that many English legal terms are considered now archaic in everyday English (Sabra, 2003). The study conducted by Temizöz (2014) showed that terminology of a highly specialized text was also an issue for experienced translators whose terminological choices were less appropriate than the choices made by experts of subject-matter. Similarly, terminological choices seemed to pose an issue in the present study even for experienced translators. Such a finding indicates that competence in translating specialized texts does not only come as a result of temporal experience but intensive practice of translating texts of the same domain (Hijazi, 2013). Obviously, what needs high level of human translator competence remains unresolved in machine translation without human interference (Öner, 2019; Biel, 2011).

To gain more insights on PE performance, this high number of terminology errors has to be related to the type of changes (post-edits) made by the two groups. PE of terminology is highly dependent on omissions of inappropriate terms and additions of appropriate ones. The number of additions and omissions was found to be somehow close in the two groups 45:41 for experienced translators and trainees respectively. The fact that each participant on average made above 40 additions and omissions and yet made the highest number of errors in terminological choices holds two possibilities. The first possibility would be that the terms chosen by google translate were inappropriate and left un-edited to fit the jargon. The second possibility would be that google translate chose the appropriate terms but were unnecessarily changed by the participants. Either possibility indicates that the post-editor was not expert in the subject-matter terminology constituting an obstacle in an efficient PE process. The problem seemed mild in the case of experienced translators but crucial in the case of trainees since the number of terminology errors made by trainees was more than double those made by experienced translators (10.3: 22.2 respectively).

Language criterion featured error count of 13.6 per trainee participant vs 3.0 per experienced translator showing some drawback in the syntactic sub-linguistic knowledge that is appropriate for legal discourse in the group of trainees. According to Dewi (2017) language errors in translation are basically related to grammar and structure, i.e. morphological and syntactic errors. Legal language in English reflects some peculiar structures, specific use of adverbs and modal verbs which are either archaic or not used in the same sense they are in general language texts. For instance, *shall* is not used as a future modal in legal discourse; it rather indicates commitment and adherence. Similarly, *thereof, herein* are domain-specific terms that are used in lieu of prepositional phrases such as *of that document* or *in this document*) among other examples (Sabra, 2003).

Therefore, for legal translators to be competent, they need to acquire a domain-specific syntactic and morphological knowledge regardless of the pair of languages (Biel, 2011), in particular between Arabic and English (Sabra, 2003; Hijazi, 2013). This sub-linguistic knowledge seemed to be under-developed in trainees in comparison to experienced translators.

Apart from *terminology* and *language* there was no criterion of errors whether accuracy, consistency or mistranslation in which any participant exceeded 3 errors including recurrent ones. The errors count for accuracy made by trainees were double those made by experienced translators (1.7: 2.6) while mistranslations made by trainees were slightly higher than those made by experienced translators (2.3: 2.7) with an identical number of errors in the two groups for the criterion of consistency (2.9: 2.9). As it can be noticed, results of LISA QA report show that errors per participant in *accuracy, mistranslation* and *consistency*, were below 3 for the 394-word text which was -in proportion- acceptable in comparison with some other similar studies (e.g. Temizöz, 2014). In other words, the percentage of errors to the total word count (394 words) in *accuracy, mistranslation* and *consistency* was negligible (less than 0.008 %).

In addition to counting errors and recurrent errors in the five criteria: *accuracy, language, terminology, consistency* and *mistranslation*, LISA QA model associates the score to Fail: Pass result. Based on the assessment strategy of the translation service provider, 80 was set as the minimum level of acceptable quality for PE in recruitment tests. Below 80, the interface would register quality assessment as Fail and any score between 80 and 100 would be Pass. Results showed that a total of 8 experienced translators got Pass vs 5 in trainees. However, no statistically significant figures showed any relation between quality and time spent on the completion of the task but showed a correlation between number of changes performed and the Pass; Fail results ($r = 0.71$). Overall conclusion, pedagogical implication and recommendations are discussed below.

VI. Conclusion

The way experienced translators and trainees post-edited the legal text seemed to meet at some levels and differ at others. Shortest time spent on the PE task was 54.19 minutes in trainees vs. 57.21 in experienced translators while longest time was 61.06 in trainees and 63.17 in experienced translators. No statistically significant difference was found between the time spent on the task in the two groups. However, it was found that PE 394 words in an average of 58.95 (the average time of the two groups) was almost double the time experienced practitioners normally do PE which is an average of 700 to 1000 per hour (O'Shea et al., 2022; Albarino, 2023). Statistically, this means that if 700-1000 words are post-edited in 60 minutes, then 394 should not take more than 30 minutes. In the present study, the average time taken for this count of words was 58.95 which is almost double the time according to the expected standards in the job market.

When errors count was investigated in the five criteria in the two groups, it was found out that participants in the two groups made low percentage of errors in relation to mistranslation, accuracy and consistency. Trainees, on the other hand, showed drawback in their structure-related post-edits while all participants without exception made the highest number of errors in the criteria of terminology.

The difference in the performance of trainees versus experienced translators was apparent in two ways; the type of post-edits and the total count of errors in the post-edited output. As a result, the overall quality of PE by experienced translators was higher than PE by trainees as 8 participants passed in the former group vs 5 in the latter. Therefore, there was a correlation between type and number of post-edits and quality of the output but no correlation was found between time spent on the task and overall quality of the output. Overall results showed that there is a correlation between PE quality and experience in the translation profession. Nevertheless, general experience in the profession of translation (which experienced translators in the present study have) was not enough to make appropriate terminological choices in a specific-domain text. The conclusion revealed that half of the trainees passed the translation service provider recruitment test while 8 out of the ten experienced translators passed. The following section discusses the pedagogical implications of the findings and indications for translation industry in Jordan.

VII. Recommendations

Results of the study show that, for legal texts, the quality brought about by experienced translators' PE was higher than the quality brought about by trainees' PE. However, there seem to be opportunities for improvement for both groups of participants in the Jordanian context.

Practical experience seemingly has a positive effect on the overall performance of PE in translation at all levels; i.e. *terminology*, *language*, *accuracy*, *consistency* and *mistranslation*. Translators with experience between 3-5 years post-edited the text in a slightly longer time than trainees, performing more post-edits at the levels of structure (capitalization, punctuation and reorganization) as well as at the level of additions and omissions of terms. As a result, 8 out of the ten translators passed according to LISA QA report.

Experienced translators' speed in PE in the present research was alarming as it was much slower than expected standards in translation industry. While expected standards should be a minimum of 700 words in an hour (e.g. O'Shea et al., 2022; Albarino, 2023), experienced translators in this study took almost double this time. Improving work speed in translation market is considered an indication of competence (PACTE, 2003; OPTIMALE, 2013) and of essential importance in competitive translation industry (e.g. Carmo, 2020; Hartley, 2009). Therefore, the results of the present study showed that PE speed is under-developed even among experienced translators, which needs to be improved through on-job training and workshops.

Another drawback in the performance of experienced translators was reflected in terminological choices which were better than trainees but marked the highest number of errors in the translators' PE. This might be attributed to the fact that the post-edited text was legal (domain-specific) requiring peculiar knowledge in legal jargon that apparently needed more development in experienced translators. This indicates that competence in translating or PE legal texts needs more than general experience in the profession, but specific experience in translating and PE legal discourse especially between Arabic and English (Hijazi, 2013; Sabra, 2003).

Similar to experienced translators, trainees -who had zero practical experience- showed under-developed skills in PE speed, terminological choices. In addition, trainees also showed drawback in structure-related choices (structure of legal discourse). This indicates that translators training programs need to enhance competence of translating and PE legal discourse at the levels of structure, terminology and work speed especially that previous studies (e.g. Khoury, 2017) showed that legal translation is demanded the most in the Jordanian translation market.

The recommendation that can be deduced from the findings and results of the present research would be enhancing PE courses in general and PE legal GTT in particular. For more than two decades, there have been calls for integrating PE skills in translator training programs (e.g. O'Brien, 2002). This came as a reflection for the need of translation industry which evolved dramatically in the past few years.

Previous studies on translator training in the Jordanian context (Khoury, 2017, 2021, 2022) revealed underdeveloped translation sub-competences in linguistic and instrumental sub-competences such as terminology management and efficient use of online sources on which editing and PE skills are built (O'Brien, 2002). Therefore, ability to do efficient and effective editing and PE starts with translation competence meaning that incompetent translators are definitely incompetence editors and post-editors. PE was only connected with machine translation (MT) or translation memory (TM); it has always been considered as a form of translation revision even before the boom of translation technology. Scholars have been talking for decades about the importance of revising and PE texts before submitting the final translation for the role it plays in improving the target text. This indicates that translator training programs in Jordan need to enhance students' abilities to edit, review and criticize a pre-translated text for improvement and adaptation to the target norms regardless whether the text is human or machine-translated. The nature of translator industry reflects that translators, post-editors and revisers are now equally required jobs.

In addition to their pedagogical implications, findings of the present study positively contribute to the selection and recruitment criteria in the Jordanian translation market. Recruiters at translation service providers should bear in mind that general experience in the translation profession or a degree in translation does not necessarily guarantee competence unless it is combined with a sound knowledge and experience in the jargon of the subject-matter. The errors count of terminology among experienced translators in this study showed that poor expertise in the jargon of a particular domain-specific text results in a poor output regardless of the temporal experience of a given translator.

VIII. Limitation of the Study and Suggestions for Further Research

The limitation of the present study lies in more than one factor. The number of participants for sampling remained limited after excluding twenty-seven applicants who did not meet the sampling criteria. Thus, the results of the present research could not be generalized as the type of the research was a mixed method research and the evaluation method was for the assessors. It is highly recommended for a similar study to be repeated in the Jordanian context for the results to be more reliable and for generalization. Finding financial resources has always been a challenging step during the course of the research. When the researcher works with professional assessors as is the case in the present study, the experiment turns out to be relatively costly. However, the present study carries its own weight in providing answers to our research questions on post-editing a machine-translated output by trainees versus experienced translators while similar studies can be repeated either with similar samples, different category of samples or a text of different specialized domain to expand the pedagogical implications.

APPENDIX A SOURCE TEXT

عقد ايجار

1. التزامات وتعهدات المستأجر

1.1 يتعهد المستأجر ان يقوم بدفع الاجرة بالوقت والطريقة المتفق عليها.

1.2 يتعهد المستأجر بالمحافظة على المأجور وبتسليمه للمالك عند انتهاء مدة الايجار بنفس الحال التي كان عليها عند استلامه من المالك، باستثناء ما قد ينتج من تلف او تشقق نتيجة الاستخدام الاعتيادي.

1.3 يتعهد المستأجر باستخدام المأجور بالكيفية المتفق عليها ،وان لا يستخدمه باي حال من الاحوال بطريقة تخالف الشريعة أو القانون الاردني أو الأنظمة والأخلاق العامة.

1.4 يتعهد المستأجر أن يقوم بدفع وتسديد كافة الفواتير الناتجة خلال استخدامه للمأجور، ومنعاً للخلط، وفي حالة عدم امكانية تركيب عدادات مستقلة او فرعية للخدمات من ماء وكهرباء وغيرها للعقار ،فإن الفواتير وتكاليف هذه المنافع يتم تقسيمها على اساس عدد الافراد بين ساكني العقار إلا في حال اتفق الأطرف على خلاف ذلك.

1.5 في حال وجود حفرة امتصاصية تخدم المأجور بشكل حصري، فان تكلفة تصريف محتويات هذه الحفرة الامتصاصية يتحمله المستأجر، واذا كانت هذه الحفرة الامتصاصية تخدم اكثر من عقار فان تكلفة تصريفها يتحملها المنتفعين بالتناسب .

1.6 خلال مدة هذا العقد ، لا يحق للمستأجر أن يقوم بأعمال إنشائية أو إدخال تحسينات للعقار موضوع هذا العقد دون الحصول على موافقة المالك الخطية.

1.7 لا يحق للمستأجر أن يسمح لأشخاص آخرين -باستثناء المواليد الجدد للقاطنين في العقار- أن يسكنوا المأجور بدون الموافقة الخطية من المالك.

1.8 لا يحق للمستأجر تأجير أي جزء من المأجور أو نقله لأي شخص آخر دون موافقة المالك الخطية.

1.9 عند نهاية هذا العقد عقد يقوم المستأجر بإعادة أي اشياء اضافية كانت موجودة اصلاً في المأجور عند تاريخ ابتداء الايجار، بنفس الحال التي كانت عليها عند استلامها من المالك باستثناء ما قد يكون تلف منها نتيجة الاستعمال الاعتيادي للشخص الطبيعي .

2. التزامات وتعهدات المالك

2.1 يتعهد المالك بدفع كافة الضرائب المفروضة على العقار والضرائب الأخرى والرسوم والنفقات والمستحقات المترتبة على ملك ي ته للعقار، بما في ذلك ضريبة المعارف ويسقط حقه بالمطالبة والرجوع على المستأجر بأي من هذه الضرائب .

2.2 يتعهد المالك بدفع كافة الرسوم والضرائب ورسوم الطوابع المفروضة بموجب التشريعات النافذة والمترتبة على هذا العقد .

2.3 يتعهد الملك ان يصدر ايصالا للمستأجر بعد دفع الايجار وبعد مختلف المدفوعات.

2.4 يتعهد المالك بتمكين المستأجر من استعمال المأجور والانتفاع منه طيلة مدة العقد بدون اي تعرض من قبل المالك او من اي شخص مفوض عنه او يعمل لحسابه او تحت سلطته.

2.5 يتعهد المالك نفقته الخاصة خلال مدة العقد بإصلاح ما يحدث من خلل/خراب في العقار باستثناء ما قد ينتج عن سوء استخدام المستأجر

APPENDIX B LISA MODEL 3.1 DATA SHEET

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Ogareet Y. Khoury is an Associate Professor in the Department of Translation at Al-Ahliyya Amman University (Amman-Jordan). She holds a PhD Degree in Translation Studies from Aston University-UK with a 20+ years of teaching experience. Her research interests include, but are not limited to, *Translator Training*, *Discourse Analysis*, *TESOL*, *Literary Criticism* and *Philosophy*. She has several publications in top-ranked journals. Between 2020- 2022, Ogareet held the position of the Head of English and Translation Department at Al-Ahliyya Amman University.

Linda A. Alkhawaja is currently an Associate Professor in the Department of Translation at Al-Ahliyyah Amman University. She holds an MA in Translation and Interpreting Studies from Salford University/Manchester and PhD in Sociology in Translation Studies from Aston University/Birmingham. Her current research projects focus on the sociology of translation, aspects of cultural studies and Machine Translation. She took on, for two years, the role of the Director of the Language Centre and the Head of the English Language and Literature and English Language and Translation Departments.

Feda M. Ghnaim is an Associate Professor in the Department of Translation at Al-Ahliyya Amman University. She holds a PhD Degree in Arabic Literature from Yarmuk University (Amman-Jordan). Her research interests include Literature Criticism, Philosophy and Literature. She is currently the Vice-Dean of the Faculty of Arts for Quality Assurance at Al-Ahliyya Amman University.

Sirine E. Awwad is a full-time lecturer in The Department of Translation at Al-Ahliyya Amman University. She holds a Master's Degree in Translation Studies from the University of Jordan. Her research interests include Machine Translation and Translation Pedagogy.

Haifa S. Dudeen is a full time lecturer in The Department of Translation at Al-Ahliyya Amman University She holds a Master's Degree in Translation Studies from the University of Jordan. Her research interests include TESOL and Translation Pedagogy. Haifa served as coordinator of The Language Center at Al-Ahliyya Amman University.