A COMPARATIVE ANALYSIS OF WEB-BASED MACHINE TRANSLATION QUALITY: ENGLISH TO FRENCH AND FRENCH TO ENGLISH

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This study offers a partial reduplication of a 2006 study by Williams, which focused primarily on the analysis of the quality of translation produced by online software, namely Yahoo!® Babelfish, Freetranslation.com, and Google Translate. Since the data for the study by Williams were collected in 2004 and the data for present study in 2012, this gives a lapse of eight years for a diachronic analysis of the differences in quality of the translations provided by these online services. At the time of the 2006 study by Williams, all three services used a rule-based translation system, but, in October 2007, however, Google Translate switched to a system that is entirely statistical in nature. Thus, the present study is also able to examine the differences in quality between contemporary statistical and rule-based approaches to machine translation.

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CHAPTER 1

INTRODUCTION

1.1. Aim and Scope

This study seeks to offer a partial reduplication of a study by Williams (2006), which focused primarily on the analysis of the quality of translation produced by online software, namely Yahoo!® Babelfish, Free Translation.com, and Google Translate. Since the data for the study by Williams were collected in 2004 and the data for present study in 2012, this will make possible a diachronic analysis with a lapse of eight years that will reveal any improvements (or lack thereof) in the translation services offered. At the time of the study by Williams (2006), two of the three services (Babelfish and Google Translate) were powered by a rule-based translation system developed by SYSTRAN (Cancedda, Dymetman, Foster & Goutte, 2009, pp. 1-2). In October 2007, however, Google Translate switched to a system developed by Google itself that is entirely statistical in nature (Kulikov, 2011). Free Translation, then as now, is a stand-alone corporate site owned by SDL International and is not associated with any engine or portal, and it uses a rule-based approach (see Help and FAQ sections of FreeTranslation.com). Thus, the present study also examines the differences in quality between statistical and rule-based approaches to machine translation.

1.2. Symbols Used in this Study

The symbols used in this study express the same meaning typically assigned to them in linguistic texts. An asterisk indicates an ungrammatical utterance. A question mark before an utterance indicates that a construction would be judged strange or grammatically aberrant by most speakers in most contexts. A number sign,

also known as a hash or pound sign, indicates that an utterance is grammatical but does not correspond to the intended meaning (in this study, this means target language output does not reflect the intended meaning of source language input). Many of the results presented in Chapter 3 are ungrammatical for reasons not related to the linguistic phenomenon being examined. In this case, the words needed to make the utterance grammatical are placed between brackets, and the utterance is marked with an asterisk only if it is ungrammatical after the bracketed "corrections" are taken into consideration.

1.3. Definition of Machine Translation

Machine translation (MT) refers to the process of using a computer program to convert an existing text written in one human language (the source language, or SL) into an equivalent text in another human language (the target language, or TL) (O'Connell, 2001). Many researchers make the distinction between MT and computer-aided translation (CAT) or machine-aided human translation (MAHT), the difference being that CAT or MAHT involves the use of translation software to accelerate and facilitate the work of a human translator. Typically, this means that a translator will simply post-edit machine translated output, but there exist other types of software that function more like word processors, offering the translator different options and suggestions for translating pieces of text as he or she types (Koehn, 2009; Nikolov & Dommergues, 2008).

1.4. A Brief History of Web-Based Machine Translation (WBMT)

1.4.1. Machine Translation

MT has its beginnings in the late 1940s and 1950s in projects funded by the

U.S. and Soviet governments to translate scientific and technical documents, typically from Russian to English and English to Russian (Hutchins, 2005). Since scientific and technical documents are typically written with a restricted range of syntax and vocabulary leaving few opportunities for ambiguity, large-scale translation agencies were able to translate many documents in very specific domains, such as nuclear reactor descriptions or aircraft manuals, using MT systems based on large dictionaries containing all the technical terminology necessary and on a very limited number of (morpho)syntactic transformations (Kulikov, 2011). The rough translations provided by these early rudimentary systems were sufficient to get a basic understanding of the articles. If an article was deemed important enough, it would be sent to a human translator for a more faithful and polished translation.

These rule-based MT systems were improved upon in the following years and many specialists in the newly emerging field voiced optimism that fully automatic, high quality translation (FAHQT) would be obtainable in the near future (Shuttleworth, 2003; Bar-Hillel, 1960). In the early 1960s, however, an argument was put forward by Bar-Hillel demonstrating the nonfeasibility of FAHQT. His argument focused on cases of lexical and structural ambiguity that seem to be resolvable by human contextual understanding alone, as in his famous “box in the pen” example:

> Little John was looking for his toy box. Finally he found it. The box was in the pen.

The correct meaning of the word *pen* as used here is certainly not “a writing utensil,” for one is typically unable to fit a box in a writing utensil, but rather “an enclosure where children play.” A human can deduce this meaning both from the fact the Little John is a child and from the relative sizes of the objects concerned. Bar-Hillel (1960) argues that it is unfeasible to program this sort of information (size,

typical contexts and thematic roles, etc) into a computer for every object imaginable. This study, conducted 52 years after the “box in the pen” article, will provide an opportunity to see if 52 years of advances in MT technology will be able to resolve Bar-Hillel’s examples of unresolvable lexical ambiguity as provided in his 1960 paper.

Bar-Hillel’s seminal article (1960) inspired and continues to inspire articles following a similar line of reasoning (Melby, 2002, for example) showing even trickier lexical and syntactical issues (Petrarca, 2002) that were judged difficult if not impossible for a machine to resolve. The purpose of Bar-Hillel’s article and of those that followed was not simply to criticize the results obtained from contemporary MT software, but to lower the goals of the field to something more attainable, like providing helpful tools for human translators. In fact, his ideas regarding the limitations and most appropriate uses of MT seem to have been influential, for the U.S. government’s Automatic Language Processing Advisory Committee (ALPAC) released a report in 1966 on the usefulness of MT research that concluded that MT was unlikely to reach the quality of a human translator in the near future, that the results obtained from MT research were not worth the costs compared to the lower expenses of human translation, and that if any money was to be spent in MT research, it should be used to develop tools to aid translators - automatic dictionaries, for example.

The report had a major impact on MT research and development in the United States as well as in a few other countries whose governments were doubtlessly influenced by the ALPAC findings. Most MT projects were either dissolved or slowed down significantly, and the number of laboratories working in the field sharply decreased. (Petrarca, 2002, p. 17). Research was almost completely abandoned for over a decade. Despite these setbacks, some limited interest in the private sector for

a MT system of practical value to people working in technical fields would, in the years to come, be the source of projects specializing in statistical approaches to MT to be discussed in an upcoming section. Additionally, two projects, SYSTRAN and Logos, managed to retain their government contracts and survive the post-ALPAC decrease of funding. SYSTRAN would go on to be an enormously successful company that would provide the technology for both Google Translate (until October 2007) and for Yahoo! Babelfish (until the time of writing). For this reason, I look further in-depth at the origins of the SYSTRAN system and its workings.

1.4.2. SYSTRAN

With its origin in the Georgetown MT project, SYSTRAN was officially founded in La Jolla, California in 1968 by Dr. Peter Toma. The United States Air Force, the primary client of the company, commissioned software to translate Russian scientific and technical documents into English. Soon, in 1973, the technology was developed in the other direction (English to Russian) as part of the *Apollo-Soyuz* joint U.S.-Soviet space flight program. In spite of the imperfect quality of the translations, the output provided by the SYSTRAN system was of much higher quality than that provided by similar contemporary systems (Lewis, 1997; Wilks, 2003, p. 65). This attracted the attention of the European Commission, which, in 1976, enlisted SYSTRAN to provide software for internal translations from English source documents. This solidified the future of SYSTRAN and initiated a sort of renaissance in MT research, as evidenced by sharp rise in interest for existing MT projects, such as Logos, and the development of new projects, such at the METEO System developed at the Université de Montréal in 1977 or the METAL MT system created in 1980 at the University of Texas.

1.4.3. How Rule-Based MT Systems Work

SYSTRAN, the system that powers Yahoo! Babelfish, and SDL's Enterprise Translation Server, which powers FreeTranslation.com, are rule-based (or traditional) MT systems, which means they rely on various levels of linguistic analysis on the source side and language generation on the target side to translate texts (Cancedda et al., 2009, pp. 1-3). The amounts of linguistic analysis and language generation performed by these components can be used to define the two extreme ends of a spectrum between which all rule-based MT systems may be placed.

On the one hand, there are direct systems. The fundamental component of a direct system is the transfer engine, which contains rules specifying the important differences between the source and target languages. Often a minimal amount of abstract analysis and generation must be performed, and most rule-based MT systems contain two components to these ends–one that analyzes SL input and another to generate TL output. Some authors (Shuttleworth, 2003; Cancedda et al. 2009) use the term *transfer system* to refer any system that uses such analysis and generation while reserving the term *direct system* for a system consisting only of a transfer engine. Others, such as O'Connell (2001), note that truly direct systems yield unimpressive results and that almost all systems today perform some level of linguistic analysis. Thus, these authors use the term *transfer system* to refer all systems of this type, including systems such as SYSTRAN, often labeled a direct system by other authors.

These systems works best for language pairs such as English and French that show many more linguistic similarities than differences. The fact that these languages share certain linguistic features such as articles, SVO (subject-verb-object) sentence structure, PMT (place-manner-time) order for adpositional phrases, relative

clauses, verb tenses, etc, may be taken for granted when translating. Thus, it would be counterproductive to analyze the source text for abstract meaning when in such cases translating the SL text word-for-word (with some minor adjustments along the way) yields an acceptable TL text (O'Connell, 2001). The primary downside to this approach is that a transfer engine must be developed for each language pair and for each translation direction in a given language pair. For companies that wish to offer MT software that is compatible with many language pairs, this approach is therefore extremely inefficient.

Finally on the other hand we have interlingua systems. An interlingua system performs a complete linguistic analysis of the source text and breaks it down into a language-independent meaning representation called an interlingua. The language generation component of the system can then generate a TL text from the interlingua representation. Because the interlingua is language-independent, an interlingua system can accommodate more than one language pair, but the difficulties of creating a totally language-independent interlingua often limit the use of this approach (O'Connell, 2001).

While the current state of technology limits the use of a true interlingua, in certain WBMT software, such as Google Translate, a language typologically or lexically similar to the SL is often used to this effect for less-common language pairs. For example, to translate a text from Catalan to French, Google translate first translates the Catalan text into Spanish and then to French (and vice versa). Similarly, a text in Haitian Creole must pass through French before being translated to English. For languages without a closely-related "relay"-language, English is used. Thus, for a translation from French to Vietnamese, Google first translates the text into English and from English to the TL, Vietnamese (Boitet, Blanchon, Seligman &

Bellynck, 2010). Like an interlingua system, this allows for translation between less-common language pairs, but, unlike an interlingua system, this process, by using a natural language as the “relay” language, basically doubles the opportunities for ambiguity and mistranslation. While an examination of this process is beyond the scope of this study (for English-French translation does not use an intermediary language), Boitet et al. (2010) notes for instance the negative effects in both French-Vietnamese (in reality FR-English-VI) and English-Ukranian (in reality EN-Russian-UK) language pairs.

All rule-based MT systems may be classified according to their place on the direct-interlingua spectrum. Directly programmed systems and interlingua-based systems are termed 1G and 3G, respectively; those that fall somewhere in between, i.e. transfer systems such as SYSTRAN, are predictably named 2G. Current technology only permits 1G and 2G systems. To develop a 3G system is akin to solving the problem posed by Bar-Hillel (1960), that is, essentially to teach a computer to understand the meaning of a text by some kind of encyclopedia knowledge of the world, to some degree mimicking the brain processes of a human translator. Fifty-two years after the “box in the pen” article, most authors (Cancedda et al., 2009; Boitet et al., 2010; McCarthy, 2004; Shuttleworth, 2003; etc) are still skeptical of this possibility anytime in the near future. Other MT approaches, however, have been developed to sidestep some of the problems inherent in rule-based MT systems.

1.4.4. Statistical Approaches to MT

The fundamental ideas behind statistical machine translation (SMT) go back to the beginnings of MT itself. As early as 1949, for example, the American scientist

Warren Weaver introduced the basic principles of SMT and its closely related counterpart, example-based MT (EBMT). Although these methods were conceived of in the early history of MT, interest and research in SMT and EBMT were quite negligible until the first SMT system was pioneered by a group of researchers at IBM in the late 1980s (Cancedda et al., 2009, p. 2). Within about a decade, statistical approaches became dominant in the field, and SMT and EBMT are widely used and have become by far the most widely studied MT methods.

Both SMT and EBMT differ radically from the aforementioned ruled-based approaches in that–in their pure forms at least–these methods dispense with any kind of pre-programmed grammatical or lexical knowledge of the two languages involved. EBMT systems use a large number of bilingual text corpora in order to match sentences or fragments of sentences in the SL with equivalent sentences and fragments in the TL. Of course, because most language pairs differ significantly in syntactical structure, some linguistic “rule-based” knowledge of the TL is typically programmed into the system so that it may recombine the target sentence parts to produce grammatical output. It should be noted, however, that Google’s statistical method uses no such grammatical filter, often yielding nonsensical and obvious errors (as the data show).

Like EMBT, SMT systems rely on vast amounts of data in the form of both monolingual and aligned bilingual text. Although systems are much more complex now than in Dr. Weaver’s time (Cancedda et al., 2009), the basic idea remains the same: for each sequence of three words in the SL text, the system first calculates the probability of a given three-word stretch of TL text being the correct translation, taking into consideration factors such as the possibility of a word shifting its position in the sentence in translation or of a single word being translated by two or more

words (the so-called “translation model”); then, it uses monolingual TL corpora to calculate the probability of a second word appearing given the first, and of the third word appearing given the first two (the so-called “language model”) (Shuttleworth, 2003).

There are of course, downsides to both EBMT and SMT. One is the vast amount of bilingual corpora needed to even make such methods possible. The advent of the Internet, however, and the accompanying digitalization of documents from important multilingual institutions (the UN and the EU for instance) have alleviated this problem somewhat. Nevertheless, for less-common language pairs with insufficient bilingual corpora, these methods remain impracticable. Also, as mentioned above, problems arise with these methods in language pairs where translation involves large-scale shifting of word order.

1.4.5. Hybrid Systems

To overcome the defects of each MT method, most MT systems combine several of them, and are therefore called *hybrid* systems (O’Connell, 2001). WBMT services seem to be in general exceptions to this rule. SDL’s Enterprise Translation Server*,* used on FreeTranslation.com, is entirely rule-based. As mentioned earlier, in 2007, Google abandoned the rule-based SYSTRAN system for an entirely statistical system of its own. While Yahoo! Babelfish’s software is still based on the entirely rule-based SYSTRAN 6, in 2010 SYSTRAN released SYSTRAN 7, the first hybrid rule-based/SMT technology released by SYSTRAN and one of first of its kind available to the general consumer. One expects that Yahoo! Babelfish might soon implement this software, in which case another evaluative study of the kind presented here would be able to evaluate the performance of a hybrid system

against the more one-sided approaches such as Google Translate or FreeTranslation.com.

1.4.6. WBMT

In the 1990s, the sharp rise in the number of personal computers provided a favorable environment for MT software designed for the general consumer (Lewis, 1997). Companies like Intergraph and SYSTRAN began making PC versions of their MT products, but these products were not easily integrated with web browsers for the quick translation of web-pages, e-mails, and the like. Increasing numbers of web-users needed basic translation services to get the “gist” of the information contained in web-page or e-mail. Finally, in the late 1990s web-portals such as Google and Yahoo! drew up contracts with MT software companies such as SYSTRAN to provide web-page and text translation services free to all users (Kulikov, 2011). This is done to increase traffic through these portals, increasing the value of advertising space. FreeTranslation.com, the site owned by SDL International, has a similar marketing function; in addition to several large advertisements for unrelated products, the site features many small advertisements for MT products and professional (human) translation services available from–as one might have guessed–SDL International.

1.5. Evaluating MT

Traditionally, there are two paradigms of MT evaluation: (1) *glass box evaluation*, which measures the quality of a system based upon internal system properties, and (2) *black box evaluation*, which measures the quality of a system based solely upon its output, without respect to the internal mechanisms of the

translation system (Boitet et al., 2010). Glass Box evaluation focuses upon an examination of the system's linguistic coverage and the theories used to handle those linguistic phenomena. This method of evaluation is primarily focused on rule-based expert systems, rather than statistical systems. Black Box evaluation, on the other hand, is concerned only with the objective behavior of the system upon a predetermined evaluation set.

Since we possess only very general notions of the inner workings of the WBMT systems under study (Google translate is an SMT system, Babelfish and FreeTranlation.com are rule-based, Babelfish is powered by SYSTRAN, etc), obviously black box evaluation techniques will be used in this study. The evaluation system to be used is based on three judgment criteria outlined below. The system for evaluation is admittedly a bit subjective; indeed, Boitet et al. (2010) and Dorr (2010) both offer several of what they call more sophisticated, i.e. more quantitative, evaluation techniques. For example, one technique, called the *post-editing distance* evaluation, involves counting the number of corrections necessary to make a machine translated text acceptable; another called the *reference translation* evaluation technique notes the number of differences between MT output and a human translation of the same text. Since no statistical calculations of any kind are used in this study, both of these techniques are, for the purposes of this study, far more rigorous than necessary. Let us outline the guidelines used for evaluation in this study:

Dorr, in a 2010 paper written from the U.S. Defense Advanced Research Projects Agency (DARPA), provided three criteria for judging the quality of MT output: adequacy, informativeness, and fluency. Adequacy measures how much of the meaning from the source text makes it into the translated text. Informativeness refers

to how easily users can find the information they are looking for. Fluency asseses how smooth the translation is. If one evaluates these three criteria for a given MT translation, one will have a good idea of the overall quality of the translation. O'Connell (2001) suggests a fourth criterion for the area of WBMT: effort. "Most users bring little patience to their Web sessions," she explains. "The less user effort required, the more users are satisfied with the Web MT session."

It is worth mentioning that all three of the DARPA criteria may be affected by properties of the source text, such as the subject matter and the writing style. For example, in a technical text, it is essential that terminology be translated consistently. In such a case, it would be much harder to satisfy the informativeness criterion. One would certainly not expect a WBMT system to consistently translate technical terminology. All technical terms that are not part of the dictionary programmed into a WBMT system are liable to be translated piecemeal or not translated at all. For example, the accounting term *capital gains tax* is rendered as *impôt sur le capital des gains* by Google Translate and *les gains capitaux taxent* [the capital gains (they) tax] by FreeTranslation.com. As can be seen, each is an attempted piecemeal translation of the English term. The accepted translation is *impôt sur les plus-values.* If this term is used in a sentence, a WBMT system might group parts of the term with neighboring words in translation, thus yielding varying results in different contexts.

The adequacy of a machine translation is not entirely disassociated from its informativeness. Adequacy, like informativeness, involves in large part the correct translation of lexical items from the SL to the TL. This task presents many problems for all MT systems to date (see discussion above). For most purposes, a machine translated text is considered adequate enough if the user is able to understand the gist of message. In the context of WBMT, this usually means a web-page or an email.

In a professional setting, the user's goal might be to determine whether to send the text to an expert for human translation.

Finally, an MT translation is fluent if the output shows acceptable morphology, syntax, discourse markers, etc. Of course, in general the more complex the syntax of the SL text, the less fluent the MT output will be. For example, adjective topicalization out of a subordinate clause beginning with "though" (*Smart though he is, Sherlock Holmes failed to solve the case)* is translated word-for-word by all three WBMT systems, yielding an ungrammatical construction in French (**Intelligent bien qu'il soit…).* The MT translation of any piece of complex prose will show a wide range of fluency issues, ranging from basic issues involving verb tenses and vocabulary all the way up to more subtle problems involving inherent differences between French and English (use of discourse markers, passive constructions, frequency of coordination and subordination, etc) of the type that professional translators must deal with. While an in-depth examination of the problems typical of MT translations of complex prose is beyond the scope of this study, we will present here two translations of the famous opening of *Du Côté de chez Swann* [Swann's Way] by Marcel Proust, in order to give a vague idea of the differences in fluency between an MT and a professionally translated text. First, the original text:

> Longtemps, je me suis couché de bonne heure. Parfois, à peine ma bougie éteinte, mes yeux se fermaient si vite que je n'avais pas le temps de me dire : « Je m'endors. » Et, une demi-heure après, la pensée qu'il était temps de chercher le sommeil m'éveillait ; je voulais poser le volume que je croyais avoir dans les mains et souffler ma lumière ; je n'avais pas cessé en dormant de faire des réflexions sur ce que je venais de lire, mais ces réflexions avaient pris un tour particulier ; il me semblait que j'étais moi-même ce dont parlait l'ouvrage : une église, un quatuor, la rivalité de François Ier et de Charles-Quint.

Here is the professional translation of the text published in 1922 by C. K. Scott Moncrieff:

> For a long time I used to go to bed early. Sometimes, when I had put out my candle, my eyes would close so quickly that I had not even time to say “I’m going to sleep.” And half an hour later the thought that it was time to go to sleep would awaken me; I would try to put away the book which, I imagined, was still in my hands, and to blow out the light; I had been thinking all the time, while I was asleep, of what I had just been reading, but my thoughts had run into a channel of their own, until I myself seemed actually to have become the subject of my book: a church, a quartet, the rivalry between François I and Charles V.

And finally the FreeTranslation.com translation:

> A long time, I went to bed early. Sometimes, scarcely my extinct candle, my eyes closed themselves so quickly that I did not have the time to say me: "I m'endors myself." And, a half an hour after, the thought that it was time to look for sleep awakened me; I wanted to put the volume that I believed to have in the hands and blow my light; I had not stopped while sleeping to do the reflections on what I had just read, but these reflections had taken a special turn; it seemed to me that I was myself that of which spoke the work: a church, A quartet, the rivalry of François Ier and of charles-quint.

These three criteria outlined here will be used throughout the remainder of the study as a sort of basis on which to judge MT output. Of course, it is worth noting that all authors and specialists in the field agree that raw MT output fulfills the three DARPA criteria only to a limited degree. Indeed, as one may read in the FAQ sections of the WBMT systems evaluated in this study, human intervention is almost always necessary in order to achieve high levels of adequacy, informativeness, and fluency. It is well understood that MT is unable to provide literary quality output and is in many cases unable to analyze complex, literary style input. Accordingly, the goal of this study is not simply to show that some WBMT systems fail miserably as translators of Proust–this much is obvious–but rather to consider a few simple examples that isolate certain grammatical phenomena to allow for a more clear and precise evaluation of the WBMT systems in question. For it will be seen that different WBMT systems perform at different levels, and the simple, clear examples chosen will permit the objective evaluation of the performance of these systems relative to one another.

CHAPTER 2

A REVIEW OF THE RELEVANT LITERATURE

2.1. Introduction

Machine translation (MT) is a lively and very active field of research spanning many domains of study, including but not limited to computational linguistics, artificial intelligence, computer science, translation studies, and language education. A query in the Cambridge Scientific Abstracts Database reveals that several hundred articles on to the topic were published in the year 2011 alone, distributed among all four categories of journals: arts & humanities, natural sciences, social sciences, and technology. Since the amount of research being published on the subject is quite overwhelming, the review of the literature will be restricted to two topics relating directly to this study: Web-based machine translation (WBMT) and problems in French-English/English-French MT.

2.2. WBMT Research

2.2.1. WBMT and Second Language Education

Most research in WBMT focuses on the role of WBMT in second language education. Obviously, this research builds on previous work concerning MT, and often researchers do not draw a clear line between the two. For example, Petrarca (2002) groups an online version of SYSTRAN with traditional MT systems in his assessment of MT output as a tool to understanding the second language learner. As a minor point in his dissertation, he remarks that second language learners are likely already using to some degree online translators such as Altavista (now Yahoo!) Babelfish, and for this reason it is all the more important for instructors and students to have a knowledge of the strengths and pitfalls of MT.

While Petrarca (2002) only makes passing mention of second language students' use of WBMT (p. 27), Luton (2003) makes it the subject of a short article with a rather revealing title: "If the Computer Did My Homework, How Come I Didn't Get an 'A'?" The article, written by an American teacher of French, begins by showing how to recognize the use of WBMT in student writing assignments, namely, by the seeming word-for-word translations out of English, the occasional English word thrown in, and the momentary slides into extremely fragmented and unnatural language. She presents two such WBMT websites, FreeTranslation.com and Babelfish, and evaluates the performance of each. She suggests ways of confronting students who seem to have used WMBT devices on homework or compositions, and offers advice to educations about teaching the appropriate and inappropriate uses of WBMT to students.

McCarthy (2004) offers an overview of the possible uses of the Internet for the translator and foreign-language student. These include not only WBMT sites, but also many resources for looking up particular contextual elements which, while left unspecified in the source text, must be specified in the TL (see for instance, the discussion on verb-framing in Chapter 3, Table 3-33), and for checking certain specific, idiosyncratic syntactic details. McCarthy overviews the possible instructional uses of MT, including using it to provide L2→L1 "gist translations" and teaching typical L2→L1 "translation traps."[1] He also evaluates the performance of Babelfish with a handful of these "translation traps" and attempts to show the weaknesses of the site by a technique he calls "ping-pong translation." The fallacy that one can use "ping-pong translation" to demonstrate the weaknesses of WBMT systems is discussed in the next paragraph. McCarthy then talks about the instructional

[1] Ideas and expressions which may not be translated word-for-word between the two languages.

drawbacks of WBMT, namely, that many students simply feed L2 or L1 input through the translation service and turn in the output as their own translation or composition, having learned nothing about translation or about the language they are studying. McCarthy then offers several different solutions for handling students who have used WBMT services, ranging from grading WBMT output as if it were the student's work and simply pointing out the drawbacks and problems of WBMT all the way to treating the use of WBMT as a form of plagiarism and imposing severe penalties for all students who use WBMT.

It should be noted that in several of the papers evaluating (WB)MT performance (Luton, 2003; McCarthy, 2004; Richmond, 1994; and, to a certain extent, O'Connel, 2001), it is suggested that the fallibility of (WB)MT systems can be proven by what McCarthy (2004) calls "ping-pong" translations and Fountain and Fountain (2009) "double back" translations. The idea is to translate a text from L1 to L2 and back to L1 again (L1 → L2 → L1). If the final output is different from the original text, we see that there is something inherently wrong with the (WB)MT system, that "the system does not think and does not respond to the broader environment" (McCarthy, 2004). Is that what is really being proven? Fountain et al. (2009) puts the finger on the problem when she concludes that the problem does not involve the computer program, but rather the nature of translation itself. A simple example can demonstrate this point. The normal translation into English of *J'ai vu la rivière* is *I saw the river.* Without any additional context, a translator could justifiably translate the English sentence back into French as *J'ai vu le fleuve.* French draws a clear distinction in ordinary speech between *une rivière*, which is strictly speaking a tributary, and *un fleuve*, which is a river that flows into the sea. Thus, while each step in the translation chain can be justified, the end result is different from the original

text because the only reasonable English translation of the French word *rivière,* i.e. *river* (*tributary* is unlikely in normal conversation even from an educated speaker), is a hyperonym of two French terms.

Williams' 2006 paper, "Web-Based Machine Translation as a Tool for Promoting Electronic Literacy and Language Awareness," which is the starting point for this study, examines and analyzes output by three different WBMT services, Google Translate, Altavista (now Yahoo!) Babelfish, and FreeTranslation.com, and offers a pedagogical plan for presenting and explaining WBMT to students. In this study, I both replicate the data provided in his data and analysis section and test some of the examples that he suggests educators should present in class to students in order to teach them about WBMT services as part of a more general program in electronic literacy.

Fountain and Fountain (2009), in a paper that frequently cites Williams (2006), examine the place of WBMT services in the modern language classroom, specifically in a Spanish-language context. The article offers a discussion about how instructors can minimize inappropriate use of WBMT, suggesting that the best solution is to both ban the use of WBMT on all assignments while penalizing its use as a type plagiarism and to teach WBMT to students so that they may better understand both the translation process and some of the flaws inherent in WBMT services. The article also examines what may be gained in the classroom by teaching literary translation, professional translation, and interpretation to students at an advanced level.

Finally, Peters, Weinberg, Sarma & Frankoff (2011) present student perceptions about different types of web-based activities used to seek information for French language learning. Group interviews were conducted with 71 students in five Canadian universities to elicit data on they use of the Internet for information-seeking

activities. Among these-information-seeking activities were form-focused activities involving the consulting of online dictionaries or the use of translation software. Surveys asking the students to list and rate certain technologies by a number of different criteria revealed that, while only four of twenty groups studied mentioned WBMT, it was given a perfect score on all criteria by three of the four groups. Thus, in spite of flaws of WBMT systems, many students seem to trust them enough to use them as a learning tool.

2.2.2. Usability and Functionalities of WBMT Services

Nikolov and Dommergues (2008) offer an overview of the functionalities of Google Language Tools for translators, and compare them to other similar translation aids, *TRAFL* and *TRADOS.* Gaspari (2004) presents an empirical evaluation of the main usability factors that play a significant role in the interaction with on-line MT services. These factors include: 1) Guessability, which refers to the effort required on the part of the user to successfully peform and conclude and on-line task for the first time, 2) Learnability, which refers to the times and effort required on the part of users to familiarize themselves with the satisfactory operation of a web-based application after they have used it already at least once, 3) the possibility of parallel browsing of an original web-page and its machine trans, and 4) the continuous machine translation of hyperlinks while browsing. The investigation is carried out from the point of view of typical users with an emphasis on their real needs, which explains the selection of the four key usability criteria listed above. A small-scale evaluation of five popular WBMT systems (Babelfish, Google Translate, FreeTranslation.com, Teletranslator, and Lycos Translation) against the select usability criteria lead to the conclusion that different approaches to interaction design

can dramatically affect the level of user satisfaction. The author offers a particularly in-depth analysis of the functionalities of Babelfish with suggestions on how it could improve its usability. Although he does not use very quantitative methods, the author seems to indicate that, on the basis of his four usability criteria, Google Translate and Babelfish are the most user-friendly of the five services. The author asserts that the factors he examines that seem to be conductive to greater user satisfaction should be fed back into the design of WBMT services to enhance their design.

2.2.3. The Impact of WBMT Services in the Field of Web-Publishing

O'Connell (2001) presents an overview of the different methods used in MT (statistical and rule-based) and explains methods used to evaluate MT performance. She then compares and contrasts free WBMT services with Commercial off-the-shelf (COTS) MT software. She notes that the out-of-the-box performance of COTS software resembles that of free WBMT, but notes that COTS MT software allows for much more personalized functionalities and possibilities for improvement based upon human corrections of texts translated by the software. She notes, however, the more and more WBMT sites are beginning to offer these services and that the gap between free WBMT services and COTS MT software is closing. She then offers web-publishers several guidelines to create more "translatable" web-sites, that is, web-sites that pose fewer problems for WBMT systems.

2.2.4. Presentation, Evaluation, and Analysis of WBMT

Shuttleworth (2003) offers a practical introduction to the theoretical problems of WBMT and of MT in general by examining machine translations between three languages: English, Italian, and French. He shows that potential ambiguity is, in fact,

relatively common in human languages, but that this is not a problem for humans because native speakers are simply able to call upon their intuitive knowledge of the world to disregard 95% of potential ambiguities. For a machine, this is not the case, and therefore machines have difficulties with simple sentences such as Bar-Hillel's (1960) *The box was in the pen* or Stephen Pinker's *Time flies like an arrow.* He also mentions the problem of anaphora as an essentially unresolvable problem in MT. For instance, in the following three sentences, the English word "it" refers to three different entities: *The monkey ate the banana because it was hungry, The monkey ate the banana because it was ripe*, and *The monkey ate the banana because it was tea-time*. In French, however, this corresponds to three different anaphora: *il, elle,* and *ce/il.* Shuttleworth postulates (correctly, as a quick test with Google translate reveals) that WBMT systems are quite helpless to determine the antecedent of a given anaphor wherever a potential ambiguity exists.

Shuttleworth (2003) then offers an overview of the different types of MT software: statistical, example-based, rule-based using an interlingua, and rule-based using a one-directional translation-engine. He summarizes the different types of MT technology available and some of the important functionalities of COTS MT software, such as terminology management. He explains the different ways in which MT can and should be used to aid professional translators, affirming the integral role of the human translator in producing a natural-sounding TL text.

Kulikov (2011) deals with WBMT in the context of Russian-English and German-English translation, but his conclusions may be generalized to all language pairs. In the first section he reviews the types of WBMT systems (systems integrated into web-browsers, systems that are part of a search engine, and online translation services), and the types of software used by WBMT systems (statistical, rule-based,

or hybrid). He then examines the eroors of different types of WBMT systems in translating Russian news texts. In the second section he presents a method of using multidomain corpora for to produce better output for specific types of texts (technical, journalistic, etc) and a method of automatically detecting the domain of the SL input. He affirms that an automatic domain detection device in WBMT systems would greatly improve output in most cases and in fact should be added to existing systems. Finally, in the third section turns to text-level analysis and briefly discusses anaphora and coreference resolution by linguistically annoted parallel texts. The fourth section turns to other natural language processing systems that may improve the quality of MT on the Web. In conclusion, he emphasizes the role of linguistically parsed and annotated parallel corpora as the means by which to reduce the number of mistakes produced by MT systems.

Boitet et al. (2010) trace the history of WBMT, from the first Systran MT server made available on the Minitel network in 1984 and on Internet in 1994 to modern WBMT systems. Since the beginning of WBMT, Boitet et al. assert that we have come to a better understanding of the nature of MT systems by separately analyzing their linguistic, computational, and operational architectures. Also, the authors clarify the systems' inherent limits as outlined by the CxAxQ metatheorem[2]. They propose that systems be designed in an informed manner using this theorem according to the translation situations. The authors present an overview of the different types of MT evaluation tools based on reference translations are useful for measuring progress; those based on subjective judgments for estimating future usage quality; and task-related objective measures (such as post-editing distances) for measuring

[2] For a more detailed discussion, see Boitet et al. (2010). The CxAxQ metatheorem is a experimentally but not formally provable theorem which states that the product of language Coverage, Automation rate, and linguistic Quality of MT systems is always well below 100%, but two of these factors can approach 100% if one compromises on the third.

operational quality. Moreover, they emphasize the importance of the Internet in democratizing MT through free WBMT services. They review certain recent applications of MT, such as usable speech translation systems (for restricted tasks) running on PDAs or on mobile phones connected to servers and man-machine interface techniques that have made interactive disambiguation usable in large-coverage multimodal MT. Increases in computing power have made statistical methods workable, and have led to the possibility of building low-linguistic quality but still useful MT systems by machine learning from aligned bilingual corpora (SMT, EBMT). In parallel, the authors assert that progress has been made in developing interlingua-based MT systems, using hybrid methods. Finally, the authors try to dispell many misconceptions about MT that have been spread among the public, and even among MT researchers, in part because of ignorance of the past and present of MT R&D.

2.3. Research in French-English and English-French MT

2.3.1. Short Overview

In addition to the various studies in French-English and English-French WBMT mentioned above, some studies focus on practical solutions in French-English and English-French translation. Cristinoi-Bursuc (2009), for instance, looks at the many different aspects of the question of grammatical gender in translation between the two languages. By means of the notions of behavioral classes, types of marking, and morphosyntactic markers, she shows that all the problems that arise in the machine translation of gender from French into English or vice-versa can be predicted a priori at a lexical level, for all the items covered. Since this is the case, she asserts that systematic solutions to these problems can be found and

implemented. In fact, the types of solutions she proposes can also be applied to other language pairs and to other linguistics categories as well to contribute to the general improvement of MT systems. Vaxelaire (2006) examines the translation of proper names by MT systems. He first shows that in many cases, proper names are translatable despite the fact that many MT systems neglect to include them in their lexicons. The more complicated question is whether of not proper names should be translated. Vaxelaire examines different criteria, such as the textual genre, the historic context, the SL, and the ontological nature of the bearer, that play a significant role in the decision to modify or to preserve a proper name in its original form. In this study, I test to see whether or not the WBMT sites modify or preserve proper names in their original form.

CHAPTER 3

METHODOLOGY AND RESULTS

3.1. Methodology

Most of the data for this study were collected in April and May of 2012. To save space, the sites Yahoo! Babelfish, Google Translate, and FreeTranslation.com are henceforth referred to as BF, GO, and FT. The data was collected simply by typing the relevant source text into each web-based machine translation (WBMT) system and copying the output into a data management program for later use. Not all data collected are presented in this study. For a given linguistic phenomenon, enough examples were tested to reveal the consistency or the inconsistency of the system. In cases where a WBMT system responded consistently to a certain linguistic structure, only a handful of examples were chosen as representative of the rest of the data.

3.2. Presentation of Results

Since the primary goal of this study is to offer a diachronic analysis of the WBMT systems evaluated by Williams (2006), the data have been divided into sections carrying the same titles as those in Williams' paper, namely Prepositions, Nouns, Adjectives, and Verbs and Verb Phrases. This is done in order to present the diachronic data as clearly as possible. Also, for clarity's sake, we have placed the date the data was collected (either in 2004 for data from Williams' paper or in 2012 for data collect for this study) as the last item in the title for each table. I have also added a section on polysemy inspired by data from Williams' paper and a miscellaneous section that contains data that could not be placed in any other category. The set of results has been significantly broadened in three ways. First,

while the Williams paper only tested the WBMT systems for the translation direction English-French, corresponding with the primary theme of his paper (the role of WBMT in French language education), we have included similar data for the other direction, that is to say, French into English. Second, in another part of Williams' paper, he presents certain problems in English-French translation as part of a pedagogical plan to help professors present and explain WBMT to students. These examples, left untested in Williams' paper, were translated with the WBMT systems and are presented here in the appropriate sections, along with equivalent French-English translations. Finally, at any point where it seemed appropriate to expand upon the original Williams' data set in order to include closely related linguistic structures, we have done so. Many of the examples in the expanded data are inspired by Cristinoi-Bursuc (2001), Girju (2009), and Luton (2003), although they are not taken word-for-word from these sources. All tables will be preceded by short discussions on the data presented in the table. We will attempt to withhold any large-scale conclusions or generalizations until the next chapter, which is dedicated to that purpose, but we will make sure to point out along the way recurrent patterns in the data that will be central to the conclusions which will be drawn.

3.3. Prepositions

Williams (2006) evaluation of WBMT sites' handling of the prepositional paradigms of "sociogeopolitical" units occupies the totality of the section he devotes to prepositions. In French, almost all countries, regions, and continents, and some islands and cities usually have to be accompanied by an article that depends on its grammatical gender, *le* if masculine or *la* if feminine. The rules are very complex, however. In situations where the geographic region or country follows the

prepositions *à* [in/to] or *de* [from], they do not contract like regular singular nouns (for which only two contractions exist: *à+le→au* and *de+le→du*). The preposition one should use depends not only on gender, but also on the initial sound of the geographical area (see Table 3-1). There exist, of course, exceptions to the exceptions. Certain islands, such as *la Martinique*, usually follow the preposition-article contraction paradigm for common nouns rather than the paradigm for sociogeopolitical units. Also, when the preposition *de* is used to mark a sort of genitive case, the article can often be omitted: *La Reine de Danemark* [the queen of Denmark], *Le Roi de Maroc* [The king of Morocco], etc. Finally, in many cases involving the preposition *de*, a single usage has simply yet to be established, and there can be significant variation among speakers. We will try to avoid such ambiguous cases in this section and throughout this chapter, but when this was unavoidable, we have in most cases included the data with full explanatory commentary.

Table 3-1

Prepositional Paradigms for Sociogeopolitical Units

Gender/Initial sound	**article**	***à* + article**	***de* + article**
Masculine/Consonant	*le*	*au*	*du*
Masculine/Vowel	*l'*	*en*	*d'* (or *de l'*)
Feminine/Consonant	*la*	*en*	*de* (or *de la*)
Feminine/Vowel	*l'*	*en*	*d'* (or *de l'*)

As be seen in Table 3-2, both BF and GO performed well in the Williams study (2006). Many countries and regions were not marked as such by the FT programmers, and so they were lacking an article altogether. In the two cases where an article was provided, **à l'Espagne* and **à la Chine*, the article and preposition did

not contract according to the paradigm for sociogeopolitical units (see Table 3-1). From the data given, it seems unlikely that the FT programmers even included a separate paradigm for sociopolitical units, as all occurrences of preposition + article corresponded to the paradigm for common nouns. BF and GO had a different, but just as serious problem in translating the preposition *from,* namely that it was absent in the TL text. Thus *I am from Denmark* became **Je suis le Danemark* [I am Denmark]; *She is from Canada* became *Elle est le Canada* [She is Canada], and so forth.

Table 3-2

Prepositions with Geopolitical Units, 2004

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
to Florida	en Floride	en Floride	* à Floride
to Argentina	en Argentine	en Argentine	*à Argentine
to Spain	en Espagne	en Espagne	*à l'Espagne
to China	en Chine	en Chine	*à la Chine
to Morocco	au Maroc	au Maroc	*à Maroc
to Denmark	au Danemark	au Danemark	*à Danemark
I am from Denmark	*Je suis le Danemark	*Je suis le Danemark	*Je suis de Danemark
She is from Canada	*Elle est le Canada	*Elle est le Canada	*Elle est de Canada
from Quebec	*le Québec	*le Québec	du Québec

The data collected for this study is shown in Table 3-3. To see if the WBMT output was affected by the preposition chosen, we also collected data for the preposition *in*, which, when translated into French, should yield the same results as the preposition *to.* Also, we tested the prepositions in context so that the system's performance would correspond to more typical translation demands. In the table, this

context has been omitted for clarity's sake, as the beginning of *I am going to…* and *I am in…* are translated accurately by all three WBMT sites as *Je vais…* and *Je suis….*

Among the three different translation sites, Google performs the best, producing only one ungrammatical form (**à l'Argentine* instead of *en Argentine*) and one questionable form (*?Je suis en provenance du Japon, être en provenance de* being reserved for inanimate objects such as trains or shipments of cargo). Babelfish also performs well in translating the prepositions *to* and *in*, but seems to have problems producing to correct form for feminine U.S. states. The preposition *to* is translated as *à (*à la Californie, *à la Floride)* rather than *en.* Nevertheless, the software still has the major flaw of not translating the preposition *from* in most cases. The two exceptions, *Je suis de la Californie* and *Je suis du Texas*, were not part of the data in Williams (2006), so it is impossible to say if this represents actual improvement in the software or simple exceptions to a more general problem that in the last eight years has not received sufficient attention from the programmers. FreeTranslation.com still has difficulties translating the preposition *to.* The data for this study match that of Williams (2006) in all cases but one. Most translations provided by the web site leave out the definite article altogether, and others use it in environments, such as before a feminine country, where it should be absent. The one exception, *to Morocco,* is correctly translated as *au Maroc*. The problem is not, however, that these words have not been properly labeled as countries or states, as the software properly translates that majority of examples using the preposition *in* and *from.* One of the mistranslated examples, **à Maroc,* is interesting because *to Morocco* is the only correctly translated example with the preposition *to.* This sort of inconsistency, noted explicitly by Williams in his 2006 paper, is easily explainable in the case of Google translate because the GO system, as has been noted, is entirely

probabilistic in nature. What is more difficult to explain is why rule-based MT systems such as those used by FT and BF should show such inconsistencies. We will examine this question further in Chapter 4.

Table 3-3

Prepositions with Geopolitical Units, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
to Texas	au Texas	au Texas	*à Texas
in Texas	dans le Texas	au Texas	au Texas
to Maine	au Maine	dans le Maine	*à Maine
in Maine	au Maine	dans le Maine	dans le Maine
to California	*à la Californie	en Californie	*à Californie
in California	en Californie	en Californie	en Californie
to Missouri	au Missouri	dans le Missouri	*à Missouri
in Missouri	au Missouri	dans le Missouri	dans le Missouri
to Florida	*à la Floride	en Floride	*à Floride
in Floride	en Floride	en Floride	*à Floride
to Argentina	en Argentine	*à l'Argentine	*à l'Argentine
in Argentina	en Argentine	en Argentine	en Argentine
to Spain	en Espagne	en Espagne	*à l'Espagne
in Spain	en Espagne	en Espagne	en Espagne
to China	en Chine	en Chine	*à la Chine
in China	en Chine	en Chine	en Chine
to Morocco	au Maroc	au Maroc	au Maroc
in Morocco	au Maroc	au Maroc	*à Maroc
to Denmark	au Danemark	au Danemark	à Danemark
I am from Denmark	*Je suis le Danemark	Je suis du Danemark	Je suis du Danemark
She is from Canada	*Elle est le Canada	Elle est du Canada	Elle est du Canada

(*table continues*)

Table 3-3 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation
I am from Texas	Je suis du Texas	Je suis du Texas	*Je suis de Texas
I am from Missouri	*Je suis le Missouri	Je suis du Missouri	*Je suis de Missouri
I am from California	Je suis de la Californie	Je suis originaire de la Californie	Je suis de Californie
I am from Quebec	*Je suis le Québec	Je suis du Québec	Je suis du Québec
I am from France	*Je suis la France	Je suis de la France	Je suis de la France
I am from Japan	*Je suis le Japon	?Je suis en provenance du Japon	Je suis du Japon
I am from Spain	*Je suis l'Espagne	Je suis de l'Espagne	Je suis de l'Espagne
I am from Iran	*Je suis l'Iran	Je suis originaire de l'Iran	Je suis de l'Iran

In the other translation direction, BF and GO produced very few errors. GO's only error is the questionable translation of *Je vais en Chine* as ?*I go in China.* Although one can certainly imagine contexts where the preposition *in* might be possible here, the preposition *to* is much more common and thus the preferable default translation. As for BF, it seems certain, judging from the quality of the translations of similar structures, that it would be able to produce the correct translations in all cases were it not for a critical fault in the software that makes it incapable of handling apostrophes in the source text. While apostrophes can be avoided in most cases if the source text is in English[3], in French it is very nearly impossible. So, for instance, BF translates *Je viens d'Espagne* as **I come d' Spain*,

[3] All contracted forms may be rewritten in a longer form that does not use apostrophes. The genitive marker *'s/s'* is the only exception.

and *Je viens d'Iran* as **I come from d' Iran,* leaving the apostrophe and adjacent letters untranslated in the target text. This will be a recurring problem with the Babelfish data collected for this study, as it is often unclear what effect Babelfish's inability to process apostrophes might have on the translation of other parts of the text.

As for FT, it seems to favor a one-to-one map between the two languages, translating erroneously any structure analyzed as *proposition + article* (*au, dans le, du, etc)* as an equivalent structure in English (*to the, in the, from the, etc*). As we have seen, countries, states, and regions seemed to be marked as such in FT's French lexicon, but in many cases there seems to be lacking a step in the translation process that would cause any items marked as geopolitical areas in the system's lexicon to be grouped with its article, if present, and translated as one unit. Other examples, however, such as *Je vais au Maroc / I go to Morocco* and *Je viens du Danemark / I come from Denmark,* are translated correctly, in spite of the fact that they use the same sort of *proposition + article* structure. Once again, we see many inconsistencies in the output even of rule-based MT systems.

Additionally, FT seems to offer few translations for each preposition. *En* is translated in all contexts as *in*, regardless of whether it represents movement to a location or not. *A* is translated as *to* if it follows the movement verb *aller* or *at* if it follows a verb indicating a static spatial relationship, in this case *être*. Of course, the correct choice in context (static location in a geographic area) is *in*, which also happens to be the translation provided for the preposition *dans* in the example listed in Table 3-4 as in all other similar examples, which, because of this similarity, have not been included in the table.

Table 3-4

Prepositions with Geopolitical Units, French-English, 2012

Source Text	BF Translation	GO Translation	FT Translation
Je vais au Texas	I go to Texas	I go to Texas	*I go to the Texas
Je suis au Texas	I am in Texas	I'm in Texas	*I am at the Texas
Je suis dans le Texas	I am in Texas	I'm in Texas	*I am in the Texas
Je vais en Californie	I go to California	I'm in California	?I go in California
Je suis en Californie	I am in California	I'm in California	I am in California
Je vais en Argentine	I go to Argentina	I'm in Argentina	?I go in Argentina
Je suis en Argentine	I am in Argentina	I'm in Argentina	I am in Argentina
Je vais en Espagne	I go to Spain	I am going to Spain	?I go in Spain
Je suis en Espagne	I am in Spain	I am in Spain	I am in Spain
Je vais en Chine	I go to China	?I go to China	?I go in China
Je suis en Chine	I am in China	I am in China	I am in China
Je vais au Maroc	I go to Morocco	I go to Morocco	I go to Morocco
Je suis du Maroc	I am in Morocco	I'm in Morocco	*I am at Morocco
Je viens du Danemark	I come from Denmark	I come from Denmark	I come from Denmark
Je viens du Québec	I come from Quebec	I come from Quebec	*I come from the Quebec
Je viens du Texas	I come from Texas	I'm from Texas	*I come from the Texas
Je viens de Californie	I come from California	I'm from California	I come from California

(*table continues*)

Table 3-4 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation
Je viens de France	I come from France	I come from France	I come from France
Je viens d'Espagne	*I come d' Spain	I come from Spain	I come from Spain
Je viens d'Iran	*I come from d' Iran	I come from Iran	I come from Iran

Often, a piecemeal translation of a noun, adjective, or verb with the preposition it selects does not yield a grammatical result in the TL. As can be seen in Table 3-5, this leads to translation errors for most of the WBMT systems tested. Though Google translate is a statistical system and thus should perform well on this task (it uses a large number of TL texts to calculate the most probable string of text, which should result in the selection of the correct preposition), it produces several errors. All three systems produce ?*une femme avec… and* ?*une attaque sur* and for *a woman with…* and *an attack on.* The more idiomatic expressions are *une attaque contre* and *une femme aux*[4]*.* While BF and GO correctly translate *disappointed with* as either *déçu de* or *déçu par,* FT goes with an ungrammatical literal translated **déçu avec*. The relatively poor performance levels for MT systems on preposition translation tasks is due to the polysemic and sometimes rather arbitrary distribution of prepositions in French in English..

[4] *Aux* is often used to caraterize body parts: *aux yeux bleus / with blue eyes, aux mains calleuses / with calloused hands, etc*

Table 3-5

Lexical Selection of Prepositions, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
Disappointed with the situation	Déçu par la situation	Déçu par la situation	*Déçu avec la situation
an attack on the Israeli forces	?une attaque sur les forces israéliennes	?une attaque sur les forces israéliennes	?une attaque sur les forces israéliennes
a woman with black hair	?une femme avec les cheveux noirs	?#une femme avec des cheveux noirs	?une femme avec les cheveux noirs

Similarly, in the other direction, FT often choo ses a literal translation of the preposition (*à* → *to, de* → *of, etc*) instead of the preposition typically selected by the noun, adjective, or verb in the TL. Sometimes, especially with reflexive structures, it fails to translate the preposition altogether (for example, *Ils se sont gavés de bonbons* [they filled up on candy] → **It stuffed themselves candies*). In the examples in Table 3-6, BF only offers one the correct translation (*un homme aux cheveux noirs* → *a man with [Ø] black hair*). But even in this translation, BF translated the French definite article into English where it is ungrammatical : **a man with the black hair.* For two examples, **disappointed situation* and #*They are force-fed candy*, BF offers no preposition at all, in the second example possibly because the reflexive verb in French was incorrectly translated as a structure that doesn't use a preposition in English. Finally, we see once again the inability of BF to handle apostrophes (**with l' paddle)*, combined with an odd lexical choice in translation (*aube* → paddle) and a translation for the preposition *à* (*à* → *with*), which suggests that *à* is in fact always translated as *with* when it accompanies a noun. GO performs well on the translation of all prepositions except for those related to reflexive verbs. In this case, GO

produces a translation that is grammatical, that is, *of* is indeed the preposition that should follow *full*, but the meaning of the sentence as a whole does not correspond with that of the source text.

Table 3-6

Lexical Selection of Prepositions, French-English, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
déçu de la situation	*disappointed situation	disappointed with the situation	*disappointed of the position
Ils se sont gavés de bonbons	#They are force-fed candy.	#They are stuffed full of candy.	*It stuffed themselves candies
un homme aux cheveux noirs	a man with [Ø] black hair	a man with black hair	*a man to the black hair
Elle se lève tous les jours à l'aube	*It rises every day with l' paddle	She gets up every day at dawn	*She gets up every day to the dawn

3.4. Adjectives

Williams (2006) notes that the three sites usually do well with adjective-noun agreement, even in situations where the adjective is not in its habitual position, as can be seen in Table 3-7. All three sites, however, failed to produce agreement between distant nouns and adjectives. The sentences used to test this point are different permutations of the sentence: *The scientific community, disappointed with the situation, decided to act → La communauté scientifique, déçue de/par la situation, a decide d'agir.* It should be noted that FT is the only site to fail to produce agreement between a noun and a proposed adjective: **Déçu, la communauté scientifique....*

Table 3-7

Adjectives Set Off by Commas, 2004

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
The scientific community, disappointed…	La communauté scientifique, déçue…	La communauté scientifique, déçue…	La communauté scientifique, déçue…
Disappointed, the scientific community…	Déçue, la communauté scientifique…	Déçue, la communauté scientifique…	*Déçu, la communauté scientifique…
Disappointed with the situation, the scientific community…	*Déçu (de) la situation, la communauté scientifique…	*Déçu (de) la situation, la communauté scientifique…	*Déçu (de) la situation, la communauté scientifique…

Willliams notes that all three sites perform well in distinguishing the difference in meaning between certain adjectives in French that have different meanings when placed before the noun than when placed after. The sites, however, had difficulties in recognizing the different shades of meaning in a polysemic English adjective such as *old,* which should be translated as *vieux* in most cases and as *ancien* when the intended meaning is “former.” All sites translated *old* as *vieux* in all cases.

Table 3-8

Translations of the English Adjectives old *and* former*, 2004*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
an old chair	une vieille chaise	une vieille chaise	une vieille chaise
an old admirer of hers	?#un vieil admirateur à elle	*un admirateur sa vieille	*un vieil admirateur du sien
my old apartment	#mon vieil appartement	#mon vieil appartement	#mon vieil appartement
the former Defense Minister	l'ancien Ministre de (la) Défense	l'ancien Ministre de la Défense	l'ancien Ministre de (la) Défense

The first thing that should be noted with respect to our data is deterioration in performance for all three sites. All three sites continue to have difficulties producing agreement between a remote adjective and noun: **Déçu [de] la situation, la communauté* scientifique.. While two of the three sites produced agreement between a noun and a prepositioned adjective in 2004, none of them did so in 2012 : **Déçu, la communauté….* While all three sites successfully produced agreement between a noun and a postposed adjective in 2004, GO failed to do so in 2012: **La communauté scientifique, déçus….* This is perhaps attributable to the change in software by the site. What is more difficult to justify is why all three sites should now produce the same error when they had no problems handling the same phenomenon in the Williams (2006) study.

Table 3-9

Adjectives Set Off by Commas, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
The scientific community, disappointed…	La communauté scientifique, déçue…	*La communauté scientifique, déçus…	La communauté scientifique, déçue…
Disappointed, the scientific community…	*Déçu, la communauté scientifique…	*Déçu, la communauté scientifique…	*Déçu, la communauté scientifique…
Disappointed with the situation, the scientific community…	*Déçu [de] la situation, la communauté scientifique…	*Déçu [de] la situation, la communauté scientifique…	*Déçu [de] la situation, la communauté scientifique…

As can be seen in Table 3-10, all three sites continue to correctly translate *former* as ancient, but most still make the mistake of translating *old* as *vieux* in all cases. A notable improvement is shown by Google translate, whose statistical method is able to determine that, the string *mon ancienne école* being more common than *ma vieille école,* it is generally better to translate *my old school* as the former. Of course, if the intended meaning in the English source text were “my school, which is old,” GO’s translation, despite being the more common in the TL, would be erroneous. One example is given that, if the software systems were capable of determining meaning from lexical context, would leave little ambiguity. *An old admirer of hers* should be translated as *un de ses anciens admirateurs,* but all three sites, in addition to having difficulties with the idiomatic syntax of the item, translate *old* by some form of *vieux.*

Table 3-10

Translation of old *and* former*, English-French, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
an old chair	une vieille chaise	une vieille chaise	une vieille chaise
an old admirer of hers	?#un vieil admirateur à elle	*un admirateur sa vieille	*un vieil admirateur du sien
my old apartment	#mon vieil appartement	#mon vieil appartement	#mon vieil appartement
my old school	#ma vieille école	mon ancienne école	#ma vieille école
the former Defense Minister	l'ancien Ministre de (la) Défense	l'ancien Ministre de la Défense	l'ancien Ministre de (la) Défense

In the other direction, BF and FT seem to share the same system for translating the adjectives *vieux* and *ancien. Vieux* is always translated as *old*, and *ancient* is always translated as *old* if it follows the noun, *former* if it precedes it. While this system does not perhaps produce the most idiomatic results in English, as *old* is often preferred to *former* in some contexts despite their similar meaning, it does however produce acceptable results in all cases. Google's system attained 100% accuracy and even produced more idiomatic translations, such as translating the count-noun group *un meuble ancien* in French by the English non-count *antique furniture,* antique being the most likely translation for *ancien* in this case. The only possible improvement would have been to add a counter: *a piece of antique furniture.*

Table 3-11

Translation of ancien *and* vieux*, French-English, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
l'ancien Premier Ministre	l' former Prime Minister	former Prime Minister	the former Prime Minister
le vieux Premier Ministre	the old Prime Minister	the old Prime Minister	the old Prime Minister
mon vieil appartement	my old apartment	my old apartment	my old apartment
mon ancien appartement	my former apartment	my old apartment	my former apartment
mon ancienne école	my former school	my old school	my former school
un manoir ancien	an old manor	an old manor house	an old manoir
un meuble ancien	an old piece of furniture	antique furniture	an old furnishing

3.5. Nouns

Williams' data consists mostly in testing the different schemata for the verb *jouer*. In the case of a game or sport, one usually uses *jouer à*, and for a musical instrument, speakers use *jouer de*. One notices immediately FT used neither in all cases, giving uniformly ungrammatical results. FT also failed to produce an aspirated h in more than half of the cases where it would be required, in such cases as **l'hockey*[5]*, *l'hautbois,* and **l'Hongrie*. Interestingly enough, BF and GO produced exactly the same results for all examples. For sports, the correct translation was produced in most cases, with the exception of **Je joue le golf, *Je joue à l'hockey,* and **Je joue ping pong* (no hyphen). Since the correct article but no preposition was

[5] Williams (2006) notes that, while *hockey* has an aspirate h in European French, this is not always the case in Canadien French.

produced for *golf*, it is possible that the term exists in the lexicon of the software but not labeled as a sport, whereas the lack of both article and preposition for *ping pong* (no hyphen) suggests that the term did not even exist in the lexicon of the system. *Hockey* was correctly recognized as a sport and the correct preposition is added, but the system failed to recognize the aspirate h at the beginning of the word. As for musical instruments, the obligatory preposition *de* was left out in all cases, producing ungrammatical results. Moreover, the systems had some problems with the vocabulary. The word *oboe* was not translated at all, and *clarinet* was capitalized, but otherwise left unchanged in the French text. The correct translations should have been, respectively, *Je joue du hautbois* and *Je joue de la clarinette*. The aspirate h at the beginning of the word *harpe* was not recognized, and rather than translating *flute* by the word *flûte* in French, signifying the musical instrument, the technical term *cannelure* was chosen. *Cannelure* is an architectural and botanical term referring to fluting on columns or tree trucks. Of course, one might question why the programmers should have decided to make *cannelure* the default translation for *flute* over the much more common *flûte*. In any case, one predicts that the statistical approach adopted by GO between the time of Williams study and this study will solve this problem. Finally, while both GO and BF used correctly an aspirate h for both *hibou* and *Hongrie*, they do not do so for *hockey* and *harpe,* in this last example failing as well to produce the necessary preposition *de*.

Table 3-12

Nouns, 2004

Source Text	BF Translation	GO Translation	FT Translation
I play tennis	Je joue au tennis	Je joue au tennis	*Je joue le tennis
I play golf	*Je joue le golf	*Je joue le golf	*Je joue le golf
I play football	Je joue au football	Je joue au football	*Je joue le football
I play soccer	Je joue au football	Je joue au football	*Je joue le football
I play hockey	*Je joue à l'hockey	*Je joue à l'hockey	*Je joue l'hockey
I play ping pong	*Je joue ping pong	*Je joue ping pong.	*Je joue le ping pong
I play ping-pong	Je joue au ping-pong	Je joue au ping-pong	*Je joue le ping-pong
I play baseball	Je joue au base-ball	Je joue au base-ball	*Je joue le base-ball
I play softball	Je joue au base-ball	Je joue au base-ball	*Je joue le base-ball
I play chess	Je joue aux échecs	Je joue aux échecs	*Je joue des échecs
I play the guitar	*Je joue la guitare	*Je joue la guitare	*Je joue la guitare
I play the clarinet	*Je joue le Clarinet	*Je joue le Clarinet	*Je joue la clarinette
I play the oboe	*Je joue l'oboe	*Je joue l'oboe	*Je joue l'hautbois
I play the flute	*Je joue la cannelure	*Je joue la cannelure	*Je joue la flûte
I play the harp	*Je joue l'harpe	*Je joue l'harpe	*Je joue la harpe
the owl	le hibou	le hibou	le hibou
Hungary	la Hongrie	la Hongrie	*l'Hongrie

The results show very little improvement on the part of FT and BF. FT commits the same errors as before, but now recognizes the aspirate h status at the beginning of words such as *Hongrie* and *hockey.* BF has only improved in that it now recognizes

golf and *ping pong*–without a hyphen–as sports, using the preposition *à* before each. BF also recognizes now the aspirate h as the beginning of *hockey,* correctly producing *Je joue au hockey.* However, the fact that the two sites have shown so little improvement in the case of this very common verb is perhaps indicative Finally, as predicted, GO shows a remarkable improvement. It passes from a ≈50% success rate to near 100% success. Its only mistake is that is does not recognize *ping pong*–without a hyphen–as a sport and thus does not add the correct preposition, *à,* in translation.

Table 3-13

Nouns, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
I play tennis	Je joue au tennis	Je joue au tennis	*Je joue le tennis
I play golf	Je joue au golf	Je joue au golf	*Je joue le golf
I play football	Je joue au football	Je joue au football	*Je joue le football
I play soccer	Je joue au football	Je joue au football	*Je joue le football
I play hockey	Je joue au hockey	Je joue au hockey	*Je joue le hockey
I play ping pong	Je joue au ping-pong	*Je joue de ping pong.	*Je joue le ping pong
I play ping-pong	Je joue au ping-pong	Je joue au ping-pong	*Je joue le ping-pong
I play baseball	Je joue au base-ball	Je joue au baseball	*Je joue le baseball
I play softball	Je joue au base-ball	Je joue au softball	*Je joue le base-ball
I play chess	Je joue aux échecs	Je joue aux échecs	*Je joue des échecs
I play the/Ø guitar	*Je joue la guitare	Je joue de la guitare	*Je joue la guitare

(*table continues*)

Table 3-13 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation
I play the/Ø clarinet	*Je joue le clarinet	Je joue de la clarinette	*Je joue la clarinette
I play the/Ø oboe	*Je joue l'oboe	Je joue du hautbois	*Je joue le hautbois
I play the/Ø flute	*Je joue la cannelure	Je joue de la flûte	*Je joue la flûte
I play the/Ø harp	*Je joue l'harpe	Je joue de la harpe	*Je joue la harpe
the owl	le hibou	le hibou	le hibou
Hungary	la Hongrie	la Hongrie	la Hongrie

This idea for the following data is in part inspired by a paper by Cristinoi-Bursuc (2009) about gender in MT. We are testing to see if the WBMT systems will be able to translate the English adjectives *male* and *female* into French, where the names of many animals have a masculine and a morphologically-related feminine form. As the data shows (Table 3-14), BF and FT typically incorrectly map a composite form in English to a composite form in French (*a female cat* → **un chat femelle,* etc), but correctly translates English words specified for gender to their French counterparts (*a mare* → *une jument*, etc). FT even goes so far as to produce the semantically somewhat redundant *?une chèvre femelle*, a mistake avoided by BF. GO really shows the strength of its statistical system here, performing with 100% accuracy, translating even very specific terminology related to animal gender: *a billy goat* → *un bouc.*

Table 3-14

Names of Animals that Denote Gender, English-French, 2012

Source Text	BF Translation	GO Translation	FT Translation
a female cat	*un chat femelle	une chatte	*un chat femelle
a female donkey	*un âne femelle	une ânesse	*un âne femelle
a female dog	*un chien femelle	une chienne	*un chien femelle
a bitch	une chienne	une chienne	une chienne
a female horse	*un cheval femelle	une jument	*un cheval femelle
a mare	une jument	une jument	une jument
a goat	une chèvre	une chèvre	une chèvre
a male goat	*une chèvre masculine	un bouc	*une chèvre mâle
a billy goat	*une chèvre de billy	un bouc	*une chèvre bilee
a female goat	une chèvre	une chèvre	?une chèvre femelle

At the end of his paper, Williams suggests a number of possible tasks that educators may use to teach WBMT to students. The following section takes data proposed for one of these tasks and puts it to the test. The data involves gender agreement between nouns in a sentence, nouns and anaphora, and nouns and semantic contexts where the gender may be guessed with high probability from the context alone. For example, in the sentence *My neighbor is an intelligent girl,* the subject and predicate should agree for gender. While this gender agreement is not manifest in the English text, it must be taken into account in the French text: *Ma voisine est une fille intelligente*. We see, however, that all three websites translate the subject of the English sentence as masculine–which happens to be the default

gender for BF and FT[6]–while translating the obviously feminine predicate as feminine. In fact, this is also the case for the examples which require use of context and anaphora. It is much more likely that a noun that is pregnant or has a baby is feminine, but this does not prevent all three systems from producing a masculine subject: *?Mon cousin a eu un bébé, ?Mon meilleur ami est enceinte.* Likewise, in the sentence *My cousin got lost in his/her backyard*, the choice of possessive pronoun makes no difference as to the gender chosen for the subject–the masculine *mon cousin* is always chosen.

Table 3-15

Contextual Gender Agreement, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
My neighbor is intellgent	Mon voisin est intelligent	Mon voisin est intelligent	Mon voisin est intelligent
My neighbor is an intelligent girl	*Mon voisin est une fille intelligente	*Mon voisin est une fille intelligente	*Mon voisin est une fille intelligente
My cousin had a baby	?Mon cousin a eu un bébé	?Mon cousin a eu un bébé	?Mon cousin a eu un bébé
My best friend is pregnant.	?Mon meilleur ami est enceinte	?Mon meilleur ami est enceinte	?Mon meilleur ami est enceinte
My cousin got lost in his own backyard	Mon cousin s'est perdu dans sa propre cour	Mon cousin s'est perdu dans sa propre cour	*Mon cousin a été perdu dans sa propre arrière-cour
My cousin got lost in her own backyard	#Mon cousin s'est perdu dans sa propre arrière-cour	#Mon cousin s'est perdu dans sa propre arrière-cour	*#Mon cousin a été perdu dans sa propre arrière-cour

[6] GO has other default genders depending on the noun in question. It was found during the study that GO consistently prefers *la danseuse* [the female dancer] to *le danseur* [the male dancer], presumably because *la danseuse* occurs more often in its corpora of texts.

This section, inspired by a paper by Vaxelaire (2006), examines the ability of the WBMT systems to translate proper nouns. Many nouns are correctly translated by the three systems, having obviously been programmed into the lexicon (*Vienna* → *Vienne*, *London* → *Londres, Socrates* → *Socrate,* etc). Some names, however, are broken down into their component parts like an ordinary noun before translation. BF, for example, translates *the Cape of Good Hope* as **le cap du bon espoir,* which, while certainly meaning "the cape of good hope" in French, is not the standard name of this geographic feature. Similarly, while both BF and FT leave the word "Peter" unchanged in *Peter the Great* (which is perhaps a conscious decision of the programmers in order to avoid the translation of proper names where inappropriate), the second part is in fact translated as *le grand*, showing that the systems have indeed performed a piecemeal translation of the proper name. An interesting case is the translation of *Julius Caesar* by FT, which translates the last name of the Roman general but not the first, showing that only the name *Caesar* but not *Julius Caesar* or *Julius* is included in the lexicon of the system. Finally, it is interesting that *British Museum* should not be translated by all three systems, a non-translation that accurately represents current Francophone practice. This means that *British Museum* is indeed included in the lexicon of all three systems, but indeed to prevent it from being rendered as *Musée Britannique/Anglais*.

Table 3-16

Proper Nouns, English-French, 2012

Source Text	BF Translation	GO Translation	FT Translation
Vienna	Vienne	Vienne	Vienne
Peter the Great	*Peter le grand	Pierre le Grand	*Peter le Grand
Julius Caesar	Jules César	Jules César	*Julius César
Socrates	Socrate	Socrate	Socrate
London	Londres	Londres	Londres
the British Museum	le British Museum	le British Museum	le British Museum
the Cape of Good Hope	*le cap du bon espoir	le Cap de Bonne-Espérance	le cap de Bonne Espérance
New Orleans	La Nouvelle-Orléans	La Nouvelle-Orléans	(la) Nouvelle-Orléans
Brittany	*Brittany	la Bretagne	(la) Bretagne

This section comes from another task provided by Williams in his 2006 paper involving the gender marking of proper names in the systems' lexicons. Taking a random assortment of typically masculine and feminine names, they were tested by placing them in the appropriate position in the sentence *[Name] is happy* and *[Name] is a student.* The first part of these sentences were correctly translated by all WBMT sites, so for the sake of clarity *[Nom] est heureux/heureuse* and *[Nom] est un/une étudiant/étudiante* have been simplified to *heureux/heureuse* and *un/une étudiant/etudiante*. FT uses the masculine gender for all cases. Obviously, the gender of proper names has not been included in the lexicon of the system. BF seems to contain the gender for several proper names included in its lexicon, but produces some inexplicable inconsistencies. For instance, *Joanna* causes gender agreement with a predicate adjective but not with a predicate noun (*Joanna est heureuse*, **Joanna est un étudiant*). For the name *Jean*, the reverse is true (**Jean*

est heureuse, Jean est un étudiant), and is perhaps a more surprising contradiction, considering that most rule-based systems use by default the masculine of nouns and adjectives. GO produces similar inconsistencies, but inconsistencies of this sort are not so surprising for a statistical system, which doesn't necessarily rely on a fixed lexicon for translation.

Table 3-17

Gender-Marking on Proper Nouns, English-French, 2012

_____ is happy/a student	**BF Translation**	**GO Translation**	**FT Translation**
Paul	heureux/un étudiant	heureux/un étudiant	heureux/étudiant
Paule	heureuse/une étudiante	*heureux/une étudiante	*heureux/*étudiant
Paula	heureuse/une étudiante	*heureux/*un étudiant	*heureux/*étudiant
Jean	*heureuse/un étudiant	heureux/un étudiant	heureux/étudiant
Jeanne	*heureux/*un étudiant	heureuse/une étudiante	*heureux/*étudiant
John	heureux/un étudiant	heureux/un étudiant	heureux/étudiant
Joanne	heureuse/une étudiante	*heureux/une étudiante	*heureux/*étudiant
Joanna	heureuse/*un étudiant	heureuse/une étudiante	*heureux/*étudiant
Anne	heureuse/une étudiante	heureuse/une étudiante	*heureux/*étudiant

If we look at the examples from Williams (2006) in the other translation direction, i.e. French-English, the systems generally perform well. All three systems

eliminate both proposition and article when translating *jouer à + [sport]*. For musical instruments however, BF literally translates both preposition and article *Je joue de la guitare* → **I play of the guitar,* etc). While in English, speakers have the choice of including the definite article before certain instruments. The GO translation of *Je joue de la guitare* represents what is perhaps more common practice for this instrument, that is, leaving out the article: *I play guitar*. Once again, the ability of statistical methods to handle and produce more colloquial or idiomatic usages is demonstrated. To this effet, GO is the only site to correctly translate *Je joue aux échecs,* ostensibly since *chess* is much more frequent after the verb *play* than the word *failures*, although in general *failure* is the more common meaning of the French word *échec.* As suggested, BF and FT give the incorrect translation: *I play failures.*

Table 3-18

Nouns Used with jouer*, French-English, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
Je joue au golf	I play golf	I play golf	I play golf
Je joue au baseball	I play baseball	I play baseball	I play baseball
Je joue de la guitare	*I play of the guitar	I play guitar	I play the guitar
Je joue du hautbois	*I play of the oboe	I play the oboe	I play the oboe
Je joue aux échecs	*I play failures	I play chess	*I play failures

If we consider a translation of animal names specifying gender from French to English, we immediately encounter the theoretical question of whether or not it is better translation practice to not include data in the source text in order to make a natural sounding TL text. The data of the different WBMT systems show distinctly different approaches to this question. GO, which by its nature tries to produce the

statistically most likely target text, here produces the most natural; that is, it leaves off all indications of gender present in the source text, except when an equivalent English word exists (*une chienne* → *a bitch,* etc). BF takes the opposite approach: it always includes any indication of gender present in the source text, even going so far as to produce the relatively rare English utterance *she-ass*. Several words seem to be missing from FT's lexicon, as *ânesse* and *lionne* are left untranslated in the target text. FT makes the interesting move of translating *une chienne* as *a female dog* rather than its relatively well-known English counterpart, *a bitch,* a move perhaps attributable to other connotations and meanings associated to this word.

Table 3-19

Names of Animals that Denote Gender, French-English, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
un chat	a cat	a cat	a cat
une chatte	a she-cat	a cat	a cat
un chien	a dog	a dog	a dog
une chienne	a bitch	a bitch	a female dog
un âne	an ass	a donkey	a donkey
une ânesse	a she-ass	a donkey	*a ânesse
un lion	a lion	a lion	a lion
une lionne	a lioness	a lioness	*a lionne

In a similar vein, the approaches taken by the three WBMT sites with respect to the names for professions that are usually specified for gender in French but typically not in English were also examined. In fact, the trend is more towards the increased usage of gender-neutral nouns in English, as certain influential groups and political/social movements advocate the use of gender-neutral nouns whenever possible. This is well represented by the exclusion of all indication of gender in the

English target text in situations where it is naturally not present. That is, none of the sites translate *une journaliste* as *a female journalist*, for instance. For other nouns, however, gender is often specified. All three WBMT choose the gender-neutral term *server* to translate the masculine *serveur,* but use the gender-specific term *waitress* for *serveuse*, which begs the question: why not translate *serveur* as *waiter* or also translate *waitress* as *server*? The answer might lie in the polysemic nature of the word *serveur*, which can also correspond to the English word *server* in other contexts, namely sports and computer science. By translating *serveur* as *server*, the programmers have in a way "hedged their bets" for a situation where the text might be a sports story or a computer science article. Why *waitress* is chosen over *server* as the translation for *serveuse* is more difficult to answer. Without a human translator to determine when and where it might be imperative that the reader know that a certain server is female, it is safer on the part of the programmers to assume that this information could potentially be important to the reader. Thus they decide to go against the gender-neutral norms of English and translate *serveuse* as *waitress.* This same logic may be used to justify the BF translation of *vendeur* and *vendeuse* as *salesman* and *saleswoman*, respectively, as well as the GO choice to translate *vendeuse* as *saleswoman.* Why GO translates *vendeur* as *seller* is another question. One might note that in legal texts, which happen to form a large part of the GO corpora, the equivalent of *vendeur* is most often the gender-neutral *seller*, and thus *seller* is the statistically commoner translation. FT chooses to use a gender-specific system, but uses *salesman* to translate both *vendeur* et *vendeuse,* a system that, not to mention the potential confusions to which it can lead, runs contrary to the trend of gender-neutral nouns in English.

Table 3-20

Names of Professions that Denote Gender, French-English, 2012

Source Text	BF Translation	GO Translation	FT Translation
un journaliste	a journalist	a journalist	a journalist
une journaliste	a journalist	a journalist	a journalist
le chanteur	the singer	the singer	the singer
la chanteuse	the singer	the singer	the singer
le vendeur	the salesman	the seller	the salesman
la vendeuse	the saleswoman	the saleswoman	#the salesman
le serveur	the server	the server	the server
la serveuse	the waitress	the waitress	the waitress

In the other translation direction for proper nouns, GO gets once again a perfect score. BF makes very few errors. It includes the word *Cathedral* in its (non)translation of *Cathédrale Notre-Dame de Paris*, which is not common usage in English. The same mistake is made in translating the name of *Pierre le Grand* as in the opposite direct, namely, that the proper noun is left untranslated and the rest of the name is translated literally as *the Large one*. FT, presumably because of its limited lexicon, on several occasions makes the mistake of translating proper nouns as if they were common nouns or just normal words. For instance, since the word *pierre* means “rock” in French and *vienne* “come 3.sg.pr.subj,” *Vienne* and *Pierre le Grand* are naturally translated as **Come* and **Rock the Big one. Cathédrale Notre-Dame de Paris*, usually left untranslated in English, is literally translated as Cathedral Our Lady of Paris. Finally, the definite article, present in French *La Nouvelle-Orléans,* is included in English (**The New Orleans*). This would only be permissible in expressions such as *The New Orleans of Jackson’s time, The New Orleans of the future, etc.*

Table 3-21

Proper Nouns, French-English, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
Vienne	Vienna	Vienna	*Come
Pierre le Grand	*Pierre the Large one	Peter the Great	*Rock the Big one
Jules César	Julius Caesar	Julius Caesar	Julius Caesar
Socrate	Socrates	Socrates	Socrates
Londres	London	London	London
Cathédrale Notre-Dame de Paris	?Cathedral Notre-Dame de Paris	Notre-Dame de Paris	*Cathedral Our Lady of Paris
Le Cap de Bonne-Espérance	The Cape of Good Hope	Cape of Good Hope	The Cape of Good Hope
La Nouvelle-Orléans	New Orleans	New Orleans	*The New Orleans
La Bretagne	Britanny	Brittany	Brittany

3.6. Verbs and Verb Phrases

The primary foci of Williams' section on verbs and verb phrases were prepositions denoting time (*ago*, for example), particle verbs, reflexive verbs, and the choice of *savoir* vs. *connaître.* Williams noted that FT has many difficulties with the English word *ago,* calquing for example English syntax onto the French translation (…*three hours ago* → **…trois heures il y a*). For BF and GO, the problem was not that *il y a* follows the amount of times, but rather that in certain cases other words were interposed between the two: *We saw our neighbor three hours ago* → **Nous avons vu il y a nos trois heures voisines* [we have seen ago our three hours neighbors]. Williams also noted the instability of certain WBMT systems by showing that a single change (replacing *neighbor* with *neighbors*) was able to yield completely

different results (in this case, a grammatical translation) in parts of the sentence relatively distant from the change.

Table 3-22

Translation of ago*, 2004*

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
We saw our neighbor three hours ago	*Nous avons vu il y a nos trois heures voisines	*Nous avons vu il y a nos trois heures voisines	*Nous avons vu notre voisin trois heures il y a	Nous avons vu notre voisin(e) il y a trois heures
We saw our neighbors three hours ago	Nous avons vu nos voisins il y a trois heures	Nous avons vu nos voisins il y a trois heures	*Nous avons vu nos voisins trois heures il y a	Nous avons vu nos voisin(e)s il y a trois heures

Williams noted that while all three systems typically distinguish well the lexical differences between *savoir* and *connaître*, the sentence *I know them* → **Je les sais* presented a sort of glitch in the system, given that the systems produced correct translations for nonpronominal forms in postverbal position (*I know your parents* → *Je connais tes parents*) and for singular pronominal compliments (*I know him* → *Je le connais*, *I know her* → *Je la connais*, etc). In the next section, we will return to the question of whether *Je les sais* is perhaps a legitimate translation for *I know them*.

Table 3-23

Savoir *and* Connaître*, 2004*

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
I know Jean	Je connais Jean	Je connais Jean	N/A	Je connais Jean
I know Paris well	Je connais bien Paris	Je connais bien Paris	N/A	Je connais bien Paris
I know him	Je le connais	Je le connais	N/A	Je le connais
I know her	Je la connais	Je la connais	N/A	Je la connais
I know them	*Je les sais	*Je les sais	N/A	Je les connais

While FT produced the correct reflexive verb (*s'endormir*) for the English expression to fall asleep, both GO and BF produced the same ungrammatical literal translation: **tomber endormi*. Other English verbs, such as to wake up, were correctly translated by all three WBMT sites as a reflexive verb in French (in this case *Elle s'est réveillée*). While BF and GO were able to translate a particle even if the particle was after the object, FT had trouble with post-object particles. For example, in the sentence *She wakes the children up*, the particle up was analyzed as a preposition and the whole sentence was translated as **Elle a reveille les enfants en haut* [She woke up the children upstairs]. The polysemic nature of the particle verb to turn down led to difficulties for FT to choose the correct meaning based on context. *I turned down the heat* was thus translated as FT as **J'ai refuse la chaleur* [I refused the heat]. For the other sites, the particle verb was simply translated part by part, resulting in the ungrammatical translation: **J'ai tourné vers le*

bas la chaleur[7]*.* To solve this problem, in general, systems must seek to consolidate both particle and verb into one unit in French (as is the case here, *J'ai baissé le chauffage*), or translate just the particle into French (i.e. the particle becomes the verb: *I walked across the field → J'ai traversé le champ*).

Table 3-24

Reflexives and Particle Verbs, 2004

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
to fall asleep	*tomber endormi	*tomber endormi	s'endormir	s'endormir
She woke up	Elle s'est réveillée	Elle s'est réveillée	Elle s'est réveillée	Elle s'est réveillée
She woke up the children	Elle a réveillé les enfants	Elle a réveillé les enfants	Elle a réveillé les enfants	Elle a réveillé les enfants
She woke the children up	Elle a réveillé les enfants	Elle a réveillé les enfants	*Elle est réveillée les enfants en haut	Elle a réveillé les enfants
I turned down the heat	*J'ai tourné vers le bas la chaleur	*J'ai tourné vers le bas la chaleur	*J'ai refusé la chaleur	J'ai baissé le chauffage

All three WBMT sites correctly translate English simple present, present progressive and simple past to their French counterparts, the simple present and the *passé composé.* BF however, because of its inability to handle apostrophes, does have problems when a contracted form of the verb *to be* is used to form the present progressive: *I'm listening → *I' ; écoute de m.* Google's statistical method causes some random errors and discrepancies with the source text. For some reason, an

[7] It is worth noting that in neither Williams' study (2006) nor in this study did any of the three WBMT sites produce the right word for *heat* in this context: *le chauffage*.

object is added occasionally when none is present in the source text (*I listen → #Je l'écoute*), perhaps because *écouter* is rarely used absolutely in the text corpora of GO. Interestingly enough, Google also produces the more idiomatic *Je suis à l'écoute* as the translation for *I am listening*. This modification of SL syntax shows once again an important advantage that statistical systems have over rule-based systems, that is, they are not as limited as are rule-based systems by the tendency to map certain parts of speech in one language to equivalent parts of speech in another (nouns to nouns, verbs to verbs, etc). Both BF and FT have problems translating the English word *just*. In all contexts, the two sites use some form of the French word *juste,* which, while communicating the right idea in combination with the structure *venir de*, communicates a different meaning when used with the simple past tense. BF places *juste* just after the finite verb. For instance, *I just saw her* is translated by BF as *Je l'ai juste vue*, which has the meaning of "I only saw her" or "I just saw her, I didn't do anything else to her," etc. If, as in the cas of FT, *juste* is placed before the object, it makes for a grammatical but somewhat odd sentence, having the meaning of "only": *I just saw her cat → #J'ai vu juste son chat* [I only saw her cat/I saw only her cat]. In general, GO successfully uses *venir de* to translate the English adverb *just*, with only a single exception: *I just saw her → #Je l'ai juste vu[e]*.

One of the weaknesses of the statistical system of GO seems to be its inability to perform syntactic analysis of input and output, which prevents it from translating verbs in the source text by verbs with the same transitivity in the target text. That is, the intransitive use of *to leave* in English generally must be translated an intransitive verb in French, either *partir* or *sortir.* Instead, GO attempts to use transitive verbs such as *laisser* or *quitter* as intransitives, resulting in sentences that, while correctly translating the tense and aspect of the source text, are ungrammatical: *He has left →*

**Il a laissé*, *He has just left → *Il vient de quitter*, *He had just left when she called him → *Il venait de quitter quand elle l'appelait*, *When she called, he had already left → *Quand elle a appelé, il avait déjà quitté*. In general, all systems correctly translate prefect and more-than-perfect tenses into French, FT having some minor problems with adverb placement: **Quand elle a appelé, il était parti déjà.* Of course, the more-than-perfect tense is more common in French than in English, and it is often used in any subordinate clause where the action or event precedes that of the main clause, even where it would be absent in English: *I've told you a thousand times, you fell in when you were little → Je t'ai dit mille fois que tu étais tombé dedans étant petit*. Although the pertinent data is not included in the table, it should be noted that all WBMT sites failed categorically to recognize the logical sequence of events in the English text and thus to use the more correct more-than-perfect tense in the French translation, as would be expected.

All three systems perform well when it comes to recognizing and translating the English equivalents of the imperfect in French. For instance, English past progressive is rendered correctly as the imperfect by all three sites (*I was listening → J'écoutais*). The English word *would,* when used as a marker of habitual action in the past, is mistaken as the conditional by both BF and FT: *When I was young, I would listen to the radio every night → *Quand j'étais jeune, j'écouterais la radio chaque nuit.* The meaning of English *used to*, which can be communicated by the use of the imperfect in French, is translated as *avoir l'habitude de* by both GO and BF (BF/GO: *I used to listen → J'avais l'habitude d'écouter,* BF: *When I was young, I used to listen to the radio every night → Quand j'étais jeune, j'avais l'habitude d'écouter la radio chaque nuit,* GO: *When I was young, I used to listen to the radio every night → Quand j'étais jeune, j'avais l'habitude d'écouter la radio tous les soirs*. While not

technically incorrect, it is not always the most natural way to express this idea in French. FT, however, translates English *used to* with the *passé composé,* which is an inaccurate translation of the source text: *I used to listen → #J'ai écouté, When I was young, I used to listen to the radio every night* → *Quand j'étais jeune, j'ai écouté la radio chaque nuit.

Hypothetical if/then statements pose difficulties for GO as the system seems to have trouble processing English *would* as the marker of the conditional mood: *If I were you, I would listen to him → *Si j'étais vous, je l'écoute, If I had a hammer, I would hammer in the morning → *Si j'avais un marteau, je marteler dans la matinée.* While *if I were you* may be literally translated in French as *si j'étais vous, à votre place* is preferred with the second person formal pronoun. All three systems correctly use the imperfect, but none use the preferred *à votre place* and FT mistakenly analyzes *vous* as a clitic object, placing it in preverbal position: **Si je vous étais.* IN another example, FT fails to use the imperfect aspect for the "if" statement in the if then clause: **Si j'ai eu un marteau, je martèlerais dans la matinée.* Finally, none of the three sites correctly translates concurrent action in the past, usually rendered in French by the imperfect in both clauses: *He vacuumed while I watched television* → BF **Il a nettoyé à l'aspirateur tandis que j'observais la télévision*, GO **Il aspirateur pendant que je regardais la television*, FT **Il a passé à l'aspirateur pendant que j'ai regardé television*. BF and FT both use the *passé composé* for the main clause and GO has issues translating the word *vacuum*, mistaking it for a noun. If you use a special example designed just to test GO, it proves it is indeed able to translate correctly concurrent actions in the past: *They played cards while I danced → Ils jouaient aux cartes tandis que je dansais.*

Table 3-25

Basic Tenses and Aspects, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**	**Acceptable**
I see her	Je la vois	Je la vois	Je la vois	Je la vois
I am leaving	Je pars	Je pars	Je pars	Je pars
I saw her	Je l'ai vue	Je l'ai vue	Je l'ai vue	Je l'ai vue
I just saw her	#Je l'ai juste vue	#Je l'ai juste vu[e]	*Je l'ai vue juste	Je viens de la voir
I just saw her cat	#J'ai juste vu son chat	Je viens de voir son chat	#J'ai vu juste son chat	Je viens de voir son chat
He has left	Il est parti	*Il a laissé	Il est parti	Il est parti
He has gone to the store	Il est allé au magasin	Il est allé au magasin	Il est allé au magasin	Il est allé au magasin
He has just left	*Il est juste parti	*Il vient de quitter	*Il est parti juste	Il vient de partir
He has just gone to the store	#Il est juste allé au magasin	Il vient de partir pour le magasin	#Il est allé juste au magasin	Il vient d'aller au magasin
When she called, he had already left	Quand elle a appelé, il était déjà parti	*Quand elle a appelé, il avait déjà quitté	*Quand elle a appelé, il était parti déjà	Quand elle a appelé, il était déjà parti
He had just left when she called him	*Il était juste parti quand elle l'a appelé	*Il venait de quitter quand elle l'appelait	*#Il était parti juste quand elle l'a appelé	Il venait juste de partir quand elle l'a appelé

(*table continues*)

Table 3-25 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
I listen	J'écoute	#Je l'écoute	J'écoute	J'écoute
I'm listening	*I' ; écoute de m	Je suis à l'écoute	J'écoute	J’écoute
I am listening	J'écoute	Je suis à l'écoute	J'écoute	J’écoute
I listened	J'ai écouté	J'ai écouté	J'ai écouté	J’ai écouté
I've listened	*I' ; le VE a écouté	J'ai écoute	J'ai écouté	J’ai écouté
I have listened	J'ai écouté	J'ai écouté	J'ai écouté	J’ai écouté
I was listening	J'écoutais	Je l'écoutais	J'écoutais	J’écoutais
I used to listen	J’avais l’habitude d’écouter	J'avais l'habitude de l'écouter	#J'ai écouté	J’écoutais
When I was young, I would listen to the radio every night	*Quand j'étais jeune, j'écouterais la radio chaque nuit	Quand j'étais jeune, j'écoutais [Ø] la radio tous les soirs	*Quand j'étais jeune, j'écouterais la radio chaque nuit	Quand j’étais jeune, j’écoutais la radio tous les soirs
When I was young, I used to listen to the radio every night	Quand j'étais jeune, j'avais l'habitude d'écouter la radio chaque nuit	Quand j'étais jeune, j’avais l'habitude d'écouter la radio tous les soirs	*Quand j'étais jeune, j'ai écouté la radio chaque nuit	Quand j’étais jeune, j’écoutais la radio tous les soirs

(*table continues*)

Table 3-25 *(continued).*

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
If I were you, I would listen to him	*Si j'étais vous, j'écouterais lui	*Si j'étais vous, je l'écoute	*Si je vous étais, je l'écouterais	À ta place, je l'écouterais
If I had a hammer, I would hammer in the morning	Si j'avais un marteau, je martèlerais le matin	*Si j'avais un marteau, je marteler dans la matinée	*Si j'ai eu un marteau, je martèlerais dans la matinée	Si j'avais un marteau, je martèlerais le matin
I was listening to music when you called me	J'écoutais [de] la musique quand vous m'avez appelé	J'écoutais de la musique lorsque vous m'avez appelé	J'écoutais [de] la musique quand vous m'avez appelé	J'écoutais de la musique lorsque tu m'as appelé
I just listened to their latest album	#J'ai juste écouté leur dernier album	Je viens d'écouter leur dernier album	*#J'ai écouté juste leur dernier album	Je viens d'écouter leur dernier album
I am listening to you	*J'écoute vous	Je suis à votre écoute	Je vous écoute	Je vous écoute
He vacuumed while I watched television	*Il a nettoyé à l'aspirateur tandis que j'observais la télévision	*Il aspirateur pendant que je regardais la télévision	*Il a passé à l'aspirateur pendant que j'ai regardé télévision	Il passait l'aspirateur pendant que je regardais la télévision

Remarkably, BF and FT still produce the same translation for *We saw our neighbor(s) three hours ago*. For an analysis of these errors see discussion for table

3-22. Google has shown improvement, correctly translating both sentences[8]. All three sites seem capable of correctly translating the concept of *ago* in certain contexts however. *She left three years ago* is correctly translated by all three sites as *Elle est partie il y a trois ans.* For other examples, however, FT continues to calque English syntax on the French translation *She just left three minutes ago → *Elle est partie juste trois minutes il y a.* Once again, both BF and FT incorrectly translate the English word *just* as French *juste*, but otherwise BF shows correct placement for *il y a: #Elle est juste partie il y a trois minutes.* GO, correctly translates *ago* as *il y a + [time]* and *just* as *venir de*, but continues to have trouble choosing the verb with the correct valence in French: **Elle vient de quitter il [y a] trois minutes*. Perfect tenses in English combined with a preposition such as *since* or *for*, should in general be translated by the present tense and *depuis* in French. All three sites fail to do this, translating a perfect tense in English by a perfect tense in French (see examples for *I have been living here for three years*, *I've lived here for two years*, *We've known them for years,* and *He has been watching television since 5 o'clock* in Table 3-26). Once again, the inability of BF to handle apostrophes causes it to fail in translating perfect tenses where the auxiliary *to have* is contracted (*I've lived here for two years → *I' ; le VE a vécu ici pendant deux années, We've known them for years, We' ; le VE connu leur pendant des années*). Finally, note that in translating the sentence *I lived there for one month,* GO's statistical system seems to give it an advantage in correctly producing the clitic pronoun *y: J'y ai vécu pendant un mois*. *Là,* while acceptable in this context if there is emphatic stress is on the word *there*, leads to a slightly out-of-place translation in most contexts.

[8] For some reason, Google produces in many examples *il ya* instead of *il y a.* While this is not a serious problem, brackets are used in these examples to indicate that have separated the two words.

Table 3-26

Tense and Aspect with the Prepositions ago*,* for*, and* since*, English-French, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**	**Acceptable**
We saw our neighbor three hours ago	*Nous avons vu il y a nos trois heures voisines.	Nous avons vu notre voisin il [y a] trois heures.	*Nous avons vu notre voisin trois heures il y a.	Nous avons vu notre voisin(e) il y a trois heures
We saw our neighbors three hours ago	Nous avons vu nos voisins il y a trois heures.	Nous avons vu nos voisins il [y a] trois heures	*Nous avons vu nos voisins trois heures il y a.	Nous avons vu notre voisin(e)s il y a trois heures
She left three years ago.	Elle est partie il y a trois ans.	Elle [est partie] il [y a] trois ans.	Elle est partie il y a trois ans.	Elle est partie il y a trois ans.
She just left three minutes ago.	#Elle est juste partie il y a trois minutes.	Elle vient de [partir] il [y a] trois minutes.	*Elle est partie juste trois minutes il y a.	Elle vient de partir il y a trois minutes.
I have been living here for three years	#J'avais vécu ici pendant trois années.	#J'ai vécu ici pendant trois ans	*J'ai vécu ici depuis trois ans.	J’habite ici depuis trois ans.
I've lived here for two years	*I' ; le VE a vécu ici pendant deux années.	J'ai vécu ici pendant deux ans	J'ai vécu ici depuis deux ans.	J’habite ici depuis deux ans

(*table continues*)

Table 3-26 *(continued).*

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
I lived there for one month	J'ai vécu là pour un mois.	J'y ai vécu pendant un mois	J'ai vécu là pour un mois.	J'y ai vécu pendant un mois
We've known them for years.	We' ; le VE connu leur pendant des années.	Nous les avons connus depuis des années.	Nous les avons sus pendant des années.	Nous les connaissons depuis des années
He has been watching television since 5 o'clock	Il avait regardé la télévision depuis 5 o' ; horloge	Il a été à regarder la télévision depuis 05 heures	Il a regardé la télévision depuis 5 heures.	Il regarde la télé depuis 5 heures.

While all three systems performed moderately well in distinguishing between the different uses of *savoir* and *connaître* in Williams (2006), their performance has signifacntly declined eight years later. FT translates *know* as *savoir* in all contexts (see Table 3-27 for the many ungrammatical translations this produces). GO incorrectly chooses *savoir* with restaurants, proper names, common names denoting people, and cities. It does, however, correctly choose *connaître* with personal pronouns. GO correctly uses *savoir* for clausal arguments and infinitives, but uses *connaître* with the word *choses*, a context where *savoir* is much more likely. Looking past (once again) the inability of BF to handle apostrophes, the data shows that it generally selects the right verb in the right context. BF makes the mistake of using *savoir* to talk about knowing someone's name (**I don' ; t savent son nom)*. In Williams' paper, he makes the point that the switch from singular *I know him* to plural *I know them* causes a random mistranslation for BF: *Je les sais.* It is worth noting

here that *them* could very well replace an inanimate plural, which means that its French equivalent, *les*, could be used with the verb *savoir.* The convoluted example given*, I know lots of useless things, but I don't know how I know them → Je sais plein de choses inutiles, mais je ne sais pas d'où je les sais*, was selected in part to illustrate this point, that is, that *Je les sais* should only be marked ungrammatical with some slight reserves. The contexts, however, where *je les sais* would be acceptable seem rather rare, hence the # mark given to this example.

Table 3-27

Savoir *and* Connaître*, English-French, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**	**Acceptable**
I don’t know his name	*I don' ; t savent son nom	*Je ne sais pas son nom	*Je ne sais pas son nom	Je ne connais pas son nom
I don’t know Jean	*I don' ; t connaissent Jean	*Je ne sais pas Jean	*Je ne sais pas Jean.	Je ne connais pas Jean
I know Paris well	Je connais bien Paris	*Je sais bien Paris	*Je sais Paris bien.	Je connais bien Paris
We know that restaurant. (We eat there often.)	Nous connaissons ce restaurant. (Nous mangeons là souvent.)	*Nous savons que le restaurant. (Nous avons mangé là souvent.)	*Nous savons ce restaurant. (Nous mangeons là souvent.)	Nous connaissons ce restaurant. (Nous y mangeons souvent.)

(*tables continues*)

Table 3-27 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
We know that restaurant. (We eat there often.)	Nous connaissons ce restaurant. (Nous mangeons là souvent.)	*Nous savons que le restaurant. (Nous avons mangé là souvent.)	*Nous savons ce restaurant. (Nous mangeons là souvent.)	Nous connaissons ce restaurant. (Nous y mangeons souvent.)
I know how to swim	Je sais nager	Je sais nager	Je sais nager	Je sais nager
I know him	Je le connais	Je le connais.	*Je le sais	Je le connais
I know her	Je la connais	Je la connais.	*Je la sais	Je la connais
I know them	#Je les sais	Je les connais	#Je les sais	Je les connais
I know it	Je le sais	Je le sais	Je le sais	Je le sais
I know lots of useless things, but I don't know how I know them.	*Je sais un bon nombre de choses inutiles, mais I don' ; t savent je les sais.	*Je connais beaucoup de choses inutiles, mais je ne sais pas comment je les connais.	#Je sais beaucoup de choses inutiles, mais je ne sais pas que je les sais.	Je sais plein de choses inutiles, mais je ne sais pas d'où je les sais
I know your parents	Je connais vos parents	*Je sais que vos parents	*Je sais vos parents	Je connais vos parents

In general, all three systems are good at recognizing common English expressions that should be translated as reflexives in French. GO, for instance, nearly scores perfectly on this section. For some reason, it chooses to translate *She*

brushed her teeth with the imperfect (*Elle se brossait les dents),* which might work in a number of contexts (*She brushed her teeth while her sister brushed her hair, She brushed her teeth every night before bed when she was little,* etc), but as a standalone sentence, it is best that it be translated with the *passé composé.* Although GO shows itself capable of translating the English phrase *to fall asleep* (*She fell asleep → Elle s'endormit*), it seems to have trouble in longer sentences (*Every evening, my grandfather falls asleep watching television → *Chaque soir, mon grand-père tombe endormis en regardant la télévision*), producing instead the literal and ungrammatical translation *tomber endormi*. One other aspect of GO's translations worth noting is the use of the simple past tense, a literary tense rarely used in ordinary French texts (cf. *Elle se lava les mains, Elle s'endormit*). The only explanation for this would be that the simple past is more common for these two verbs in the text corpora used by Google translate, which, if true, means that Google's text corpora are perhaps representative of a more literary register of the language, and that all texts thus may have a slight tendency to shift to a more literary register in translation (the data in this study is not conclusive on this point).

BF usually uses the correct reflexive forms, but makes the past participle agree with the reflexive pronoun in all cases for reflexives in the *passé composé* instead of just in cases where the reflexive pronoun represents a direct object. For instance, BF erroneously makes the past participle agree with the reflexive pronoun in these cases as well: **Elle s'est lavée les mains, *Elle s'est brossée les dents.* Just as in Williams' data, BF uses a literal (and ungrammatical) translation of *to fall asleep, *tomber endormi: *Chaque soirée, mon père tombe télévision de observation endormie, *Elle est tombée endormi.* In the first of those last two examples, there are also a number of other faults by the system unrelated to the phenomenon under

study. To brush over them quickly, there are lexical errors (*Every night → ?chaque soirée*, *my grandfather → #mon père*), analysis errors (*watching* considered as a present participle modifying *television: watching television → télévision de observation*) and a simple failure to produce elision (*de observation* instead of *d'observation*). Another translation with a similar compounding of problems is the translation of *She wakes up every day at the crack of dawn* as **Elle réveille journalier à la fente de l'aube*. It is unclear why BF, which successfully reproduces the reflexive *se réveiller* in other sentences, should fail to do so here. Besides the mistranslation of the adverbial element *every day* as an adjective (*journalier),* BF, along with FT, produces a literal translation of *at the crack of dawn* (BF: **à la fente de l'aube*, FT: **à la fissure de l'aube*). Once again, GO trumps the other two systems in lexical questions and idiosyncratic expressions. In most cases, FT correctly produces reflexive pronoun-past participle agreement in the *passé composé*. It seems to consider, however, that any element following the participle is a direct object and thus incorrectly fails to produce reflexive pronoun agreement in such cases: **Elle s'est réveillé à midi.* Moreover, FT is the only site that fails to translate English *[genitive pronoun] + [body part]* with a dative clitic pronoun. Thus, it produces the ungrammatical, non-reflexive structures **Elle brosse ses dents*, and **Elle a brossé ses dents*. Finally, FT gives the best translation of the three sites for *She fell asleep → Elle s'est endormie*, and comes closest to producing a grammatical translation of *Every evening, my grandfather falls asleep watching television → *Chaque soir, mon grand-père endort se regardant la télévision*. There are only two serious problems with this translation. First, for some reason, the reflexive pronoun follows the verb. Second, and relatively unrelated to the phenomenon under study, is the absence of the gerundive marker *en* before the word *regardant*.

Table 3-28

Reflexive Verbs, English-French, 2012

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
She is washing her hands	Elle se lave les mains.	Elle se lave les mains	Elle se lave les mains.	Elle se lave les mains
She washed her hands	*Elle s'est lavée les mains.	Elle se lava les mains	Elle s'est lavé les mains.	Elle s'est lavé les mains
She wakes up every day at the crack of dawn.	*Elle réveille journalier à la fente de l'aube.	Elle se réveille chaque jour à l'aube.	?Elle se réveille tous les jours à la fissure d'aube.	Elle se réveille chaque jour à l'aube.
She woke up at noon	Elle s'est réveillée à midi.	Elle se réveilla à midi	*Elle s'est réveillé à midi.	Elle s'est réveillée à midi.
She woke up.	Elle s'est réveillée.	Elle s'est réveillée.	Elle s'est réveillée.	Elle s'est réveillée
She is brushing her teeth	Elle se brosse les dents.	Elle est se brosser les dents.	*Elle brosse ses dents.	Elle se brosse les dents
She brushed her teeth	*Elle s'est brossée les dents.	#Elle se brossait les dents	*Elle a brossé ses dents.	Elle s'est brossé les dents
Every evening, my grandfather falls asleep watching television.	*Chaque soirée, mon père tombe télévision de observation endormie.	*Chaque soir, mon grand-père tombe endormis en regardant la télévision.	*Chaque soir, mon grand-père endort se regardant la télévision.	Tous les soirs, mon grand-père s'endort en regardant le télévision
She fell asleep	*Elle est tombée endormi	Elle s'endormit	Elle s'est endormie	Elle s'est endormie

Generally, most WBMT systems do not translate particle verbs as one lexical unit, but rather translate the verb and the particle separately. To list some of the simpler examples from Table 3-29 of this type of error, we have: BF: *I turned it in before Tuesday → *Je l'ai tourné dedans avant mardi, I turned it down → *Je l'ai tournée avale*, GO: *I think I'll turn in for the night → #Je pense que je vais tourner dans la nuit, I ran into the bank → #J'ai couru dans la banque*, FT: *He will fill you in → *Il vous remplira en, She swam across the river → *Elle a nagé à travers la rivière.* Another problem is the polysemy of particle verbs. Most particle verbs in English have more than one meaning, and, predictably, the WBMT systems have difficulties distinguishing between the different meanings of a given verb, as is usually the case. For instance, FT offers *remplir* as the translation for *to fill in* in a number of different contexts: *All you have to do is fill in the blanks → *Tous vous devez faire est remplit les vides, He will fill you in on the details → *Il vous remplira sur les details*. BF translates *to turn out* as *s'avérer* in all contexts: *The voters turned out in droves → *Les électeurs se sont avérés dans les droves, The play turned out to be a flop → Le jeu s'est avéré être un [fiasco], That writer turned out more novels in ten years than most do in their entire career → *Cet auteur s'est avéré plus de romans en dix ans que les plus font dans leur carrière entière*. Even Google makes this type of error, translating *to turn down* in all contexts as *tourner vers le bas* (not to mention the fact that this is a faulty piecemeal translation of the particle verb).

As for the examples taken from Williams (2006), BF continues to correctly translate the sentences *She woke up, She woke up the children,* and *She woke the children up*, but performance actually declined for GO and FT. FT translates the last two examples as **Elle est réveillée les enfants,* a mistake the system made only when the particle followed the object in Williams' data. GO, which produced the

same translations as BF in 2004 since it more or less used the same system as BF at that time, now makes the mistake of translating the particle separately when it follows the object: *She woke the children up → *Elle a réveillé les enfants vers le haut.* All three systems continue to have trouble translating the other example from Williams (2006), *I turned down the heat*. FT offers the same translation as before, and GO, while offering a slightly different translation, produces the same type of error as before (translating the verb and particle separately: **Je me suis tourné vers le bas la chaleur*). While BF no longer translates verb and particle separately, it mistranslates the meaning of *to turn down* in the context given: **J'ai décliné la chaleur.* Examples are given is Table 3-29, where the lexical choice of BF and FT (*décliner* and *refuser,* respectively) leads to the correct translation, which goes to show that consistently ignoring all the other possible meanings of a word or phrase has its advantages, that is, it produces the correct translation in at least one context.

Occasionally when a particle ends a sentence, GO translates the particle simplly as *po* and leaves it at the end of the sentence: *All you have to do is fill them in → *Tout ce que vous avez à faire est de les remplir po, He will fill you in → *Il vous comblera po, She motioned him in → *Elle lui fit signe de po, He ran in → *Il a couru po*. Nowhere in the Google Translate FAQ is it explained what this means or whether it is even intended to indicate to the user that a particle was unable to be translated. GO is, however, the only WBMT sire to produce the idiosyncratic translation of *fill it up, please*, ostensibly because of its statistical system: *Faites le plein, s'il vous plaît*.

Table 3-29

Particle Verbs, English-French, 2012

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
I think I'll turn in for the night.	*Je pense l' ; tour de ll dedans pour la nuit	#Je pense que je vais tourner dans la nuit.	#Je pense que je me livrerai pour la nuit.	Je vais me coucher
You must turn in your paper before Tuesday.	*Vous devez tourner en votre papier avant mardi.	*Vous devez activer dans votre document avant mardi.	#Vous devez livrer votre papier avant mardi.	Vous devez rendre votre composition avant Mardi
I turned it in before Tuesday.	*Je l'ai tourné dedans avant mardi.	*Je l'ai tourné en avant mardi.	*Je l'ai tourné en avant mardi.	Je l'ai rendu avant Mardi
I turned down the heat.	*J'ai décliné la chaleur.	*Je me suis tourné vers le bas la chaleur.	*J'ai refusé la chaleur.	J'ai baissé le chauffage
I turned down the offer.	J'ai décliné l'offre.	*Je me suis tourné vers le bas l'offre.	J'ai refusé l'offre.	J'ai décliné l'offre
I turned it down.	*Je l'ai tournée avale.	*Je l'ai tourné vers le bas.	Je l'ai refusé.	NA
She woke up.	Elle s'est réveillée.	Elle s'est réveillée.	Elle s'est réveillée	Elle s'est réveillée
She woke up the children.	Elle a réveillé les enfants.	Elle a réveillé les enfants.	*Elle est réveillée les enfants.	Elle a réveillé les enfants.
She woke the children up.	Elle a réveillé les enfants.	*Elle a réveillé les enfants vers le haut.	*Elle est réveillée les enfants.	Elle a réveillé les enfants.

(*table continues*)

Table 3-29 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
She woke them up.	Elle les a réveillés.	Elle les a réveillés.	*Elle les est réveillés.	Elle les a réveillés.
The voters turned out in droves.	*Les électeurs se sont avérés dans les droves.	Les électeurs se sont déplacés en masse.	#Les électeurs ont été en foule.	Les électeurs se sont déplacés en masse.
The play turned out to be a flop.	Le jeu s'est avéré être un [fiasco].	Le jeu s'est avéré être un flop.	Le jeu s'est avéré être un fiasco.	La pièce s'est avéré être un fiasco.
That writer turned out more novels in ten years than most do in their entire career.	*Cet auteur s'est avéré plus de romans en dix ans que les plus font dans leur carrière entière.	*Cet écrivain s'est avéré plus de romans en dix ans que la plupart le font dans toute leur carrière.	*Cet écrivain a été plus de romans dans dix ans que la plus fait dans leur carrière entière.	Cet écrivain a écrit plus de romans etc…
He filled in for the sick professor.	*Il a complété pour le professeur malade.	*Il rempli pour le professeur malade.	Il a remplacé le professeur malade.	Il a remplacé le professeur malade
All you have to do is fill in the blanks !	Tout que vous devez faire est de compléter les blancs.	Tout ce que vous avez à faire est de remplir les blancs.	*Tous vous devez faire est remplit les vides	Tout ce qu'il faut faire, c'est de remplir les blancs

(*table continues)*

Table 3-29 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
All you have to do is fill them in	Tout que vous devez faire est de les compléter.	*Tout ce que vous avez à faire est de les remplir po	*Tous vous devez faire est les remplit en.	Tout ce qu'il faut faire, c'est de les remplir
He will fill you in on the details	*Il vous remplira dedans sur les détails.	*Il vous comblera sur les détails	*Il vous remplira sur les détails	Il vous mettra au courant (des détails de l'affaire)
He will fill you in	*Il vous complétera	*Il vous comblera po	*Il vous remplira en	Il vous mettra au courant
Your mother has filled out a bit, hasn't she?	*Votre mère a complété un peu, hasn' ; t elle ?	*Ta mère a rempli un peu, n'est-elle pas?	*Votre mère a rempli un peu, n'est-ce pas ?	Ta mère s'est étoffée un peu, non ?
She filled out the form.	Elle a complété [le formulaire]	Elle a rempli le formulaire	Elle a rempli [le formulaire]	Elle a rempli le formulaire
She filled it out	Elle l'a complété.	Elle [l']a rempli	Elle l'a rempli	Elle l'a rempli
You're filling up on junk food and dinner is in ten minutes!	*You' ; le remplissage re vers le haut sur la nourriture industrielle et le dîner a lieu en dix minutes !	*Vous êtes de remplissage sur la malbouffe et le dîner est en dix minutes!	*Vous remplissez sur les snacks vite prêts et le dîner est en dix minutes !	Vous vous gavez de malbouffe et le dîner…

(*table continues*)

Table 3-29 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Fill it up, please.	*Remplissez-le, svp.	Faites le plein, s'il vous plaît.	*Le remplir en haut, s'il vous plaît.	Faites le plein, s'il vous plaît.
She motioned him in.	*Elle l'a fait signe dedans.	*Elle lui fit signe de po	*Elle l'a fait signe en.	Elle l'a fait entrer d'un geste
He ran in.	*Il a couru dedans.	*Il a couru po	*Il a couru en.	Il est entré en courant
I ran into the bank.	#J'ai couru dans la banque.	#J'ai couru dans la banque.	*J'ai rencontré la banque.	Je suis entré dans la banque en courant
She swam across the river.	*Elle a nagé à travers le fleuve.	*Elle a nagé à travers la rivière.	*Elle a nagé à travers la rivière.	Elle a traversé le fleuve à la nage
Step out of the train to the left.	*Étape hors du train vers la gauche.	Sortez du train vers la gauche.	*Marcher du train à la gauche.	Sortez du train à la gauche
He kicked the door open.	*Il a donné un coup de pied la porte ouverte.	*Il a débuté la porte ouverte.	*Il a donné un coup de pied la porte ouvre	Il a ouvert la porte d'un coup de pied
I turned the light on.	J'ai allumé la lumière.	*Je me suis tourné la lumière.	J'ai allumé la lumière.	J'ai allumé la lumière
I turned the light off.	*J'ai arrêté la lumière.	*J'ai tourné la lumière éteinte.	*J'ai tourné la lumière loin.	J'ai éteint la lumière

(*table continues*)

Table 3-29 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
The log floated down the river.	*La notation a flotté en bas du fleuve.	#Le journal flottait sur la rivière.	*Le journal a flotté en bas la rivière.	Le tronc d'arbre a descendu la rivière (au fil d'eau)
Get out!	Sortez !	Sortez !	*Obtenir hors !	Sortez !
Get out of the way!	*Sortez de la manière !	#Sortez de la route!	*Se pousser !	Dégage ! / Écartez-vous !

The WBMT systems have many difficulties translating the subjunctive mood from French into English. The most common problem is that both BF and FT fail in most cases to render a subordinate clause in the subjunctive mood in French with some other kind of structure in English, which is typically what must be done to produce a natural-sounding English text*: Je veux que tu sois plus gentil avec lui* → GO: *I want you to be nicer to him, Il faut que tu sois là demain → You have to be there tomorrow*. GO's abilty to find the right translation in its bilingual text corpora is in some cases quite remarkable: *Vive le roi ! → Long live the king!, Grand bien lui fasse ! → Good for him!*.

Table 3-30

Mode, French-English, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**	**Acceptable**
Il faut que tu sois là demain.	*It is necessary that you would be there tomorrow.	You have to be there tomorrow.	?It is necessary that you are there tomorrow.	You must be there tomorrow
Il faut que je parte.	?It is necessary that I leave.	I must go.	I must leave	I must go
Je veux que tu sois plus gentil avec lui.	*I want that you would be nicer with him.	I want you to be nicer to him.	*I want that you are kinder with him.	I want you to be nicer to him
Il veut simplement que tu dises la vérité	*He wants simply that you say the truth	He just wants you to tell the truth	*It wants simply that you say the truth	He just wants you to tell the truth
Je préfère qu'il vienne seul.	*I prefer qu' it only comes.	?I prefer him to come alone.	*I prefer that it comes alone.	I would prefer it if he came alone
J'ai peur qu'il ne lui soit arrivé quelque malheur.	J' am afraid qu' it did not arrive to him some misfortune.	I fear that some misfortune has happened to him.	I am afraid that it did not arrive him some misfortune.	I fear that something bad has happened to him
Vive le roi !	*Live the king!	Long live the king!	*Lively the king!	Long live the king!
Grand bien lui fasse !	*Large good makes him!	Good for him!	*Big well does him!	Good for him!

(*table continues*)

Table 3-30 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Qu'on me serve tout de suite !	*Qu' one me serf immediately!	?They may serve me right away!	*What one serves me right away!	Someone serve me!
Il a fait signe qu'on le serve.	*It made sign qu' one it serf.	He motioned to be served.	*It did signs that one serves it.	He signaled them to serve
Il a fait signe qu'il comprenait.	It made sign qu' it included.	He motioned that he understood.	*It did signs that it understood.	He indicated that he understood
L'essentiel, c'est que nous soyons d'accord.	*L' essence, c' is that we are d' agreement.	#The bottom line is that we agree.	#?The essential one, it is that we are in agreement.	The main thing is for us to agree
L'essentiel, c'est qu'il soit d'accord avec nous.	*L' essence, c' is qu' it is d' agreement with us.	#The bottom line is he agreed with us.	#?The essential one, it is that it agrees with us.	The main thing is for him to agree with us
L'essentiel, c'est qu'il est d'accord avec nous.	*L' essence, c' is qu' it is d' agreement with us.	The bottom line is that he agrees with us.	The essential one, it is that it agrees with us.	The main thing is that he agrees with us
L'essentiel, c'est que nous sommes d'accord.	*L' essence, c' is that we are d' agreement.	The bottom line is that we agree.	The essential one, it is that we are in agreement.	The main thing is that we agree

Google has the fewest problems translating reflexive structures from French to English. In structures using a dative possessor, however, it seems to have trouble identifying the possessor: *Elle s'est lavé les mains → #She washed his hands, Elle*

*s'est brossé les dents → #She brushed their teeth, Elle va se brosser les dents → *She will brush their teeth*. BF has two main problems. First, it translates *elle* as *it* in all cases. Accordingly, it preserves the definite article in source texts such *as Elle se lave les mains → *It washes the hands* and *Elle se brosse les dents → *It brushes the teeth,* where an English text would use the genitive pronoun *her.* Secondly, BF's inability to handle apostrophes once again disrupts any other processes that may be at work in the translation engine itself, and all that is left is a baffling series of non-translated *s'* in the target text. FT is also reasonably successful in handling reflexive forms, but, in cases where the reflexive pronoun represents a dative possessor, it often literally translates it as *himself/herself/*etc: *Elle se brosse les dents → *She brushes herself the teeth, Elle s'est brossé les dents → *She brushed herself the teeth, Elle va se brosser les dents → *She will brush herself the teeth.* FT, like GO, occasionally has trouble identifying the possessor in such cases: *Elle risque de se casser la jambe → #She risks breaking its leg.* For some reason, FT is also unable to recognize forms of the verb *s'endormir*, though it is hard to believe that this word is absent of the lexicon of the system since it successfully produces it in the other translation direction: *Tous les soirs, mon grand-père s'endort devant la télé → *All the evenings, my grandfather s'endort himself in front of the TV, Elle s'est endormie la tête sur le clavier → *She is herself endormie the head on the keyboard*. In this last example, FT offers yet another erroneous literal translation of the reflexive pronoun.

Table 3-31

Reflexives, French-English, 2012

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Elle se lave les mains	*It washes the hands	She washes her hands	She washes her hands	She is washing her hands
Elle s'est lavé les mains	*It s' is washed the hands	#She washed his hands	She washed her hands.	She washed her hands.
Elle se lève tous les jours à l'aube	*It rises every day to l' paddle	She gets up every day at dawn	She gets up every day [at] dawn	She gets up every day at dawn
Elle se réveille tous les jours à l'aube	*It awakes every day with l' paddle	She wakes up every day at dawn	She awakens every day [at] dawn	She wakes up every day at dawn
Elle s'est levée à midi	*It s' is raised at midday	She got up at noon	She got up at noon	She got up at noon
Elle s'est réveillée à midi	*It s' is awaked at midday	She woke up at noon	She awakened at noon	She woke up at noon
Elle s'est levée	*It s' is raised	She stood up	She got up	She stood/got up
Elle s'est réveillée	*It s' is awaked	She woke up	She awakened	She woke up
Elle se brosse les dents	*It brushes the teeth	She brushes her teeth	*She brushes herself the teeth	She is brushing her teeth
Elle s'est cassé la jambe	*It s' the leg is broken	She broke her leg	She broke her leg	She broke her leg

(*table continues*)

Table 3-31 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Elle va se casser la jambe	*It will break the leg	She'll break a leg	She will break her leg	She will break her leg
Elle risque de se casser la jambe	*It is likely to break the leg	*It may break a leg	#She risks breaking its leg	She might (accidentally) break her leg
Elle s'est brossé les dents	*It s' is brushed the teeth.	#She brushed their teeth	*She brushed herself the teeth	She brushed her teeth
Elle va se brosser les dents	*It will brush the teeth	#She will brush their teeth	*She will brush herself the teeth	She will brush her teeth
Tous les soirs, mon grand-père s'endort devant la télé	*Every evening, my grandfather s' deadens in front of the TV	Every evening, my grandfather fell asleep watching TV	*All the evenings, my grandfather s'endort himself in front of the TV	Every night, my grandfather falls asleep watching television
Elle s'est endormie la tête sur le clavier	*It s' the head on the keyboard is deadened	?She fell asleep head on the keyboard	*She is herself endormie the head on the keyboard.	She fell asleep with her head on the keyboard

While BF and FT had difficulties translated the concept of *ago* into French, in the other direction, they have no problems at all; *ago* is never calqued on the French word order, i.e. it follows the amount of time in all cases. GO, however, interprets *il y a* to mean *there* and translates it as such in all the examples in this study. Just as English present perfect progressive + *since* and present perfect + *for* must be

translated as present + *depuis* in French, present + *depuis* in French must be translated by its counterparts in English. The only site to produce a grammatical form is BF, which comes close to producing a second grammatical form as well: *J'habite ici depuis trois ans → [I] have lived here for three years, Il regarde la télévision depuis 5 heures → *It has looked at television for 5 a.m.* The other sites simply calque the present + preposition phrase structure of French (cf. Table 3-32, translations *for J'habite ici depuis trois ans, Nous les connaissons depuis des années, Il regarde la télévision depuis 5 heures*, and *Il regarde la télévision depuis midi*). Whereas both *pendant* and *pour* can be used with future quantities of time in French, it is more common to use *for* in English. So, while BF and FT produce the correct translation for *Ils seront absents pour quelque temps*, in the examples *Ils seront absents pendant quelque temps and Elle devra rester sans sortir pendant encore un jour ou deux*, they use the English preposition *during* as a sort of literal translation of the French, producing unnatural sounding results: BF/FT: *?They will be absent during some time*, BF: *It will have to remain without leaving during a day or two more* FT: *She will have to remain without go out during again a day or two*. A similar phenomenon seems to be the case for completed past events: *J'y ai vécu pendant un mois* → FT: **I there lived during a months*.

Table 3-32

Tense and Aspect with the Prepositions il y a*,* depuis*,* pendant*, and* pour*, French-English, 2012*

Source Text	**BF Translation**	**GO Translation**	**FT Translation**	**Acceptable**
Elle est partie il y a trois ans	[She] left three years ago	*She left there three years	She left three years ago	She left three years ago
Elle vient de sortir il y a quelques minutes	[She] has just left a few minutes ago	*She just released minutes there	*She has just go out some mi nutes ago	She just left a few minutes ago
Elle vient de partir il y a trois minutes	[She] has just left three minutes ago	*She just left there three minutes	She has just left three minutes ago	She just left three minutes ago
J'habite ici depuis trois ans	[I] have lived here for three years	#I lived here for three years	*I live here for three years	I have been living here for three years
J'y ai vécu pendant un mois	*J' there lived for one month	I lived there for a month	*I there lived during a months	I lived there for a month
Nous les connaissons depuis des années	*We know them since years	*We know them for years	*We know them since years	We have known them for years
Ils seront absents pendant quelque temps	?They will be absent during some time	They will be absent for some time	?They will be absent during some time	They will be gone for some time

(*table continues*)

Table 3-32 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Ils seront absents pour quelque temps	They will be absent for some time	They will be absent for some time	They will be absent for some time	They will be gone for some time
Elle devra rester sans sortir pendant encore un jour ou deux	It will have to remain without leaving during a day or two more	She will not go out for another day or two	She will have to remain without go out during again a day or two	She won't be able to go out for another day or two
Il regarde la télévision depuis 5 heures	*It has looked at television for 5 a.m.	*He watches television for 5 hours	*It looks at the television since 5 hours	He has been watching television since 5 o'clock
Il regarde la télévision depuis midi	*It looks at television since midday	*It is watching TV since noon.	*It looks at the television since noon.	He has been watching television since noon

Languages can be either verb-framing or satellite framing languages. A verb-framing language, such as French, tends to encode the direction of movement in the verb and encode the means of movement in an optional preposition phrase or adverbial clause. For instance, in the sentence *Il est entré en courant*, the direction is encoded in the verb *entrer* and the means is encoded in the gerundive *en courant*. In satellite-framing languages, the means of movement is generally encoded in the verb and the direction of movement in a detached particle. For instance, in the Englsih translation of the above exemple, *He ran in*, the means of movement is encoded in the verb *to run* and the direction in the particle *in.*

Therefore, any translation device translating from French to English must switch the information that each part of speech encodes. BF and FT fail on all accounts. All prepositional phrases and gerundives are translated literally into the English text, and the direction of movement remains encoded in the verb. In cases where this does not make for outright ungrammatical translations (**It opens the door of a kick)*, it leads to very unnatural sounding English translations (BF: *?I entered the bank while running,* FT: *#??She took him into a gesture*). The only WBMT systems to encounter any success at all with this complicated procedure is Google translate, which successfully translates *allumer* and *éteindre* as *turn on* and *turn off.* Google does not, however, succeed in any translating where the information encoded must effectively "switch places" when moving from one language to the other. Thus, Google produces the same sort of unnatural English sentences as BF and FT *(?I walked into the bank running, ?They left the house running, ?She crossed the river by swimming,* etc).

Table 3-33

Verb Framing, French-English, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translati**	**Acceptable**
Il est entré en courant	?It entered while running	?He came running	?It entered while running	He ran in
Je suis entré dans la banque en courant	?I entered the bank while running	I walked into the bank running	?I entered int the bank whil running	I ran in the bank
Ils sont sortis de la maison en courant	?They left the house while running	?They left the house running	?They went c of the house while running	They ran out of the house

(*table continues*)

Table 3-33 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation	Acceptable
Elle a traversé la rivière à la nage	*It crossed the river to the stroke	?She crossed the river by swimming	*She crossed the river to swimming	She swam across the river
J'allume la lumière	?J' light the light	I turn on the light	?I light the light	I turn on the light
J'éteins la lumière	*J' extinguish the light	I turn off the light	?I extinguish the light	I turn out the light
Il ouvrit la porte d'un coup de pied	*It opened the door d' a kick	*He opened the door a kick	*It opens the door of a kick	He kicked open the door
Elle le fit entrer d'un geste	*It made it enter d' a gesture	#??She took him into a gesture	#??She took him into a gesture	She motioned him in

3.7. Polysemy

Williams (2006) suggests that teachers use polysemic words such as *speaker* and *tax* to demonstrate the inability of WBMT systems to discern meaning from context. It becomes apparent that FT adopts an approach to the word *speaker* similar to the software's approach to other syntactic and lexical issues, namely, that it takes one of the meanings of the word, here *haut-parleur*, and uses it in all contexts. No matter how much the context suggests another interpretation such as *orateur* or *conférencier* (cf. *The speaker spoke too loudly, There is a problem with the speakers who were going to speak today*), FT chooses *haut-parleur.* In the examples just given where the meaning is relatively clear from the context, BF is the only site to offer a reasonable translation for both examples (*orateurs*). Interestingly enough, when faced with parallel sentences, BF and GO often offer two different

translations (*The speaker was too quiet* → BF: *Le haut-parleur était trop tranquille, The speaker spoke too loudly* → BF: *L'orateur a parlé trop fort, I couldn't hear the speaker* → GO: *Je ne pouvais pas entendre l'orateur, I couldn't hear the speakers* → GO: *Je ne pouvais pas entendre les haut-parleurs*). It is unclear in the case of BF what causes these rather arbitrary differences in translation, but in the case of GO, one must assume that in the text corpus, *haut-parleurs* plural is more common that *orateurs* plural and vice versa for the singular. Since many of the examples in Table 3-34 are indeed ambiguous without additional context, what is happening is indeed a sort of random variation by the WBMT systems.

Williams notes that the WBMT systems had difficulties in translating the English word *tax*, which corresponds to two different terms in French, *taxe* and *impôt. Impôt* typically applies to income taxes and profit taxes, whereas one uses *taxe* to talk about a tax on goods and services. Williams notes that BF translated *tax* by *taxe* in all cases, resulting in possible inaccurate translations. In the data for this study, all three systems differentiate these terms accurately in most cases. All three systems render any kind of income tax as *impôt,* and translate accurately the phrase *sales tax* by *taxe de vente* (BF, GO) or *taxe à l'achat* (FT). However, if it can only be determined by context that a certain tax is a tax on goods, as in the sentence *There is a 10% tax on alcohol sales,* both BF and FT tend to overgeneralize the term *impôt*, leading to a mistranslation in this case.

Finally we return to the example of polysemy mentioned at the beginning of this study and taken from an influential 1960 paper on the status and limits of MT by Bar-Hillel: *Little John was looking for his toy box. Finally he found it. The box was in the pen. John was very happy.* Bar-Hillel asserted that it was not only unlikely that MT systems were unlikely to solve such cases of polysemy in the near future, but

that it was unlikely MT systems would ever be able to be programmed to handle an infinite number of polysemic ambiguities such as these. Fifty-two years later, his conclusions seem to still be holding true, as all three WBMT sites translated *The box was in the pen* with *La boîte était dans le stylo* rather than the more likely *Son coffre (à jouet) était dans le parc (pour bébés).* As Bar-Hillel concludes in his paper, until the relative size of objects, i.e. a sort of encyclopedic knowledge of objects may be included as part of the lexical entry for each word in a system's lexicon, it is unlikely a simple problem such as this will be solvable.

Table 3-34

Polysemy, English-French, 2012

Source Text	**BF Translation**	**GO Translation**	**FT Translation**
The speaker was too quiet	?Le haut-parleur était trop tranquille	L'orateur était trop calme	Le haut-parleur était trop calme
The speaker spoke too loudly	L'orateur a parlé trop fort	L'orateur a parlé trop fort	#Le haut-parleur a parlé trop fort
The speakers were too quiet	?Les haut-parleurs étaient trop tranquilles	Les conférenciers étaient trop calmes	Les haut-parleurs étaient trop calmes
I couldn't hear the speaker	I couldn' ; t entendent le haut-parleur	Je ne pouvais pas entendre l'orateur	Je ne pourrais pas entendre le haut-parleur
I couldn't hear the speakers	I couldn' ; t entendent les haut-parleurs	Je ne pouvais pas entendre les haut-parleurs	Je ne pourrais pas entendre les haut-parleurs
There is a problem with the speaker	Il y a un problème avec le haut-parleur	Il [y a] un problème avec le haut-parleur	Il y a un problème avec le haut-parleur

(*table continues*)

Table 3-34 (*continued*).

Source Text	BF Translation	GO Translation	FT Translation
There is a problem with the speakers	Il y a un problème avec les haut-parleurs	Il [y a] un problème avec les haut-parleurs	Il y a un problème avec les haut-parleurs
There is a problem with the speakers who were going to speak today	Il y a un problème avec les orateurs qui allaient parler aujourd'hui	*Il [y a] un problème avec les haut-parleurs qui allaient prendre la parole aujourd'hui	*Il y a un problème avec les haut-parleurs qui allaient parler aujourd'hui
The sales tax is often considered a regressive tax	Le taxe de vente est souvent considéré un impôt régressif	La taxe de vente est souvent considérée comme une taxe régressive	La taxe à l'achat est souvent considérée un impôt régressif
There is a 10% tax on alcohol sales	?Il y a un impôt de 10% en ventes d'alcool	Il [y a] une taxe de 10% sur les ventes d'alcool	?Il y a un 10% impôt sur les ventes d'alcool.
He never pays his taxes	Il ne paye jamais ses impôts	Il ne paie jamais ses impôts	Il ne paie jamais ses impôts
He doesn't have to pay income tax	Il [ne doit pas] payer l'impôt sur le revenu	Il n'a pas à payer de l'impôt sur le revenu	Il ne doit pas payer l'impôt sur le revenu
Little John was looking for his toy box. Finally he found it. The box was in the pen. John was very happy.	#Petit John recherchait sa boîte de jouet. Enfin il l'a trouvée. La boîte était dans le stylo. John était très heureux.	*#Little John a été la recherche de son coffre à jouets. Enfin il l'a trouvé. La boîte était dans le stylo. John était très heureux.	#Petit John cherchait sa boîte de jouet. Enfin il l'a trouvé[e]. La boîte était dans le stylo. John était très heureux.

CHAPTER 4

CONCLUSION

4.1. Results of the Diachronic Analysis

4.1.1. Yahoo! Babelfish

In general, the output of Yahoo! Babelfish is exactly the same in this study and in Williams' (2006). Since a lot of the output is ungrammatical, this is not a sign of a conscientious effort on the part of Yahoo! Babelfish to improve their software. In light of the closing of Babelfish on May 31, 2012, this lack of progress might be seen as an internal decision not to improve a service that was eventually going to be done away with anyway.

The only improvement shown by BF is the fact that it now recognizes the aspirate h at the beginning of *hockey*: *Je joue au hockey.* The systems performance was clearly worse, however, in two cases. The system fails to produce certain adjective-noun agreements where it succeeded eight years ago (**Déçu, la communauté scientifique*), and the system has more problems now translating the English verb *to know.* The system only correctly produces *connaître* for personal prounouns, but uses *savoir* in almost all other cases. One persisting problem that must be mentioned is the inability of Babelfish to deal with apostrophes. It is difficult not to ask how a problem so serious could have gone unaddressed for eight years. After all, while apostrophes can be avoided in English texts, the genitive marker *'s/s'* excluded, this is not the case for a number of other important languages using the Latin alphabet, including French, Italian, Catalan, Dutch, Finnish, Swahili, and, to some extent, Polish and Turkish. To have gone to all the trouble to develop a translation engine for source texts in these languages only to have the translations

marred by the systems inability to handle apostrophes is a rather mystifying state of affairs to say the least.

4.1.2. FreeTranslation.com

FreeTranslation.com, the worst performer in Williams' (2006) data, continues to be the worst performer eight years later. Almost none of the critical issues noted by Williams have been fixed, the only exception being that FT now recognizes the aspirate h at the beginning of *hockey, hautbois,* and *Hongrie*. It should be noted that no data was collected by Williams on the ability of FT to correctly distinguish between the uses of *savoir* and *connaître.* This turns out to be unimportant because the data shows that FT simply translates English *to know* as *savoir* in all cases. So, it is extremely unlikely that the system has shown any improvement in this regard. Finally, FT's performance slightly worsens in one case. FT correctly translated *to fall asleep* as *s'endormir* in Williams study, but the data in this study shows it sometimes has trouble producing the correct syntax for the reflexive verb*: Every evening, my grandfather falls asleep watching television → *Chaque soir, mon grand-père endort se regardant la television.*

4.1.3. Google Translate

Google Translate is the only system to have made a drastic change in its software, and is thus the only system to have shown drastic changes and a general improvement over the eight year period separating the studies. Whereas in Williams' (2006) section on prepositions, GO made the same errors as BF, in this study GO obtained a perfect score on the examples taken from Williams (although it did produce occasional errors in some of the examples original to this study). In the data

for this study, Google did produce more noun-adjective agreement errors when the adjective is separated by commas than it did in Williams' study: **La communauté scientifique, déçus…, *Déçu, la communauté scientifique.* However it makes up for this with a significant improvement in its ability to successfully translate the English word *old* to either *vieux* or *ancien* depending on the context, something that neither of the other two WBMT systems seems to be able to do: *my old chair → ma vieille chaise, my old school, mon ancienne école,* etc. In Williams section on nouns, GO had several problems, especially when translating *to play [a musical instrument]*. In the data for this stidy, GO produced only a single error: it was unable to recognize the word *ping pong* when unhyphenated. In the section on verbs and verb phrases, where in Williams' data GO produced the same errors as BF in translating the English sentences *We saw our neighbor three hours ago* and *We saw our neighbors three hours ago*, in the data for this study GO has no problems at all, producing grammatical forms in both situations. On the other hand, Google has almost exactly the same problems as BF when determining whether to translate *to know* as *savoir* or *connaître,* that is, it produced *connaître* with most personal pronouns and *savoir* in almost all other cases. Whereas GO successfully translated *She woke up, She woke up the children, and She woke the children up* in Williams' study, it had difficulties with the last one in this study, translating separately the verb and particle: **Elle a reveille les enfants vers le haut*. On the other hand, GO showed an improvement when it came to translating *to fall asleep*, translated literally as *tomber endormi* in Wiliams' study. In this study, it produces the correct translation, the reflexive verb *s'endormir* in half of all cases. There is a tendency for GO to revert to the literal *tomber endormi* as syntactic complexity of the source text increases. Google continues to have problems translating the particle verb *to turn down*, as it still

translates it piecemeal instead of as a single lexical unit: *I turned down the heat* → **J'ai tourné vers le bas la chaleur.*

4.2. Comparison of MT Systems

If the merits of a certain MT system may be judged on the performance of the software that uses that system, then one can perhaps draw conclusions regarding the merits of the system itself. In this study two of the three WBMT sites, Babelfish and FreeTranslation.com, used rule-based systems and one, Google Translate, used a statistical based system. Google outperforms the others in most tasks. Just to get an idea of how much better Google's performance is than that of BF and FT, a point was given to a given web site whenever its performance was two errors better than the next closest site in a particular section (this was done just to provide a casual means of comparison, since obviously not all sections are of equal importance). Google received ten points, Babelfish three, and FreeTranslation.com one. The odd thing about Google's statistical system is that it seems in many cases to do just as well with quirky, idiosyncratic phenomena as with ordinary, everyday translation needs. That is, while it performs really well with certain items that the other sites cannot seem to handle, such as the subjunctive, proper nouns, fixed expressions and colloquialisms, polysemy, and verb schemata, it sometimes has random problems with very simple tasks, such as selecting a TL verb with the right valence, choosing between *savoir* and *connaître,* and not "normalizing" the syntactic and lexical eccentricities of a target text.

On the whole, however, the advantages of a statistical system seem to outweigh the disadvantages, and it seems that many MT companies are also coming to this conclusion. The most recent version of SYSTRAN, SYSTRAN 7, is the first

version of SYSTRAN to use statistical methods and is one the first COTS hybrid MT software packages. In the future, hybrid systems such as these may be able to capitalize on the strengths of both methods, and, once implemented in a WBMT service, will offer Internet users more and more possibilities for cross-linguistic communication.

APPENDIX

GLOSSARY OF ACRONYMS

ALPAC – Automatic Language Processing Advisory Committee

BF – Yahoo! (formerly Altavista) Babelfish

CAT – Computer-aided translation

COTS – Commercial off-the-shelf

DARPA – Defense Advanced Research Projects Agency

EBMT – Example-based machine translation

FAHQT – Fully automatic high quality translation

GO – Google Translate

MAHT – Machine-aided human translation

MT – Machine translation

SL – Source language

SMT – Statistical machine translation

TL – Target language

WBMT – Web-based machine translation

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Yahoo!® Babelfish. http://babelfish.yahoo.com/