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Machine Translation in the Arab World: Saudi Arabia as a Case Study

Abstract

There has been an increasing interest recently in machine translation technology in the Arab world, especially with the growing demand for translation. The aim of this paper is to investigate how widely machine translation systems are used and researched in the Arab world and what can be done to achieve real progress in this field by taking one country as a case study. A survey was carried out in Saudi Arabia to collect the necessary data to assess how many Arabic machine translation systems are used by Saudi organizations, how much interest exists in machine translation in Saudi universities and research centers, and how much research is being conducted on issues of machine translation. The findings of this study indicate that most Saudi organizations and translation agencies do not trust or are not interested in machine translation. Only a few universities have conducted research in this field. It is recommended that more attention be paid and more research be conducted to get the most use out of this technology and that more efficient Arabic machine translation systems be developed.

1 Introduction

As the demand for translation has increased tremendously, and because of the large amount of material needing to be translated in every field, machine translation (MT) systems are now used widely around the world. To follow the revolution of information technology worldwide, more translations will need to be done, and since translators will not be able to cope with the volume of material, there is a place for the use of MT, which can save time and energy, at least, when there is merely a need for the gist of a text rather than for a full and accurate translation or when translating websites and online information. MT can be used to produce rough translations, with translators post-editing the output, especially when only a rapid post-editing is required. In this way, human translators can save time that they would otherwise spend translating simple or repetitive texts. The aim of this study is to provide a scholarly account of the use of MT in Saudi Arabia and to discover to what extent MT has been established in that country, both as an area of research and as a professional practice.

With the increasing need for translation, the use of translation technology in general and machine translation in particular has become a necessity. Research has led to the development of many MT systems that have been used in many countries. Some of these systems include the Arabic language such as Sakhr (Sakhr System n.d.), ATA software (ATA System n.d.), Cimos (Cimos System n.d.), and SYSTRAN (SYSTRAN System n.d.). In addition, there are web-based MT systems such as Babylon (Babylon System n.d.), Bing Translator (n.d.) and Google Translate (n.d.) that have Arabic as a source or target language.

A further goal of this paper is to explore what measures might be taken to achieve substantial progress in this field, based on such questions as do Saudi organizations benefit from this technology, and do they use the available MT systems? Are Saudi universities and their faculties interested in this field? Are linguists, translators, computer engineers, and software programmers interested in MT? And if there is any research in this field, is it adequately funded by the Saudi government or universities?

The paper is made of five sections: section 2 discusses MT and related areas such as dissemination, assimilation, interchange, and data access as well as the benefits and drawbacks of MT, its limitations, and the quality of its output. It also provides a general overview of Arabic MT. It touches on some features of the Arabic language, which can cause problems that are challenges for MT. Section 3 discusses the data collected for the study and the surveys carried out on Saudi organizations, translation agencies, and universities. The study findings are analyzed and commented on in section 4. Section 5 concludes the paper by summarizing its findings and providing recommendations.

2 General Overview of MT

2.1 Uses of MT

In this section and the subsequent ones some general issues of the use of MT are discussed to link them to the results of our surveys and how respondents provide feedback regarding these areas.

Translation is mainly used for one of the four following functions and so is MT. These functions, according to Hutchins (2005: 7), are:

- (1) Dissemination: texts to be translated for dissemination need to be of high quality. So, if MT is used to translate such texts, then human assistance is necessary, whether for pre-editing the input, post-editing the output, using a controlled language, or restricting the system to a specific subject domain.
- (2) Assimilation: when the texts to be translated will be used for monitoring or filtering information, or if the recipients only need to get a general idea about what the text conveys, then the MT will do, and there is no need for a good quality translation.

- (3) Interchange: when the translation is needed for communication between individuals who speak different languages, by correspondence, e-mail, or telephone, then again any translation will do as long as the communicators understand the message they receive and it conveys their intentions.
- (4) Database access: nowadays, many people use translations, even rough ones, for searching the Internet and Websites and for accessing databases to get information in foreign languages.

MT has also been used in large companies and as software on personal computers. However, MT systems have been developed to be used in hand-held devices (pocket translators used by travelers, mobiles, tablets etc.) as well, and on the Internet as AltaVista's Babelfish Translation Online (n.d.), Gist-in-Time System (n.d.), ProMT Translator (n.d.), PARS Translator (n.d.), and many others, and for localization in e-mails, chat rooms, and social networking sites (Hutchins 2011: 441-446). According to Hutchins (2007: 16), MT is used for the following purposes:

- Document drafting (in poorly known languages)
- Tourism and shopping (so far only dictionaries of words and phrases)
- Scanning-translation
- Translation into sign languages
- Information retrieval (IR)
- Information filtering
- Information extraction
- Summarizing foreign language texts
- Multilingual generation from (structured) databases
- Subtitling

2.2 Benefits of MT

MT has many benefits such as the following (Dilmanc n.d.; The Language Translation n.d.):

- Productivity: MT improves the productivity of human translators who are willing to perform pre- or post-edit translations or both.
- Speed: it is much faster than a human translator.
- Low cost: it is a one-time cost, namely, the cost of the tool and its installation.
- Confidentiality: people can use it to translate private e-mails or financial documents.
- Consistency: it keeps translation consistent. So, there is no need to go back to previous pages to see how a certain word was translated.
- Universality: human translators usually specialize in certain domains, whereas MT can translate texts in different domains. One only needs to switch on a corresponding setting.
- Availability: MT is available around the clock.

2.3 Drawbacks and Limitations of MT

MT is said to have the following drawbacks:

- Lack of superior exactness: if accurate translation of official documents, agreements, and so on is needed, then MT cannot be used. However, if it is used, then the output should be pre- or post-edited or both (Dilmanc n.d.).
- Inferior translation quality of texts with ambiguous words and sentences: the SL text to be translated by an MT system should be clear and straightforward. If it includes ambiguous words or complex syntax, then a poor translation ought to be expected (Dilmanc n.d.).
- MT is based on formal and systematic rules; so, sometimes it will not be able to resolve ambiguity by concentrating on the context and using experience or mental outlook, as human translators are able to do (Dilmanc n.d.).
- MT cannot correctly translate expressions (multiword terms) that convey ideas, idiomatic phrases, ambiguous words, complex structures, proverbs, opaque sentences, ellipses, colloquial phrases, and culture-specific aspects (Hutchins 2011: 445-446).
- MT cannot retain aspects of source culture or adapt to the target culture. It cannot maintain the same register as the source document, or coin translations for new technical terms (Melby 1987: 145).
- Machines break down, and replacement can be costly.

2.4 Arabic MT

As the Arab world looks forward to improving its quality of life, organizations and individuals need to gain access to new information, discoveries, and technologies in the world and to benefit from others' experiences. Therefore, the need for translation increase and with the large volume of material need to be translated Arab translators can benefit from the use of MT. Zantout and Guessoum (2000) state that "it is obvious, that MT will boost the technology transfer efforts to make more information about new technologies available to Arabs in their native language" (Zantout/Guessoum 2000: 123).

According to Farghaly and Shaalan (2009), Zughoul and Abu-Ashaar (2005), and Zantout and Guessoum (2000), using MT in the Arab world can be helpful in many ways; however, the following benefits currently seem to exist more in theory than in practice:

- To cope with the increasing demand from multinational companies and governments for translation.
- To keep up with technological, scientific, economic, and financial developments.
- To transfer knowledge and technology to the Arab world.
- To modernize Arabic by adding new concepts and terms through coinage and arabicization.

- To make information retrieval, extraction, and translation easier for the Arab user to bridge the gap between people in the Arab world and their peers in more technically advanced countries.

According to White, “a country unable to assimilate a high volume of potentially useful information from abroad could lack timely, accurate data and lose its edge in international business, diplomacy, military readiness, and academic research” (White 1993, as cited in Zantout/Guessoum 2000: 123).

2.5 Challenges for Arabic MT

Arabic is a very rich language that belongs to a different language family, namely the Semitic languages, from the languages spoken in the West, which are mainly Indo-European. So, when translating between Arabic and Western languages using MT, many problems arise that make it difficult for machines to produce good outputs.

Habash (2007) states that “Arabic has a very rich morphology characterized by a combination of templatic and affixational morphemes, complex morphological rules, and a rich feature system” (Habash 2007: 263). According to Farghaly and Shaalan (2009), these features are as follows:

- Arabic is written from right to left.
- There is no capitalization in Arabic, which makes it difficult to recognize names of entities.
- There are no rules for punctuation. Actually, there are rules, but there is lack of training.
- It has a flexible word order.
- Its letters change shape according to their position in the word.
- Its letters share the same shape and are only differentiated by adding certain marks such as a dot, a *hamza*, or a *madda* placed above or below the letter.
- It allows subject pronouns to be dropped.
- It has a very rich and complex agreement system. A noun and its modifiers have to agree in number, gender, case, and definiteness.

Izwaini (2006: 121-129) notes the following features:

- Many Arabic names have meanings.
- Arabic sentences can be nominal (subject–verb) or verbal (verb–subject), whereas English sentences are mainly nominal (subject–verb).
- Arabic uses constructions that literally mean *friend of*, *mother of*, or *father of* to indicate ownership, a characteristic, or an attribute.
- Arabic uses pronouns of two genders only; it has no gender-neutral pronouns.
- The absence of diacritics “al-tashkiil” can change the meaning.
- In Arabic, possessive pronouns (one or two letters) are attached to nouns.

- There are no copula verbs in Arabic.
- In Arabic, generic names, many place names, and titles have to be used with *al*, which functions as a definite article.

Arabic is one of the morphologically sophisticated languages, and being as such it would be expected that a machine translation from Arabic is more straightforward than the other direction, producing a higher quality. However, this is not the case. There can be many problems in translating from Arabic into English. As discussed above, features of Arabic do not make the Arabic into English output less challenging. Reporting on the Arabic into English mode in the evaluation of three systems, Izwaini (2006) notes that, although “many texts are rendered into correct, full and coherent English translations, the output suffers from many drawbacks in dealing with forms of person, gender, tense and aspect” (Izwaini 2006: 119). Even when an MT system produces “a coherent, grammatically well-formed TL text”, it is still “[a] wrong analysis (and synthesis) [...] that is a total mis-translation” (Izwaini 2006: 127). Moreover, other features of Arabic such as orthography, spelling, lexis and syntax do pose challenges to MT (Izwaini 2006, 2011; Habash 2010; Habash/Sadat 2012).

These features present many ambiguities for machines. Moreover, other important and more sophisticated problems must be addressed. Therefore, more refined rules and possible solutions need to be established for MT than what is currently available so that it can handle Arabic and produce more accurate translations.

Izwaini (2006) points out that “[a] good MT system should endeavour to go a further step beyond the gist level. Rules need to be developed and refined so that the output can reach the finest product possible with minimum post-editing needed. The less post-editing is required, the more successful the translation is, and the less time is spent and less work is done to produce the final translation” (Izwaini 2006: 146-147).

3 Data

To map the status of MT in Saudi Arabia, a survey was deployed to collect data from actual and potential users of MT such as organizations and translation agencies as well as institutions of higher education.

To discover whether Saudi governmental and non-governmental organizations are interested in MT and/or use it, a questionnaire was designed and submitted to them for their consideration (see Appendix 1). As translation agencies have an important role in the translation industry, data were collected from a number of agencies to ascertain their views of this technology and also whether they benefit from it in their business. Another questionnaire was designed for Saudi universities which offer degrees in translation to ascertain to what extent they are interested in teaching MT and conducting research on MT (see Appendix 2). Data were also collected from Saudi universities that offer degrees in computer science and information technology to find out whether any research is

conducted on MT or any other related fields, such as natural language processing (NLP) and Arabic computing (Arabization of Computers).

Following is the procedure adopted to collect the data:

- To examine how widely MT is used in Saudi organizations, data were collected from the 66 responses, out of 100 governmental and non-governmental organizations included in the survey, received to specifically designed questionnaire (see Appendix 1). Governmental organizations include ministries, airlines, banks, media and chambers of commerce, as well as agencies, boards and departments of health, industry, metrology, monetary, petroleum, ports transport, and tourism. Non-governmental organizations include different business corporations.
- To investigate if translation agencies in Saudi Arabia use MT and to what degree, data were collected from 30 translation agencies included in the survey.
- To find out how much Saudi universities are interested in MT and how much research conducted in this field, data were collected from 21 universities that offer degrees in languages that responded to specifically designed questionnaire (see Appendix 2). More data were also collected from the universities' websites of 28 universities that offer degrees in computer science and information technology to find out whether research is being conducted on natural language processing since NLP and Arabic computing are the fields in which research is needed for developing the tools upon which to build MT systems. A dependent research center was also contacted. Research work conducted in Saudi universities and research centers, whether undertaken by faculty or graduate students, are included in Appendix 3.



Fig. 1: Map of Saudi Arabia showing the cities where the surveyed academic, research and professional institutions are located.

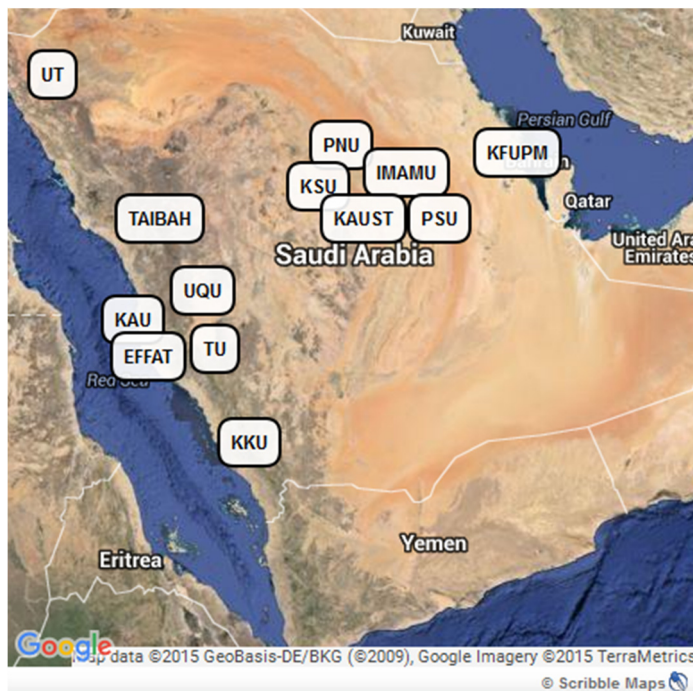


Fig. 2: Map of Saudi Arabia with the surveyed academic research and professional institutions.

4 Analysis

In this section we discuss the findings of the survey that are analyzed in three sections: MT in Saudi organizations, MT in Saudi translation agencies, and MT in Saudi universities and research centers.

4.1 MT in Saudi Organizations

From the 66 responses received, 22 organizations (33.3 %) do not need translation. The other 44 responses (66.7 %) were analyzed. Only 17 of those 44 organizations (38.6 %) use MT, specifically Google Translate. While two of these 17 organizations use both Google Translate and Babylon translation software, no other translation software has been used by any of the organizations responded except by Shura Council which has used different translation software over the last 10 years.

Eleven of the aforementioned 17 organizations (64.7 %) use MT to translate different types of texts, including official documents. Twelve organizations (70.6 %) conduct post-editing of the translation output, whereas the remaining five organizations (29.4 %) do not because they need only a gist of the content or no final versions of translated documents are needed.

Twenty-seven of the 44 organizations (61.4 %) do not use MT for one of the following reasons:

- They do not trust MT (63 % out of 27).
- They cannot afford it (3.7 % out of 27).
- Their texts are in hard copy (3.7 % out of 27).
- They believe that MT output is inaccurate (11.1 % out of 27).
- They think that, with post-editing, it makes for twice the work (3.7 % out of 27).
- They do not need it because they either do little translation or rely on their own translation departments or translators (3.7 % out of 27).

Twenty of the 44 organizations (45.5 %) plan to continue using MT or to start using it in the future (see Figure 3 below). Seven of these 20 organizations (35 %) provided one or more of the following comments:

- Google Translate is really good for the translation of words.
- Google Translate is much easier and faster than regular dictionaries.
- They plan to use MT software during a trial period.
- MT produces only draft translations. That means, it is only 50 % of the translation process. The output needs much reviewing and editing, but it does save time.¹

Twenty-two of the 44 organizations (50 %) do not plan to continue using MT or to start using it in the future. Nine of these 22 organizations (40.1 %) gave one or more of the following reasons:

- MT is not reliable and translation memory TM (such as TRADOS) is a better alternative; however, it requires a large financial investment.
- Google Translate is good but only for words. MT may translate simple sentences but not complex ones.
- MT cannot be used for translating technical and legal documents.
- MT is not accurate; so it cannot be used to translate official documents.
- MT produces literal translation and, therefore, provides strange output.
- MT cannot deal with abbreviations or understand culture-specific aspects.
- MT can be used only to get a general idea about a text. Translation is not science; it is an artistic task that can only be done by humans.
- MT software cannot be considered really viable, unless a significant breakthrough is achieved in terms of technology. A computer can be easily fed with all kinds of different styles, jargon, cultural voids. It is doable, but what about implicatures?²
- Arabic differs in terms of its morphology, syntax, and semantics from Western languages, which makes it difficult for machines to translate from and into Arabic.
- MT needs post-editing, which means double-work.

¹ Shura Council response.

² Aramco Company response.

Two of the 44 organizations (4.5 %) have no plans for future MT use and are waiting to see how much improvement will be achieved.

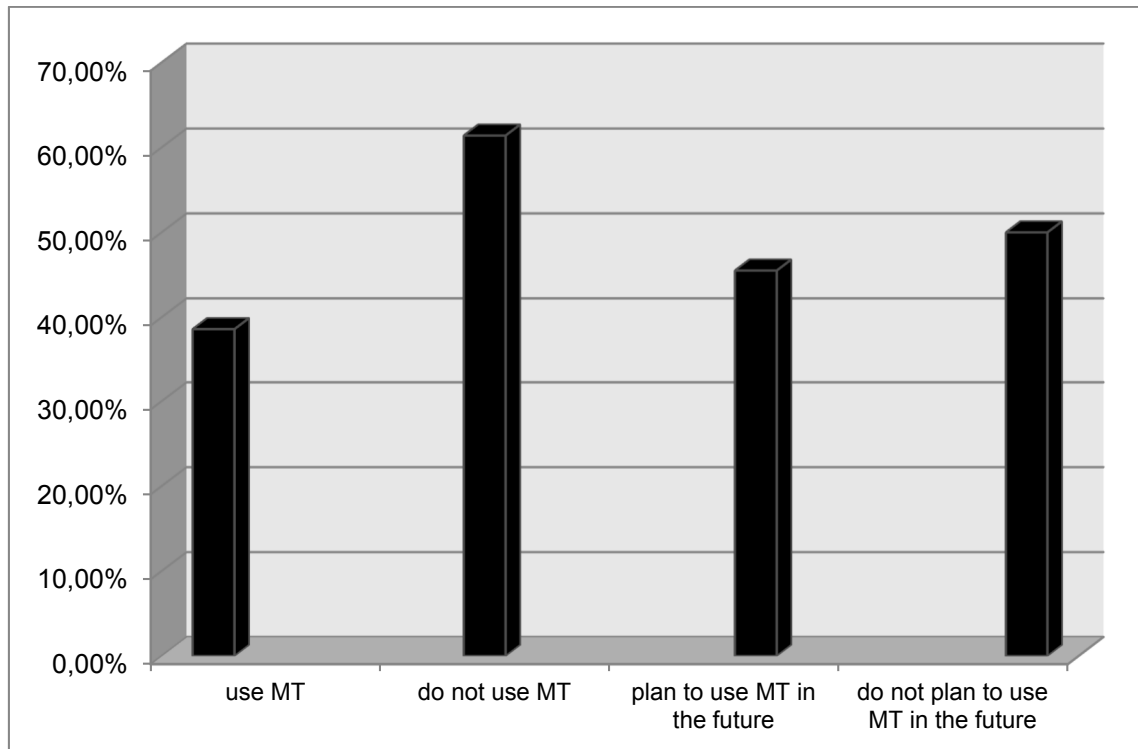


Fig. 3: The use of MT in Saudi organizations

4.1.1 Shura Council Experience with MT Systems

Because the Shura Council is the only organization taking part in the survey that has used different MT systems, it was of special interest to consider what its staff had to say about these systems and to what degree they found them helpful.

Shura Council staff used two MT systems offered by ATA software; Golden AI Wafi and MutarjimNet. The translation quality of the former, according to Shura staff, and based on their experience, personal judgment and in response to the questionnaire, ranged from 10 % to 40 % and the other was useless. At the same time, other software was used such as Tarjim offered by Sakhr, which proved to be unhelpful.

According to Shura Council staff, Google Translate was and still is much better than the others, especially when dealing with names of local and international organizations, international treaties, specialized economic terms, and even names of herbs and diseases. They also noted that Google Translate seems to be developing rapidly, in contrast to other software.

In recent years, more improved software has appeared on the market and was used by the staff, for example, Sakhr Enterprise Translation SET. It offers more tools to assist the translator, and the translation quality is more desirable.

At this writing, Shura Council staff use only Google Translate with post-editing of the output; according to them, Google Translate has proven to be the best available system. It is continually being developed, even day by day. As communicated in their response to the questionnaire, according to their own rough judgment, its translation accuracy usually ranges between 70 % and 80 %, but it can be as low as 40 % and as high as 90 %.

4.1.2 Discussion

Based on the responses received from the 44 organizations that took part in the survey, it became clear that 61.4 % of them do not trust MT. Most of them have already decided that MT is not accurate, or not trustworthy, even those who have never tried it. In addition, some hold views that are clearly incorrect, for example, MT cannot deal with abbreviations and technical and legal texts. As a matter of fact, abbreviation dictionaries are included in MT software (and can even be added to), and technical texts are one text type that is well-suited to being translated by MT. As for legal texts – although this text type is difficult for MT, at least according to Melby (1987: 146), due to its complex syntax and need for accuracy – they, in fact, display language that is quite formulaic and subject to rigid rules of text arrangement; thus being suitable for MT. Some translators find post-editing a tiresome job, although they are supposed to review any translation whether done by machine or by themselves.

Only 11.4 % of the 44 organizations that responded to the survey need translation of official documents, meaning, they require accurate translations, not merely rough drafts. The other 88.6 % need translation of different text types such as reports, general paperwork, e-mail, and Websites, for which a rough translation is sufficient.

As for Arabic, it is true that machines can face difficulties when translating between Arabic and Western languages due to the complicated morphology, syntax, and semantics of Arabic. However, if more refined rules for Arabic morphology and syntax are integrated in MT systems, those difficulties, or at least most of them, can be overcome.

Most notable in the responses of 76.4 % of the organizations that use MT is that they use Google Translate as an online dictionary or to translate simple sentences. Google Translate is popular because it is free, easy to use, fast and with a wide range of language combinations (58 languages). It is online software that is easy to access and more practical than others when translating Websites and e-mail. Its translation quality can be improved by using its Translator Toolkit or by uploading the user's own TM into the Translator Toolkit.

MT can be very helpful for organizations. It translates fast and keeps translation consistent. It covers all domains, is confidential and available any time. MT is not expected to be used to translate novels, poems, or advertisements. Yet, it can produce

a rough translation that can be used to get a general idea about a text, for assimilation, interchange, or database accesses. It can also be used to translate repeated simple sentences and text types that do not include complicated structures or culture-specific expressions such as manuals, weather forecasts, reports, and more.

4.2 MT in Saudi Translation Agencies

Thirty translation agencies were contacted. Fifteen only (50 %) responded. Only six of the 15 agencies (40 %) use the online MT Google Translate and only to translate words or simple sentences. They found that it is fast; so it saves time, especially with typing. According to these agencies, Google Translate is very accurate when translating abbreviations and the names of local and international organizations. However, they found it to be 90 % inaccurate when translating complex text and capable of being misleading. Getting a rough translation can be useful; however, depending on the text type, only experienced translators can get full benefit from using it.

The translation center of King Faisal University (KFU) and the translation center of the Riyadh Chamber of Commerce and Industry use both Google Translate and Babylon software, but they prefer the former. However, the KSU's translation center does not use MT, because there is not enough interest expressed by staff and faculty to try this technology.

Nine of the 15 agencies (60 %) completely reject the idea of using MT because, as they maintained, it is not advanced enough; it produces a poor quality of translation, and it needs post-editing, which means double the work. Some even think that MT is a 'joke'.

Thirteen of the 15 translation agencies that responded to the survey (86.7 %) have no plans to use or continue using MT. Two of the 15 agencies (13.3 %) will consider using it in the future under one of the following conditions:

- If their business expands and they need many translations done.
- If MT systems become more advanced.

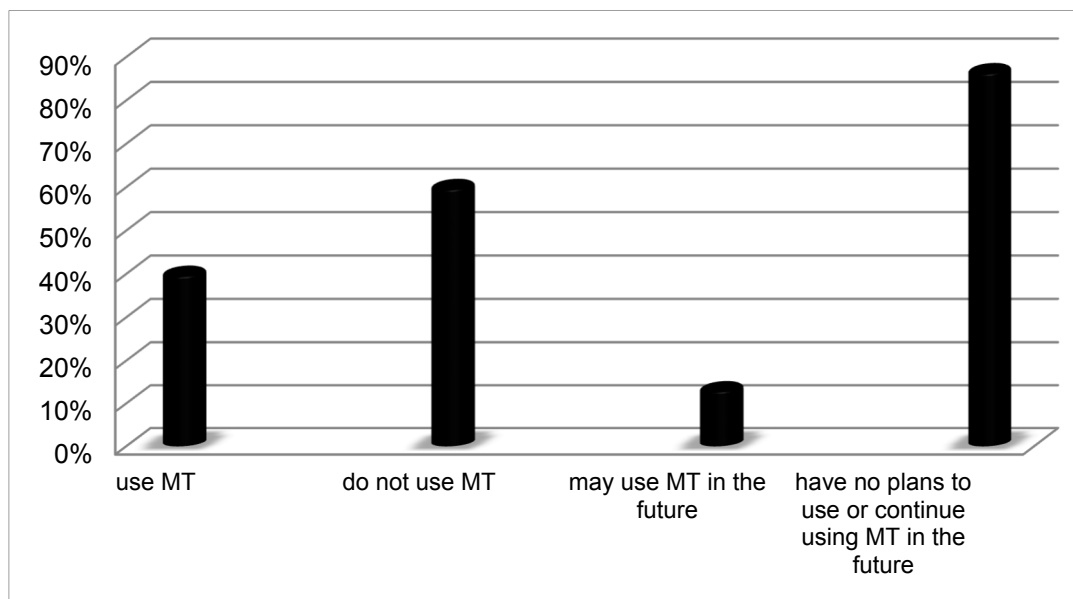


Fig. 4: The use of MT in Saudi translation agencies

4.2.1 Discussion

It is not surprising that translation agencies do not use MT, or when they do decide to use it, that they opt for Google Translate to translate words only because they believe that they have to produce accurate translations. Their job is not to give people a general idea about a text or a rough draft. Any bilingual person can do that, but not every bilingual person can provide an accurate translation of a given text. Only a professional translator can produce such translation. However, translators can utilize the help that MT offers and, at least, get rid of all those paper and even electronic dictionaries to settle down with one comprehensive dictionary and save time. Paper and electronic dictionaries will always be there if needed. Of course, MT has many drawbacks: it is unable to deal with culture-specific aspects and idiomatic expressions, it cannot understand context, it cannot resolve ambiguity, it cannot deal with ellipses or understand colloquial phrases. However, translators as professionals can take advantage of the benefits of MT and deal with its drawbacks.

Using MT, may make some translators feel threatened and fear for their jobs. According to Vasconcellos (1994: 113), there is some truth to this, but a distinction should be made between *existing jobs* and *new work*. Translators should not expect to lose their jobs to MT, but they are expected to learn how to deal with this technology. Lawson (2008) observes that MT has led many organizations to hire more translators, and that MT opens up new career avenues as translators learn to edit MT drafts, build MT dictionaries, and identify the improvements needed in the software (Lawson 2008: 107-108).

4.3 MT in Saudi Universities and Research Centers

This study also attempts to find out if Saudi universities are interested in MT. It confined its focus to language and translation colleges and computer science and information technology colleges, where MT is expected to be studied and researched.

4.3.1 Colleges of Languages and Translation

Responses were received from only 12 universities, but more data could be gleaned from these 21 universities' websites to discover that only six of the 21 universities (28.6 %) offer degrees in translation (see EFFAT University Website n.d.; Imam Muhammad Bin Saud University Website n.d.; King Khalid University Website n.d.; King Saud University Website n.d.; Princess Nora University Website n.d.; Umm AlQura University Website n.d.). Three of these six universities (50 %) offer or have offered a course in MT, as outlined below.

Imam Muhammad Bin Saud University (IMAMU) offers a course in MT every year for graduate students. Although there is no interest in this field among professors, according to the questionnaire responses, this course is offered every year because there is a plan under way to expand. Three master's theses are written on MT at IMAMU (see Al-Haqil; Al-Lihaidan; Al-Rumaih in Appendix 3).

King Saud University (KSU) offers an introductory course in MT every semester to undergraduate students. No master's program in translation is offered at KSU, and no research projects by students are under way. Only two professors at KSU are interested in MT. The first has a long career in the area of linguistics and terminology and wrote and published 17 conference and journal papers in MT and Arabic computing (see Sieny in Appendix 3). The second (now retired) taught the MT course at KSU for years. He published a book and 10 conference and journal papers in this field (see Homiedan in Appendix 3). Based on the questionnaire response, he did a survey (unpublished) on market demand for MT, which proved to be in demand. MT research of the KSU College of Computer Science is discussed in 4.3.2 below.

Umm AlQura University (UQU) offered a course in MT only once, and no plan is in evidence to offer it again in the future, because of lack of interest among students or professors. No plans exist to expand, and there is no funding available.

4.3.2 Colleges of Computer Science and Information Technology

According to the data collected from the 28 colleges included in the survey, many of them are either new and no research has as yet been conducted on MT or some colleges have no interest in MT, NLP, or Arabic computing. One professor teach at Taibah University and at Taif University (TU) showed interest in MT or NLP or both, but no research has been conducted as yet in either place. The following universities have shown more interest in MT and have conducted research:

King Abdul Aziz University (KAU): Three professors are interested in MT and NLP. They presented three conference papers in these fields (see Al-Barhamtoshy et al.;

Jambi et al. in Appendix 3). Unfortunately, research at KAU is neither funded by KAU itself nor by King Abdul Aziz City for Science and Technology (see 4.3.3 below; King Abdul Aziz City for Science and Technology n.d.). Four Master of Science theses are written on MT (see Alahmadi; Ba-Aziz; Batawi; Khuja in Appendix 3), and many projects are done on MT and Arabic computing (Al-Barhamtoshy, personal communication).

King Fahd University of Petroleum and Minerals (KFUPM): A research group of seven professors work on Arabic computing. Their research is funded by KFUPM and King Abdul Aziz City for Science and Technology (KACST). One professor is a pioneer researcher in MT and Arabic computing. He teaches courses in MT to undergraduate and graduate students. He has published a book and 20 articles or conference papers (see Al-Muhtaseb in Appendix 3). Another professor works at the computer research institute of KACST and has published 10 articles and conference papers on MT and Arabic computing (see Alghamdi; Alghamdi/Muzaffar; Alghamdi et al.; Al-Muhtaseb et al., KFUPM Arabic Speech Processing Group in Appendix 3). Two MS theses are written on MT at KFUPM (see Al-Hashim; Lawal in Appendix 3), and many projects are carried out on Arabic computing (Al-Muhtaseb, personal communication).

King Saud University (KSU): KSU is the first university to show an interest in MT in Saudi Arabia as early as the 1970s, but no research was conducted until the 1990s. About 14 studies on Arabic computing were conducted (see AlAjlan et al.; Al-Qabbany et al.; Al-Rabiah/Al-Salman; Al-Salman et al.; Al-Subaihin et al.; Harrag et al. in Appendix 3). These were funded by KSU or KACST. Two MS theses are written on MT (see Al-Rabiah; Al-Sikhan in Appendix 3), and many projects are being done on MT and Arabic computing (Al-Salman, personal communication).

Prince Sultan University (PSU): Two professors are interested in MT at PSU. One is another pioneer in researching MT and Arabic computing. He has published a book chapter and 15 articles and conference papers in these fields (see Al-Sikhan et al.; Guessoum/Zantout; Hamandi et al.; Obeid/Zantout; Osman et al., Salamah et al.; Zantout/Guessoum Appendix 3). The second professor has published seven papers on NLP and Arabic computing (see El-Affendi in Appendix 3). Currently, PSU does not offer any graduate programs and it does not fund any research on MT.

University of Tabuk (UT): One professor has expressed interest and published 9 articles and conference papers (see Abu Shquier et al. in Appendix 3). UT does not fund any research and does not offer any graduate programs.

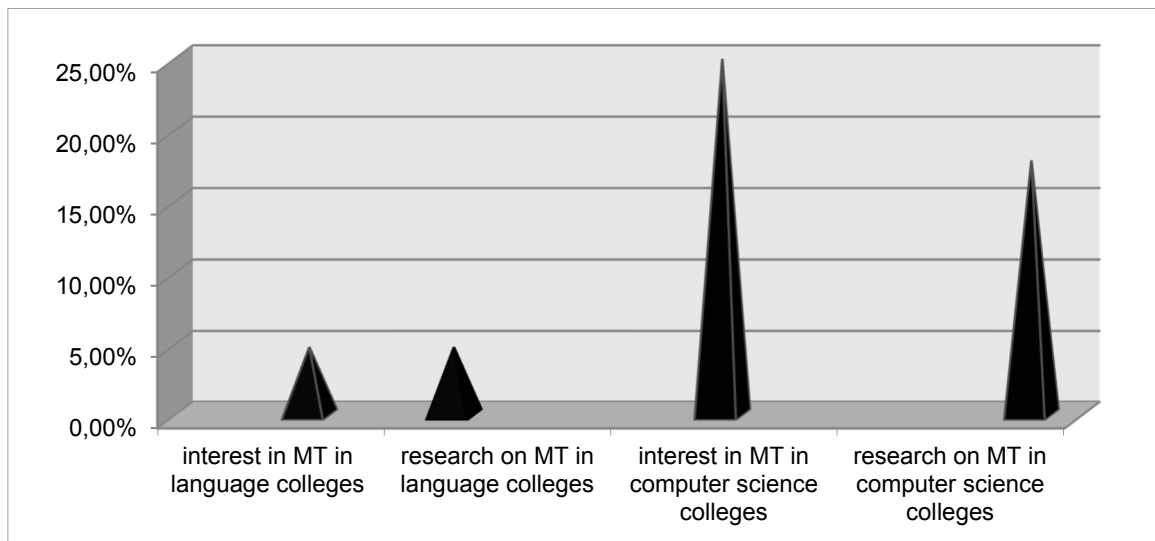


Fig. 5: Interest in MT in language colleges and computer science colleges

The most surprising result of the survey is that only one language college, namely KSU, has shown interest in MT and was a research site in this field. However, currently there is no research being conducted at this college, according to questionnaire responses. No collaboration is taking place between its faculty and the faculty of the computer science and information technology college, who show more interest in MT and conduct more research on MT or a related field, which helps to improve or build Arabic MT systems such as NLP or Arabic computing. Only seven computer science and information technology colleges (25 %) have faculty who are interested in MT, and only five out of the 28 colleges (17.9 %) conduct research on MT.

The survey showed that 109 studies have been conducted. Forty-six of these studies (42.2 %) are on MT. Twenty-one out of these 46 (45.7 %) were conducted in language colleges, and 25 (54.3 %) in computer science colleges. The remaining 63 of the 109 studies (57.3 %) were conducted on NLP and Arabic computing. Seven of these 63 studies (11.1 %) were conducted in language colleges, and 56 (88.9 %) in computer science colleges and KACST. Of these 109 studies, two (1.8 %) are books, and one (0.9 %) is a book chapter, 39 (35.8 %) are journal articles, and 67 (61.5 %) are conference presentations in both language and computer fields.

Study Type & Topic	Computer Science Colleges		Subtotal	Language Colleges		Subtotal	Total
	MT	NLP & Arabic Computing		MT	NLP & Arabic Computing		
Books	–	1	1	1	–	1	2
Book chapters	1	–	1	–	–	–	1
Journal papers	9	15	24	15	–	15	39
Conference presentations and papers in conference proceedings	15	40	55	5	7	12	67
Total	25	56	81	21	7	28	109

Tab. 1: Types and topics of studies conducted on MT, NLP and Arabic computing in language and computer science colleges.

The interest in and research on MT in Saudi Arabia started in the 1980s during which time nine studies (8.2 % of the total of 109) were conducted, five of these 9 (55.6 %) at language colleges on MT, and four (44.4 %) at computer science colleges on NLP and Arabic computing. In the 1990s, the number increased to 37 studies in all fields (33.6 %), with 18 (48.6 %) conducted at language colleges and 19 (51.4 %) at computer science colleges. From 2000 to the time of this writing, the number increased to 63 studies in all fields (57.8 %), with five (8 %) conducted at language colleges and 59 (92 %) at computer science colleges. It should be noted that from the 1980s until this writing, interest and research in MT have decreased in language colleges and increased in computer science colleges.

Neither interest nor funding is sufficient to develop and research Arabic MT or design an Arabic MT system. Not even doing research in one of the related fields can achieve that. There must be whole-hearted cooperation between linguists, translators, computer engineers, and software programmers to achieve real progress. A computer engineer may be a native speaker of Arabic, but that does not mean that he or she can do the job as well as a linguist. Only when there is interest, funding, and close cooperation between researchers in related fields, will there be a realistic chance for developing Arabic MT.

Field of Study		1980s	1990s	2000-2012	Total
Computer Science Colleges	MT	–	6	19	25
	NLP & Arabic Computing	4	13	39	56
	Subtotal	4	19	58	81
Language Colleges	MT	2	15	4	21
	NLP & Arabic Computing	3	3	1	7
	Subtotal	5	18	5	28
Total		9	37	63	109

Tab. 2: Number of studies conducted on MT, NLP and Arabic computing since the 1980s.

4.3.3 King Abdul Aziz City for Science and Technology (KACST)

KACST is a governmental organization that conducts and supports research in all fields of science and technology, including MT (see King Abdul Aziz City for Science and Technology Website n.d.). It has a major role to play in MT, as explained by Alghamdi (2009):

- It launched a terminology database, called BASM, in 1982.
- It works on and funds research to develop algorithms, tools, and systems that help to improve MT and transliteration.
- It developed a free Arabic-English translation engine called AutoTranslator.
- It developed a system for automatic transliteration of Arabic names into English.
- It developed a system for automatic transliteration of foreign names into Arabic.
- It is working with IBM to develop an MT engine (Pangeanic.com 2009).
- It funds research on MT, NLP, and Arabic computing conducted by universities, such as KSU and KFUPM, and is ready to fund any serious researcher in one of these fields.

KACST's members have conducted research on MT and other related fields. They seem to be ready to help and support researchers to improve the existing Arabic MT systems and even to build new and more developed ones (see Alghamdi; Alghamdi et al. in Appendix 3).

5 Conclusion

MT is not intended to replace translators or translation agencies. Translators will always be there and needed. However, simple texts or large volumes of texts of a certain technical nature can be translated by machines to enable translators to focus on texts that require their human creativity and intelligence. It is true that human translators, contrary to machines, can understand language nuances and culture, but they also

forget, need time to remember, and get tired and make mistakes, even when they are highly experienced, try to be meticulous, and follow very strict rules. Machines, on the other hand, can work 24 hours, 7 days a week; they never forget, never get bored or tired, can be fed with millions and millions of pieces of information, and can produce the output in record time; however, they can break down.

This study has investigated the status of MT in Saudi Arabia. The purpose of this paper was to determine to what extent MT is used and how much interest in MT is shown by Saudi organizations, translation agencies, and universities and how much research is being conducted by Saudi universities and research centers on MT.

The study has shown that there seems to be relatively little interest in MT, which leads to very little research being conducted. The lack of interest is caused by the assumption that MT cannot produce accurate translations and, therefore, cannot be trusted. Most translators do not like the idea of a rough translation even if it can be improved by post-editing. Full post-editing can be more time-consuming and expensive than human translation. So, translators prefer to translate from scratch rather than post-edit MT outputs. Yet, if only rapid post-editing (or no post-editing at all) is needed, MT can save time and money. It is also shown that Arabic poses some difficulties for MT that need to be dealt with. In addition, there appears to be no cooperation between language colleges and computer science colleges. Finally, there is no funding for research in this field offered by the Saudi government. Only two universities, KFUPM and KSU, offer funding for research done by their faculties. KACST is the only research center that supports and funds research in this field.

The findings of this study suggest that more attention to MT needs to be paid by Saudi governmental and non-governmental organizations, translation agencies, and universities. More research needs to be conducted by universities and research centers. Interest will lead to more research, which, in turn, will help to improve the available Arabic MT systems and build more advanced ones. Therefore, there is a definite need for serious cooperation between faculties of both language colleges and computer science colleges. Linguists of Arabic and other languages, translators, computer engineers, and software programmers should all work together. Linguists must play their role in specifying the rules of the languages to be translated from and into, computer engineers and software programmers need to devote themselves to building the systems, and translators must evaluate the systems and the output quality.

Even though it is widely believed that machines cannot produce translations as accurately as humans do, MT systems can produce acceptable translations for certain text types, and if more research is conducted, then more improved Arabic MT systems will be built to produce more acceptable translations or to translate other types of text.

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Appendix 1: Questionnaire Designed for Saudi Organizations

Questionnaire

Machine Translation in the Arab World: Saudi Arabia as a Case Study

This questionnaire is designed to find out how widely machine translation is used in different organizations in Saudi Arabia. Your participation, by answering this questionnaire, will be very helpful and much appreciated. Machine translation means using computer software to translate texts from one language to another. There are translation software that translate from and into Arabic, such as Sakhr, Al Mutarjim Al Araby, Al Wafi and TranSpher. There are also online translation sites, such as Google Translate, Tarjim, WebTrans and Bing Translate.

Name of Organization:

1- Do you need or perform translation in your organization work?

☐ Yes ☐ No

A- If **Yes**, what do you need translation for?

☐ Official documents ☐ Paperwork ☐ Reports ☐ Emails ☐ Websites

☐ Other, please state the purpose:.....

B- If **Yes**, how often do you need translation?

☐ Always ☐ Occasionally ☐ Rarely

C- If **Yes**, do you have a translation department?

☐ Yes ☐ No

If **Yes**, how many translation staff do you have?

If **No**, do you have a translator?

☐ Yes ☐ No

If **No**, who does the translation, if any?

☐ A translation agency ☐ A freelance translator
☐ A bilingual employee whose main duties are not translation

2- Do you use machine translation?

☐ Yes ☐ No

A- If Yes, do you use:

☐ Translation software. Which one?
☐ Online translation. Which one?.....

B- If Yes, what do you use machine translation for?

☐ Official documents ☐ Paperwork ☐ Reports ☐ Emails ☐ Websites
☐ Other, please state the purpose:

C- If Yes, do you post-edit the machine translation output?

☐ Yes ☐ No

If **No**, why not? ☐ Only a gist is needed ☐ No final version is needed

D- If No, why do you not use machine translation?

☐ You do not trust it ☐ You cannot afford it ☐ Texts are in hard copy
☐ Other:.....

3- Are you planning to use machine translation in the future?

☐ Yes ☐ No

4- Any other remarks:

.....
.....

Appendix 2: Questionnaire Designed for Saudi Higher Education Institutions

Questionnaire

Machine Translation in the Arab World: Saudi Arabia as a case study

This questionnaire is designed to find out how much Saudi universities are interested in teaching and researching in machine translation. Your participation, by answering this questionnaire, will be very helpful and much appreciated. Machine translation means using computer software to translate texts from one language to another. There are translation software that translate from and into Arabic, such as Sakhr, Al Mutarjim Al Araby, Al Wafi and TranSpher. There are also online translation sites, such as Google Translate, Tarjim, WebTrans and Bing Translate.

Name of University or College:

1- Do you offer a translation degree in your university?

☐ Yes ☐ No

A- If **Yes**, do you offer a course in machine translation?

☐ Yes ☐ No

B- If **Yes**, how often do you offer this course?

☐ Every semester ☐ Every year ☐ Other:

C- If **No**, it is because:

☐ There is no interest in machine translation ☐ There is no funding available
☐ There is no professor who can teach it ☐ Other:

2- Is there any professor specialized or interested in machine translation in your university?

☐ Yes ☐ No

3- Is there, in your university, any research done by faculty on machine translation?

☐ Yes ☐ No

A- If **Yes**, how many? Please state whether it is a conference presentation, paper, or a book:

B- If **Yes**, is this research adequately funded?

☐ Yes ☐ No

C- If **No**, it is because:

- ☐ There is no interest in machine translation ☐ There is no funding available
☐ Other:

4- Are there, in your university, any graduate projects, theses or dissertations done by students on machine translation?

- ☐ Yes ☐ No

If **Yes**, how many? Please state the kind of work and level of study:.....
.....

5- Are you planning to offer a course in machine translation in the future?

- ☐ Yes ☐ No

A- If **Yes**, why?

- ☐ There is interest among students ☐ There is a plan to expand
☐ There is available funding ☐ All the above

B- If **Yes**, it is because there is a market demand ☐

If so, has the market been surveyed by you or by another party?

- ☐ Yes ☐ No

C- If **No**, why?

- ☐ There is no interest among students ☐ There is no plan to expand
☐ There is no available funding ☐ All the above

D- If **No**, it is because there is no market demand ☐

If so, has the market been surveyed by you or by another party?

- ☐ Yes ☐ No

6- Any other remarks:

.....
.....

Appendix 3: Research Conducted in Saudi Universities and Research Centers

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