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Machine Translation in the News: A Framing Analysis of the Written Press

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Abstract

Machine translation (MT) is now firmly in the public eye. The media can reflect and influence the public perception of MT and, by extension, of translation itself, but the news coverage of MT has to date remained largely unexplored. This study draws on the news framing literature to present an analysis of how MT is described in the written press. Based on a sample of 284 MT-focused newspaper articles, the news reporting on MT was found to be significantly more positive than negative. This positive framing was unrelated to the launch of neural MT. Furthermore, the portrayal of MT in the press tended to lack nuance, with few instances that raised awareness of the technology's use implications. The study calls for higher standards in the public discussion and promotion of MT and for more research on non-professional conceptualisations of translation technologies and their role in communication.

Keywords

Machine translation, news coverage, news framing, content analysis, translation technology

1. Introduction

Freely available MT systems such as Google Translate, Microsoft Translator and DeepL allow users to obtain translations easily, fast and at no ostensible cost. Translation research has placed great emphasis on how this technology can affect the work of professional translators and how it can change human translation processes and products (see Vieira, Alonso and Bywood 2019). To date, there has been less research, however, on how the ease of access and widespread availability of MT might influence societal perceptions of language, translation and multilingual communication. MT has great potential to facilitate and promote multilingualism, but its speed and usefulness may also prompt end-users to underestimate the complexities of translation while overestimating the capabilities of the technology, which in turn may lead to its misuse.

Importantly, the public perception of MT's capabilities is likely to be influenced by how the technology is marketed and publicly discussed. The history of MT is marked by over-promising of what the technology can do and of how fast it is expected to advance. In a landmark case from the 1960s, undelivered promises in MT advances led to a major U-turn in government funding in the United States (see Hutchins 2010). More recently, MT systems have gone through major improvements in their architecture thanks to the use of artificial neural networks as a machine learning methodology (Bahdanau et al. 2015). While superior results are often reported for neural MT (NMT), a Microsoft research group recently took the bold, if not conceptually problematic, step of declaring that their system was on a par with human translation (Hassan et al. 2018). A methodological rebuttal showed that the claim of human parity was unsound (Toral et al. 2018). Irrespective of subsequent academic scrutiny, however, this claim was quickly reproduced in the news at the time with much commotion and little nuance (e.g. Tan 2018; Perez 2018). At the other end of the spectrum, MT errors have also hit the news recently in situations where organisations and individuals use the technology in high-stakes contexts where translation errors pose serious reputational risks (see Kassam 2015; BBC News 2019). MT is therefore now firmly in the public eye and the news reporting on the implications of its use is likely to reflect and influence the public perception of translation technology and, by extension, of translation itself.

Previous research from the social sciences has shown that the way different subjects are 'framed' in the news has great power, including the capacity to shift political views and public opinion (de Vreese and Boomgaarden 2003; Schuck and de Vreese 2009). To the author's knowledge, however, the press coverage of MT has not been systematically examined to date. This article draws on the news framing literature to examine how MT is portrayed in newspaper articles where MT-related keywords appear in the headline as well as in the body of the text. Frames are generally defined as the angle from which an issue is described or as a specific facet of the issue that is given more emphasis (de Vreese 2005, 53). In previous research, news frames have corresponded to strategies used to contextualise events—e.g. a "conflict" or "attribution of responsibility" frame (Semetko and Valkenburg 2000)—or simply to the story's positive or negative inclination to the issue being recounted (e.g. de Vreese and Boomgaarden 2003; Schuck and de Vreese 2009). In applying this concept to MT, the present study has two objectives. First, it investigates if the news

coverage of MT is predominantly positive or negative and whether this is linked to the articles' date of publication. Second, the study qualitatively explores frequent themes used to contextualise the reporting on MT in news items deemed to be positive, negative and neutral. The discussion also raises broader societal issues linked to the implications of MT use and of how this technology is publicly portrayed.

Since the study concerns use and perceptions of MT by the general public, rather than by translators, it should be noted that most settings described here involve the use of raw MT outputs as an end-product. Post-editing or human translation practices are therefore not a prominent factor in the analysis. The study does not make a priori distinctions between different use cases or types of MT system, however. Details of this nature were largely allowed to emerge organically from the data based on the news items themselves (see Section 4).

In the remainder of the paper, Section 2 provides a brief review of previous research on perceptions of MT and on news framing. The article's methodology is then described in Section 3. The results are presented and discussed in Section 4 and, finally, the article concludes in Section 5 with a summary of the findings and suggestions for future research.

2. Review of Literature

Most research on perceptions of MT to date has concentrated on the views of translation professionals (e.g. Cadwell et al. 2017; Guerberof 2013; Vieira 2018; Rossi and Chevrot 2019). With a few exceptions (see e.g. Guerberof 2013), translators are largely found to have negative attitudes to the use of MT in the translation process (e.g. Moorkens and O'Brien 2015; Vieira and Alonso 2019; Läubli and Orrego-Carmona 2017). This can be associated with MT's unsuitability for certain tasks (Cadwell et al. 2017) as well as with broader issues linked to the economy and the structure of the translation industry (Vieira 2020).

Another strand of research on MT use has concentrated on the importance of promoting awareness of MT's limitations with a view to improving 'literacy' in the technology (Williams 2006; Bowker and Buitrago Ciro 2019). There has also been research on how MT is used in 'everyday' communicative acts and on what can be learned from the public's experience with MT in these contexts (Nurminen 2018). These studies discuss important aspects of how MT is used and how this use can be improved. Unlike the present analysis, however, they are not concerned with how

opinion-shaping, mass-distribution outlets contextualise the technology. The news framing literature offers a useful framework for analysing this type of phenomenon.[1] To identify frames in the news, previous studies have usually adopted one of two approaches. The frames can emerge inductively from the content itself (e.g. Neuman et al. 1992) or they can be deductively assigned to the material based on a pre-conceived definition of the frames of interest (e.g. Semetko and Valkenburg 2000). In more recent research, scholars have largely favoured the deductive approach. This approach is considered more reliable because it requires the frames to be operationalised prior to the analysis, which avoids inconsistency in the frames' identification (de Vreese 2005, 53). To identify the frames deductively, researchers often draw on specific elements or 'focal points' of the content, such as headlines or final statements in a news article, to establish if the material contains characteristics of the frame(s) (ibid., 54). Studies based on this methodology usually examine the extent to which certain frames are present in the news. In terms of the nature of findings reported by these studies, of particular relevance to the present analysis are investigations that classify frames based on their valence, i.e. whether they are positive or negative (e.g. de Vreese and Boomgaarden 2003; Schuck and de Vreese 2009). Some of this work presents empirical evidence showing that the extent to which news stories are positively or negatively framed can influence the valence of opinions held by those who consume the stories (de Vreese and Boomgaarden 2003, 373). These studies also provide a methodological framework that can be applied to the present analysis, where the objectives also involve identifying valenced frames in the press. With previous news framing research as a backdrop, the present study for the first time applies this framework to an investigation of MT use and its implications. The procedure for sampling and analysing the content is discussed in detail below.

3. Methodology

3.1 Sampling

The Newspapers section of the Westlaw database (Thomson Reuters 2020) was used

[1] A slightly different conceptualisation of 'framing' has been applied by studies based on narrative theory (Baker 2006; Harding 2012). Unlike the present article, these studies are usually interested in translations themselves and how they can be used to legitimise a stance or advance a specific agenda (Harding 2012, 287). These studies are therefore not reviewed here in detail.

to identify and retrieve newspaper articles with a focus on MT. Westlaw is an online resource that includes a large database of print and online news from multiple countries that can be searched based on detailed criteria. The search relied on a series of keywords that included different ways of referring to MT technology, including the names of popular MT systems, such as Google Translate and Microsoft Translator. Variations of the term 'babel fish', for instance, were also included because of previous MT systems with this name and because of the fictional alien fish with multilingual powers from *The Hitchhiker's Guide to the Galaxy* (Adams 1979), which is often used as a symbol for MT technology. The full search equation is presented and explained below. The search was case insensitive.

> advanced: ("machine translation" OR "automated translation" OR "automatic translation" OR "machine translator" OR "automatic translator" OR "automated translator" OR "google translate" OR "babel fish" OR babelfish OR "microsoft translator" OR "bing translator" OR systran) & TI("machine translation" OR "online translation" OR "automated translation" OR "automatic translation" OR "machine translator" OR "online translator" OR "automatic translator" OR "automated translator" OR "google translate" OR "babel fish" OR babelfish OR "microsoft translator" OR "bing translator" OR systran) % SO(patent)

The search was designed to ensure a sample with wide-ranging coverage, but which reflected the topic as precisely as possible. The operator 'OR' searched for any of the terms between brackets.[2] The search was set to return only records where the keywords appeared both in the text and in the headlines indexed as the articles' title, which helped to concentrate the analysis on news stories that had MT as a central subject. This was achieved by using the operator '&' ('and') coupled with 'TI' ('title). The sequence '% SO(patent)', in turn, excluded publications with 'patent' in the name. This term matched exclusively the periodical *Plus Patent News* to counterbalance a disproportionate number of records from this source (40% of the items initially retrieved). This is a high-frequency periodical, indexed under 'Pakistan

[2] Due to restrictions affecting the length of the search equation, the keywords searched in the text did not include 'online translation' and 'online translator', which were among the keywords searched in the title. This asymmetry was not found to affect the search coverage.

Newspapers', which publishes news snippets about patents. Excluding this source helped to balance the sample and focus the analysis on MT use at large rather than on patent-specific issues. Lastly, an English-language filter was applied to the results to exclude records in other languages that had been matched to some of the keywords. Since it would be difficult to exhaustively represent all languages in which this subject appeared in the news, the language of publication is an inevitable constraining factor for analyses of this nature. Focusing the present analysis on English-language records in any case provided consistency and helped to diversify the spread of sources by including newspapers that are available in English even if this is not an official language in the country of publication (see Appendix).

The above procedure returned 334 records. A series of manual filters were then applied. Thirty-seven records were excluded because of a poor fit to the topic (e.g. where 'Babelfish' was the name of a restaurant or where the article was about human translation only). Nine records were excluded because access to the full article was restricted by the database. Three records were excluded because they were duplicates, and one additional record was excluded because it was a non-English record missed by the language filter. The resulting sample contained 284 records in total. This was the sample retained for analysis and the basis for all information provided in the remainder of the paper.

The sample includes records from thirty countries. The most represented countries were the UK (N=108), the USA (N=67) and India (N=31). English-language articles from countries where English is not an official language include records from Japan (N=8), China (N=7) and South Korea (N=5). The articles were published between 1986 and 26 June 2019, when the search was carried out. No date filter was applied, so this date range represents the range in the database itself at the point the search was conducted. A full list of the newspapers is provided in the Appendix.

3.2 Content Analysis

The content analysis can be divided into two stages. First, valenced frames were deductively identified to assign the articles with scores reflecting their degree of positive or negative framing. An inductive qualitative examination was then carried out to explore the thematic aspects that underpinned the articles' framing. All the analysis was conducted by the present author with the involvement of an external

coder to check inter-annotator agreement in the identification of valenced frames (see below).

As per previous news framing research (Schuck and de Vreese 2006; 2009), the procedure for estimating the extent to which the articles were framed positively or negatively was based on a series of binary 'yes/no' questions that reflect the presence (value of 1) or absence (value of 0) of positive and negative elements in the newspaper articles. Six pairs of questions were originally devised for this purpose. Each question was regarded as a potential item to be included in two multi-item scales reflecting the articles' positive and negative framing, respectively. The full articles were the unit of analysis in all cases. Mokken scale analysis (MSA) (Mokken 1971) was applied to check if the negative and positive questions formed strong and reliable scales that could be used as a proxy for the articles' framing. MSA is a checking and validating procedure that is fit for binary-coded items. Specifically, it ensures that the different items (in the present study, the questions) devised to reflect a latent concept (in the present study, the negative or positive framing of the news articles) are reliable, consistent with each other and can have their scores added up or averaged to form a multi-item scale. By using MSA as a diagnostic device, two of the questions originally used were merged and two others were discarded,[3] which resulted in three question pairs used to measure the articles' negative and positive framing, respectively. The questions are presented below.

> *Negative Q1*: Does the article contain negative phrases about MT in the headline?
>
> *Negative Q2*: Does the article place more emphasis on MT's drawbacks than on its benefits, portray MT technology as something predominantly negative/ineffective or discourage its use?
>
> *Negative Q3*: Does the article use negative phrases to describe MT results or mention negative consequences of using MT?
>
> *Positive Q1*: Does the article contain positive phrases about MT in the headline?

[3] The discarded questions were 'Does the article include negative [or positive] phrases about MT or its use consequences in a quote?' and 'Does the article include negative [or positive] phrases about MT or its use consequences in its final statement?'.

Positive Q2: Does the article place more emphasis on MT's benefits than on its drawbacks, portray MT technology as something predominantly positive/effective or encourage its use?
Positive Q3: Does the article use positive phrases to describe MT results or mention positive consequences of using MT?

The two question groups formed strong and reliable scales that passed all recommended MSA tests (see Stochl et al. 2012) (negative frame: scale coefficient *H* = 0.88, reliability *Rho* = 0.84, scale Z = 16.83; positive frame: scale coefficient *H* = 0.88, reliability *Rho* = 0.80, scale Z = 14.18; N = 284).[4] An external researcher was asked to provide binary answers to these same questions for a random sample of approximately 10% of the newspaper articles (N = 28). The average level of agreement with the external coding was 80% (88% for the negative framing questions and 73% for the positive framing questions).

To form positive and negative frame scales, the average of the binary codes was taken for each question group. For an article where the negative questions had been answered with the codes 0-1-1, for instance, the negative score for that article was 0.667 (i.e. the average of the codes). This means that each newspaper article in the sample was assigned with a negative frame score and a positive frame score, which ranged between 0 (frame not present) and 1 (frame strongly present) (for a similar frame scoring procedure, see Schuck and de Vreese 2009, 47).

4. Results

4.1 Valenced frames: quantitative analysis

The frame scores allowed the articles to be ranked and compared to each other in relation to their valenced framing. The scales were analysed directly, as numeric scores, and indirectly as the parameter for a nominal classification. An article was classed as positive if its positive frame score was higher than its negative frame score. Similarly, articles were classed as negative if the negative score was higher than the positive score. Neutral articles were those where negative and positive frame scores

[4] The values of the scale coefficient *H* and reliability *Rho* have a maximum of 1 and the closer to 1 the stronger and more reliable the scale is deemed to be. The high Z scores, in turn, reflect the significance of the *H* coefficients (for more details on Mokken scale analyses, see Stochl et al. 2012).

were the same (i.e. ties). Table 1 presents the proportion of positive, negative and neutral articles in the sample.[5]

	Proportion of articles (%)	CI lower bound (%)	CI upper bound (%)
Positive	57	51	63
Negative	29	23	35
Neutral	14	08	20

Table 1. Proportions and 95% confidence intervals[6] (CI) for articles classed as positive, negative and neutral. N = 284

As shown in Table 1, most newspaper articles in the sample were positively framed. For 57% of the articles (N = 162), the positive framing was stronger than the negative framing. For 29% of the articles (N = 83), stronger negative framing was observed. Positive and negative frame scores were the same for 14% of the articles (N = 39). When considering the numeric scores directly, results of a Wilcoxon paired test[7] confirmed that the articles' positive and negative frame scores were significantly different ($p < 0.01$; $PS_{dep} = 0.66$)[8]. The size of this effect is expressed here as the probability of superiority for dependent groups (PS_{dep}), which expresses the probability of newspaper articles on MT being predominantly positive (Grissom and Kim 2011, 172–174). This measure (0.66) is equivalent to the rebased proportion of positive articles (the largest group) when ties (i.e. neutral articles) are excluded.[9] These results indicate that the coverage of MT in the written press is significantly more positive than negative. A comparison of the median negative and positive frame scores across all articles is presented in Figure 1.

[5] Throughout the study, decimal sample proportions used in any calculations are presented as percentages in the tables to make results easier to interpret.
[6] Confidence intervals were computed with the MultinomCI function of the DescTools R package. The lower and upper bounds reflect the range of values where true population proportions are likely to fall.
[7] Conducted with the coin R package, using the Pratt method.
[8] Confidence intervals (95%, based on the BinomCI function of the DescTools R package) of the rebased proportion of positive articles (excluding ties): 0.60, 0.72. Bootstrap resampling was also used to obtain the confidence intervals, but the results were largely the same.
[9] Another method for handling ties in these cases is to add half the count of ties to the number of positive cases (Grissom and Kim 2011, 172–174). This corresponds to $PS_{dep} = 0.64$.

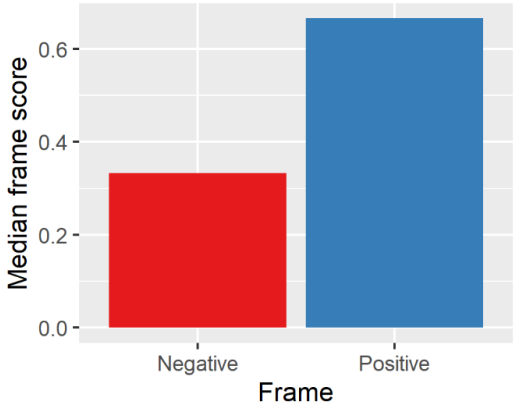

Figure 1. Median score for negative (left) and positive (right) frames.

To check if the date of publication of the articles was a factor in their framing, the data was also analysed for two sub-groups of articles: those published before 2016 and those published from 2016. The year of 2016 was the sample's median year of publication. This year also coincides with Google's public release of its neural systems (Wu et al. 2016). Google's roll-out of NMT systems made NMT gain wide public attention, which could have been a factor in the framing of this subject in the news. The proportions of positive, negative and neutral articles corresponding to the period before and from 2016 are presented in Table 2.

	Before 2016			**From 2016**		
	Proportion of articles (%)	**CI lower bound (%)**	**CI upper bound (%)**	**Proportion of articles (%)**	**CI lower bound (%)**	**CI upper bound (%)**
Positive	62	54	71	53	45	61
Negative	26	18	34	32	24	40
Neutral	12	04	21	15	07	23

Table 2. Proportions and 95% confidence intervals (CI) for positive, negative and neutral newspaper articles published before 2016 (N = 125) and from 2016 (N = 159).

Table 2 shows that most articles in the two date ranges were predominantly positive—i.e. the overall pattern presented in Table 1 can also be observed when articles published only before or only from 2016 are considered. It can be noted, however, that the proportion of positive articles was slightly higher before 2016. Conversely, the proportion of negative articles had a slight increase from 2016. Kendall's rank correlation tests showed a very small but significant negative association between the year of publication (treated as a direct numeric variable) and the positive frame score

(tau = -0.13, $p < 0.01$). No significant effect was observed for the negative frame score (tau = 0.06, $p = 0.22$). A non-parametric multivariate analysis checking the impact of date range (i.e. before and from 2016) on both the negative and positive frame scores showed no significant effects either.[10]

These results have at least two implications. First, while the negative association between the year of publication and the positive frame score suggests that the overall news coverage of MT became less positive with time, the association is too weak (-0.13) to warrant any conclusive interpretations. This result is regarded here as negligible until otherwise confirmed by a larger sample. Second, what the insignificant results do suggest is that NMT is unlikely to have made the news reporting on MT become more positive. In fact, these results show that the positive news framing of MT is not a recent phenomenon. The coverage of MT was more positive than negative irrespective of the date of publication.

To gain further insight into how the articles were framed, prominent features of positive, negative and neutral articles are qualitatively discussed below in sections 4.2, 4.3 and 4.4.

4.2 Positive articles

In broad terms, positive articles were often focused on how MT technology is advancing or on how it can be useful. The process of reading and analysing the articles suggested Google Translate was frequently discussed in articles with a positive framing. Further inspection showed that the word 'Google' appeared in the headlines of 65% of positive articles. Of articles with the maximum positive score (i.e. 1), 64% mentioned 'Google' in the title. A substantial amount of news traffic on MT is therefore dedicated to a positive account of how Google Translate is improving and how it can be beneficial. Among these articles, some focused on the technological aspects of Google Translate's updates, with headlines such as "Google Translate is about to become really accurate" (Turner 2016) or "Google Translate's mobile app just got even more magical" (Ma 2015). Of these two articles, the former covered Google Translate's launch of NMT while the latter covered the release of a camera feature that allows users to obtain translations of signs and other print material by

[10] This analysis was conducted with the nonparatest function of the npmv R package, which examines the effect of a single explanatory variable (in this case, period of publication) on multiple response variables (in this case, negative and positive frame scores) (ANOVA Type test = 2.1, $p = 0.13$).

using the camera on their phones. This same camera functionality was described in another article as a "new, very snazzy feature" (Tsukayama 2015). Although Westlaw does not automatically index details of the specific news sections where the articles appeared, a manual inspection suggested that articles focused on improvements and technological advances were often published under 'Science' or 'Technology'. It was also noted that this type of article sometimes relied heavily on information provided by MT developers themselves (e.g. Beall 2016; Turner 2016).

Among articles where the positive framing of MT was strong, at times the underlying assumption was in fact that MT had infallible, if not 'magical' (see above), powers. This is implied in headlines such as "Google Translate now lets you chat to anyone in a foreign language" (Titcomb 2016) and "Google Translate live translation upgrade to let anyone speak any language, any time" (Griffin 2015) In some of these articles, the lack of nuance in the description of what MT can do is objectively inaccurate. The claim that Google Translate can translate 'any language' is simply incorrect, for instance.

Another type of positive reporting on MT consisted of articles that tried to elicit empathy by telling stories with a clear human appeal. These included titles such as "Franklin cop uses Google Translate to talk to Chinese theft victim" (Muscavage 2019), "Couple who don't speak same language fall in love—thanks to Google Translate" (Jolly 2019) and "Google Translate: the unlikely World Cup hero breaking barriers for fans" (Ames 2018). In this group of articles, it is worth noting how the stories paint MT in a positive light while at the same time reflecting some level of surprise at how MT proved to be useful in real, often high-stakes, communicative contexts. This is clear in how MT is described as an 'unlikely hero'. The very fact that the stories were published also implies that MT's success in these cases is unusual or unexpected and therefore something newsworthy. In these cases, the articles are not directly motivated by technological advances, but rather by MT's impact on communication.

Associations between humans and machines were also, directly or indirectly, a theme explored in the articles. It is worth noting how MT is personified or regarded as a human-like feature in some of the stories, for instance by being described as a 'hero'. Something similar can be noted in the headline "Just me, you and Google Translate" (Irish Independent 2012), where Google Translate is alluded to as the third person in a trio. Among other reasons, articles that personify MT or regard it as a human-like

technology are notable especially because of how they implicitly attribute agency to MT systems. Conceptually, this is consistent with theoretical frameworks that challenge a distinction between human and non-human factors in understanding the effects of technology on society (Ballantyne 2015). These frameworks, in particular Actor Network Theory, conceptualise agency as a property that can be distributed between human and non-human elements in a social network (see Latour 1996). An in-depth analysis of MT use from this prism is beyond the scope of the present article. Nevertheless, it is worth pointing out how public portrayals of MT as a human-like technology may, advertently or inadvertently, entail expectations that the technology should behave or be as effective as a human. This is clear in a headline that announced 'human parity' even before this was claimed by Microsoft: "Google Translate now 'as good as a human'—could it save you on holiday?" (Parsons 2016). Similarly, in an article that reports on the availability of Swahili in Microsoft Translator, it is mentioned that Microsoft is "veering away from the human translator," which is described as having cost benefits for local governments in Africa that wish to make documents available in different languages (Kuria 2015). The benefits of MT in these cases notwithstanding, the article shows no attempts to temper its stance or draw attention to the fact that MT also has limitations and may lead to unexpected problems when used without post-editing in governmental settings and other formal circumstances (see Section 4.3).

Generally, articles with a positive framing tended to focus on technical aspects of MT technology or on MT's usefulness rather than on textual characteristics of MT outputs, which were more salient among articles with a negative framing (see Section 4.3). While some articles made the point that MT also had shortcomings, the articles with a predominantly positive framing largely lacked nuance and often put forward conceptualisations of MT as a technology with at times human-like, at times 'magical' powers. Some articles just disseminated information provided by MT developers. This also raises important questions about the role of the press in technological news and about how it can act as a conduit for usually non-peer-reviewed research published through MT companies' blogs.

4.3 Negative articles

Unlike articles with a predominantly positive framing, negative articles tended to focus on linguistic errors and, sometimes, on their consequences. These articles were

often published by tabloids. Some of them appealed to humour or attempted to shock readers by calling attention to the unusual nature of certain machine translations. Among these, there were articles with headlines such as "Egg-streme sports: Norway's Olympic squad accidentally orders 15,000 eggs after asking Google Translate how to say 1,500 in Korean" (Sear 2018) or "Google Translate users TERRIFIED as site reveals disturbing DOOMSDAY prophecies" (capitals in original, Blair 2018). There were also articles that were in direct opposition to positive articles that stressed how MT had been useful in high-stakes settings. These included articles with headlines such as "Patients 'at risk' in care home where staff who can't understand English 'use Google translate' to speak to residents" (Hudson 2019) and "Stop using Google Translate! Wrexham Council staff warned after complaints over Welsh language errors[11] (Randall 2018). These articles highlighted the consequences of MT errors in serious or formal contexts.

Some negative articles implied that the general level of awareness of how MT systems work is often low, which has implications for what users might expect of the technology. In relation to a case where a translation error ended up on the website of a town in Galicia, it is mentioned that the town was considering "legal action against Google for the mistranslation" (Saxena 2015). Here it is worth noting how mistranslations can be regarded as unexpected issues rather than occurrences that are in the nature of MT. A different article covering this same story provided explanations such as "Google Translate is an automatic translator, meaning it works without the intervention of human translators" (Eleftheriou-Smith 2015). A Google expert is quoted in this article saying, "[s]ince the translations are generated by machines, not all translation will be perfect and sometimes there will be mistakes or mis-translations" (Eleftheriou-Smith 2015).

While in professional translation settings statements saying that MT is not perfect may come across as obvious, it was clear from articles with a negative framing that, when users encounter MT use issues, they can feel misled. This raises questions concerning the attribution of responsibility for MT errors. On the one hand, as seen above, MT is often portrayed as a 'magical' technology with infallible powers that allow users to translate 'any language'. As previously mentioned, this can follow claims announced by MT developers themselves. On the other hand, however, when

[11] These headlines appeared in banners at the top of the page in addition to the articles' titles.

problems arise, quotes by major commercial developers state that MT is by nature imperfect and that errors should be expected. One article covering the case involving the town in Galicia indirectly suggests that MT use is a matter of choice and that users should know when to hire professional translators instead: "the gaffe is proof that the Internet is no substitute for a professional translator" (Saxena 2015). This pushes the burden of responsibility closer to users and further away from developers. From the user's perspective, however, the overall message is conflicting, so it is not surprising that they might consider legal action when MT errors have serious consequences. These cases expose a need for greater awareness of MT's limitations and clearer guidelines on the situations where the technology should and should not be used, and on who should be held accountable for cases where poor MT has serious repercussions.

Generally, articles that framed MT negatively tended to exploit humour or situations of distress to provoke a reaction in the readership. While some articles alluded to broader questions about how MT can affect language learning (Stapleton 2019) and how its problems may be down to 'misuses' rather than issues that are intrinsic to the technology (Wooten 2011), these articles were the exception rather than the rule. A lack of nuance is therefore also apparent among negative articles.

4.4 Neutral articles

As previously mentioned, articles classed as 'neutral' were those that had equal positive and negative frame scores. As shown in Section 4.1, neutral articles represented 14% of the sample. Of these, the majority (67%) were articles where positive and negative frames were both absent (i.e. where both frames had a score of zero). These articles often described MT-related developments without advancing a particularly negative or positive argument. Some of them were published by an institutional source rather than by a specific reporter (e.g. Korea Times 2016; LETA 2016). Others were slightly different from the rest of the sample and deserve special attention. These were articles that mentioned MT use in relation to crimes. These articles were published either in tabloids or in regional newspapers. They included, for instance, "Sex attacker 'used Google Translate to search "I am interested in you" before attacking schoolgirl'" (Armstrong 2016) and "Sham wedding gang who made £500,000 marrying bogus couples who had to communicate via Google Translate are jailed for 20 years" (Boyle 2018).

Based on the headlines, it is plausible to expect that these articles provide more details of how exactly MT was used or why its use is important in relation to the reported events. Surprisingly, however, MT is mentioned in the body of the text in these articles usually once or twice more, often just to restate the information already provided in the headline—i.e. that individuals linked to the crime used MT to communicate. While MT use may be construed negatively by these articles' readers, based on the deductive frame identification method adopted here, there was no basis to classify these articles as either positive or negative because the articles' stance on MT itself or its usefulness is not explicit. In one similar case, MT had been used by the victim (to report the crime) rather than by the perpetrator (Morrison 2016).[12] Here readers may construe MT positively, but again there was no basis to classify the article's framing as either positive or negative since the article does not go into detail about its stance on the technology itself or its implications. Nine neutral articles overall followed this format and associated MT with those who had been involved in a crime as victim, perpetrator or some connected third party. This was not therefore a common phenomenon, but these articles raise relevant questions about the different ways in which MT, and communication technologies in general, can be construed and associated with different social stereotypes. In the examples mentioned above, especially where MT had been used in criminal activity, the mention of MT in the headline could be seen as an attempt to portray those committing the crime as having a 'foreign' or 'outsider' status.

In addition to articles with no negative or positive framing, there were also articles where the positive and negative frames were present in equal measure. As mentioned above, these articles were also treated as neutral. There were only thirteen of them in the sample. These articles can be regarded as having a balanced stance on MT by giving comparable emphasis to its positive and negative points. Among these, there were articles where the headline was a question—e.g. "Can machine translation stand alone?" (Jun-ho 2019); "Are we using Google Translate responsibly?" (Stachova 2019); "Is Google Translate improving or ruining the way we travel?" (Dickinson 2018)—as well as articles where negative and positive points were both

[12] This article was indexed by Westlaw without a named author. Some inconsistencies of this nature were noted for online articles. They were most likely due to updates published after a copy of the article had been retained by the database and are not deemed to influence the analysis in any way. References provided here are up to date at the time of writing.

included in the headline itself: e.g. ‘blunders’ and ‘successes’ (Wooten 2010); ‘some success’ and ‘serious limitations’ (Nikkei Weekly 1993). These articles tended to consider the strengths and the limitations of MT in more depth.

Due to their small number, it is not easy to discern patterns in the group of neutral articles with equal positive and negative scores. It was noted, however, that these articles spread across a relatively wide temporal range (from 1993 to 2019). It is also worth noting that one article in this group was published by a Translation Studies academic (Kockaert 2019), another was an opinion piece by a professional interpreter (Jun-ho 2019) and another was an article by the director of translation services at a company (Wooten 2010). These three articles raised awareness of the complex and context-dependent nature of the concept of translation quality. They also highlighted how human and machine translation can complement each other and how the issue of MT’s usefulness is not necessarily to do with a dichotomy between humans and machines. The fact that these authors were translation professionals most likely explains the more carefully considered stance of these articles. While the present paper does not expect the news coverage of this topic to have a widespread educational agenda, the fact that arguments of this nature were rare in the sample suggests that the public discussion of MT in the news often fails to take into account important factors that are usually considered by experts in language and translation.

5. Conclusion

This study presented a framing analysis of the newspaper coverage of MT. Based on a sample of 284 newspaper articles where different MT-related keywords are mentioned in the text and in the headlines, the results showed that the coverage of MT in the written press tends to emphasise the positive aspects of the technology. NMT was not found to be associated with a significant increase in the positive tone of the news reporting on MT. In fact, MT’s positive framing was observed irrespective of the date of publication.

Positive articles emphasised MT’s benefits especially by describing technological advances or positive consequences of MT use. Some of these articles inflated the capabilities of the technology by comparing it to human translators or by implying that MT had the power to make users speak and understand any language without the prospect of encountering any issues. Negative articles were more narrowly focused on the MT output and errors that could elicit humour or shock. These articles largely

missed opportunities to discuss ways in which MT-related issues could be minimised or avoided. Given the overstating tendencies of positive articles and the often sensationalist tone of negative articles, this paper does not deem the news reporting on MT technology to be a fair account of MT's strengths and limitations or of the implications of its use.

While measuring the specific effects of the news frames on the readership is beyond the scope of this paper, some of the positive articles analysed put forward oversimplified notions of language that risk exacerbating misuse of MT. MT errors can have reputational and professional consequences and, in covering cases where these arose, the newspapers did little more than exploit the public appeal of the story. Some positive articles acted as conduits for information disseminated by MT companies themselves, which raises further questions about a potential lack of public scrutiny of MT developers' claims. As MT becomes increasingly available across platforms and devices, more attention should be drawn to questions of agency and attribution of responsibility for MT errors or problems resulting from its misuse. Given MT's ease of access, low awareness of its benefits and limitations is an issue of potentially great magnitude.

The results above also point to a divide between expert and non-expert perceptions of MT technology and of its potential. In recent years, translation technology research, especially research on human factors in MT use, has been predominantly focused on professional issues or issues related to translation as a process or practice. Meanwhile, MT has become a mainstream communication tool. While previous research indicates that professional translators' attitudes to MT are usually negative (see Section 2), the results presented here show that the public coverage of this technology veers towards the other end of the spectrum. While news articles are just one data source on public conceptualisations of MT, the coverage of MT in the news is an important indicator of how this technology is portrayed to non-linguists and the wider public. The results reported here therefore call for research and other initiatives that can promote fruitful and informed uses of MT. There is a need for the MT and professional translation community, including industry and academia, to engage with the wider population to raise awareness of how MT works and of what it can do. This has implications for several other subjects where MT-mediated communication may be a factor, including migration, social media use, political discourse and language policy. It is hoped that

future research on these topics will shed further light on how translation technologies might influence attitudes to translation and, more broadly, to language.

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Appendix

Newspapers	Articles (count)
Advertiser (Australia)	1
Afternoon Voice (India)	1
Arizona Republic, The (Phoenix, AZ, USA)	1
Arkansas Democrat Gazette (Little Rock, AR, USA)	1

Australian Financial Review (Australia)	1
Baltimore Sun (MD, USA)	1
Bangkok Post (Thailand)	1
Belfast Telegraph Online (UK)	2
Boston Business Journal (USA)	1
Boston Globe (MA, USA)	2
Bradford West Gwillimbury Topic (Canada)	1
Business and Financial Times (Ghana)	1
Cambodia News Gazette (Cambodia)	1
Cape Argus Weekend (South Africa)	1
Cape Community Newspapers (South Africa)	1
Chicago Sun Times (IL, USA)	1
CHICAGO TRIBUNE (USA)	1
China Daily (China)	2
China Knowledge Press (China)	1
Chosun Ilbo (South Korea)	1
Christian Science Monitor (USA)	3
City AM (UK)	1
Columbus Telegram (NE, USA)	1
Corkman (Ireland)	2
Courier News (Bridgewater, NJ, USA)	1
Daily American, The (Somerset, PA, USA)	2
Daily Dot (USA)	4
Daily Herald (Arlington Heights, IL, USA)	1
Daily Home, The (Talladega, AL, USA)	1
Daily Mail (UK)	1
Daily Mail Online (UK)	23
Daily News Egypt (Egypt)	1
Daily Pak Banker (Pakistan)	3
Daily Pakistan Today (Pakistan)	1
Daily Post (North Wales Edition) (UK)	3
Daily Press (USA)	1
Daily Record (Rochester, NY, USA)	1
Daily Star Online (UK)	2
Daily Telegraph (UK)	4
Dallas Morning News, The (USA)	1
Derby Evening Telegraph (UK)	1
Deseret Morning News (USA)	2
Economic Journal Insight (Hong Kong)	1
Economic Times (India)	2
European Voice (Belgium)	1
Evening Standard Online (London, UK)	4
Evening Times (Glasgow, Scotland, UK)	1
Express (UK)	1
Express Online (UK)	7
Express Tribune, The (Pakistan)	1

Financial Express (India)	1
Forward, The (New York, NY, USA)	1
Globe and Mail (Canada)	1
Globes Online (Israel)	1
Guardian (UK)	11
Guardian.co.uk (UK)	1
Hamilton Spectator (Canada)	1
Hindu (India)	3
Hindustan Times (India)	7
Honolulu Star-Advertiser (Honolulu, HI, USA)	1
Houston Chronicle (USA)	2
Huffington Post (USA)	9
i Newspaper (UK)	4
Idaho Press-Tribune (Nampa, ID, USA)	1
Independent (UK)	1
Independent Online (UK)	12
Indian Express (India)	5
Industrial Worker (USA)	1
International Herald Tribune (USA)	1
International New York Times (USA)	2
Iran Daily (Iran)	1
Iraq News Gazette (Iraq)	1
Irish Independent (Ireland)	2
Irish Times (Ireland)	1
Israel National News (Israel)	1
Japan News, The (Japan)	2
Jarrow and Hebburn Gazette (UK)	1
Journal – Gazette (USA)	1
Kitchener Record (Canada)	1
Korea Times (South Korea)	4
Lanka Puvath (Sri Lanka)	1
Latvia National News Agency (LETA) (Latvia)	3
Leader, The (UK)	1
Los Angeles Times (USA)	1
Mail on Sunday (UK)	1
Maryborough Herald (Australia)	1
Metro - New York (New York City, NY) (USA)	1
Mint (India)	4
Mirror (UK)	2
Mirror Online (UK)	9
Mizzima (Burma)	1
Montreal Gazette (Canada)	2
Nation (Kenya)	1
National Post (Canada)	2
National, The (Scotland, UK)	1
New Zealand Herald (New Zealand)	1

News Point (India)	1
Nikkei Weekly (Japan)	6
Oregonian (Portland, OR) (USA)	1
Ottawa Citizen (Canada)	3
Peninsula, The (Qatar)	1
Phnom Penh Post (Cambodia)	1
Richmond Times Dispatch (VA) (USA)	1
Salisbury Journal (UK)	1
San Francisco Chronicle (CA) (USA)	1
Saudi Gazette, The (Saudi Arabia)	1
Scotland on Sunday (Scotland, UK)	1
Scotsman (Scotland, UK)	1
Shenzhen Daily (China)	1
Silicon Valley Business Journal (USA)	2
South China Morning Post (China)	1
South China Morning Post (Contributor Content) (China)	1
South China Morning Post Online (China)	1
Star-Ledger, The (USA)	1
Star Tribune: Newspaper of the Twin Cities (USA)	1
Straits Times (Singapore)	2
Sun Sentinel, Fort Lauderdale, FL (USA)	1
Sunday Business Post (Ireland)	1
Sydney Morning Herald, The (Australia)	2
Telegraph Online (UK)	9
Telegraph, The (India)	1
Telegraph, The (Nashua, NH) (USA)	1
Times of Central Asia, The (Kyrgyzstan)	2
Times of India (India)	5
Times of India (Online Edition) (India)	1
UB Post, The (Mongolia)	1
USA Today (USA)	1
Vancouver Province (Canada)	1
Vancouver Sun (Canada)	1
Victoria Times Colonist (Canada)	1
Washington Business Journal (USA)	1
Washington Post, The (USA)	1
WashingtonPost.com (USA)	4
Western Mail (UK)	1
WESTERN MAIL (UK)	1
Western Star (Australia)	1
WND (WorldNetDaily) (USA)	2
York Daily Record (PA) (KRT) (USA)	2

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