

Parlant de Business: An Application of Combined Probability Theory to Inherent and Translation-Induced Semantic Ambiguity

Ross A. Jackson and Amanda M. Reboulet

Abstract—Debate persists around the axiom that it is impossible not to communicate. Given the multitude of potential meanings associated with words, a reasonable correlate in this dispute is that it is unlikely to communicate sans ambiguïté. Such an occurrence is even more pressing in international business management where the language used is frequently abstract, metaphorical and translated. Informed by this insight, one is able to view meaning as occurring probabilistically. Frequently, probability theory is used to model the risk and uncertainty associated with a given set of business projects. In this research, that methodology and focus is turned on itself, and an application of combined probability theory to select words in management related to business is explored and extended further to show how translations between French and English could increase the ambiguity of meaning. Through the process, an uncommon application of probability theory is illustrated; one focused on addressing problems of effective, international business communication.

Index Terms—Analytics, business, semantics, translation.

I. INTRODUCTION

Ambiguity haunts communication. Unpacking intended meaning is a complex endeavor, which people seem to navigate routinely without much difficulty. Yet, miscommunication is common enough to suggest that the fluidity of speech masks a dense web of semantic uncertainty. How does one determine what (*if anything*) something means? Exploring this question benefits from familiarity with the rudiments of communication theory.

Communication is arguably a central and essential component to complex, human activity and progress [1]–[3]. However important communication is, determining the intended meaning of communicative acts is particularly challenging. Watzlawick, Bavelas and Jackson explained, “the attribution of ‘meaning,’ a notion that is essential for the subjective experience of communicating with others” was found “to be objectively undecidable” [4]. *Bref, le sens est ambigu*. Consequentially, one benefits from thinking of meaning probabilistically. This is perhaps illustrated best in a narrower context.

Maintaining an openness to the ambiguity of potential meanings of communication is likely even more pressing when engaged in international business. Communicating

across languages, within the context of international business, contains a multitude of unique linguistic and cultural challenges to overcome [5]–[7]. Such issues can arise even at the most elementary level of communication: words. As Zhu explained, “words are the basic language units used for business communication... Words often reflect or assume cultural values, assumptions, beliefs, customs, and connotations, which differ from culture to culture. Weak awareness of these differences can lead to problematic business communication” [8]. When conducting business internationally, there are at least two sources of uncertainty in communication at the word-level: a) inherent ambiguity (occurring within a given language), and b) translation-induced ambiguity (emerging when switching from one language to another).

Cette recherche, explores an application of combined probability theory to model the uncertainty associated with select words in management. Specifically, high-frequency terms, in both English and *en français*, were identified within a context of international business. Sentiment analysis was used to capture objectively a type of ambiguity that exists among competing definitions of each of the twenty identified terms. This uncommon application of probability illustrates the illusiveness of assured meaning in a context of international business communication, and points to a methodology for bringing the concern into sharper focus if not allowing for its partial mitigation.

The methodology used to extract sentiment along with the approach for the probabilistic modeling of semantic uncertainty is presented in Section III, with the results of this study following in Section IV. A summary of key findings and extensions are included in the conclusion (Section V). Literature related to communication, translation and modeling uncertainty is provided next (Section II).

II. COMMUNICATION, TRANSLATION AND UNCERTAINTY

Context is essential to understanding. Establishing a shared context, consistent with the ambiguities of communication being addressed here, is neither easy nor straightforward. Delimiting a study adequately requires a degree of selectivity in terms of its relevant literature. If the aperture is too wide, one muddles through a convoluted mess of disjointed tangents. If too narrow in focus, one potentially excludes material that would provide a relevant nuance. In an attempt to strike a balance, research related to communication, translation, and uncertainty is addressed here. While not exhaustive, this review should prove useful in establishing the shared context required for understanding.

Manuscript received May 3, 2019; accepted August 15, 2019.

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As a result of its centrality to human development and achievement, the material related to communication theory, and the ongoing debate around the impossibility of not communicating, is presented first.

A. Communication

Language and communication are arguably essential components of human development. As critical as communication is, debate persists around both as to what constitutes communication and whether it is possible for one to not communicate. Further, whereas communication is clearly important, it is far from certain that one will be able to communicate clearly (i.e., without ambiguity). In this section research related to communication and societal development, the ongoing debate around the notion as to if it is possible for one to not communicate as well as communication and ambiguity is presented.

Human propensities toward progress are inseparably linked to language and communication. As explained by Chiot, “at some time our distant ancestors acquired the ability to communicate,” and as a result the “continual increase in humans’ ability to manipulate the natural environment, has made us what we are today: the dangerous masters of the world, able to perform miracles, but also capable of destroying much of the earth” [1]. Janus-like, the ambiguities of communication reside not only in its potential meanings but also in terms of its engendered consequences. This finding appears to exist psychologically as well as sociologically. Johnson described how “the structure” of “society has been and continues to be determined significantly by the structure of the language,” and that the “quandaries” in which humans find themselves are “rather like verbal cocoons in which individuals elaborately encase themselves, and from which, under circumstances common in our time, they do not tend to hatch” [9]. Such *quandaries* perhaps arise as language becomes more abstract and less tethered to a shared, discernable reality. Lefebvre described that “a hundred years ago words and sentences in a social context were based on reliable referentials that were linked together, being cohesive if not logically coherent” [10]. In the absence of such “reliable referentials,” it is unsurprising that communication is ambiguous. Before addressing this ambiguity further, it is important to assess if it is possible to not communicate.

Debate persists around the “metacommunicational axiom” that “one cannot not communicate” [4]. Much of this debate centers around axioms, postulates, and hypotheses [11]-[13]. Motley claimed the axiom is inconsistent with several communication postulates, and that if intention is required for communication than it is possible to not communicate [11]. In response, Bavelas suggested that the statement should be treated as a hypothesis rather than an axiom, “but that one probably cannot avoid communicating in a social setting” [12]. Andersen’s critique of Motley’s position focused on broadening the focus of source behavior from an oversimplified dichotomy to a trichotomy to include symptomatic behaviors, spontaneous and symbolic or rhetorical messages. Andersen concluded his argument by noting that, “whenever people gather, in pairs or groups, behavior occurs and meaning is assigned to these

actions...communication is ubiquitous; one cannot not communicate” [13]. Even while critiquing the axiom, Motley admitted that, “the question should be not so much the simple one of whether one cannot not communicate, but rather the more complex question of what indeed are our fundamental assumptions about communication” [11]. Given that international business is an intentional activity occurring in a social setting it is reasonable to conclude, at least within the parameters of the ongoing debate, that the axiom holds for the area focused upon here. However, a “more complex question” focused on assumptions related to ambiguity in communication remains.

Ambiguity appears to be inherent in communication. At a minimum, it seems one would be better served assuming ambiguities are part of communication rather than not. Inherent ambiguities in communication have been observed in both symbolic expressions [14] and silence [15], and in a range of interactional contexts from text messages [16] to verbal irony [17]. It is understandable that those most directly engaged in communication are perhaps particularly attuned to ambiguity. As Gallagher explained, “the ambiguity of language is a concern for many writers and teachers of writing” [16]. Mewhort-Buist and Nilsen found that “communicative ambiguity” is highlighted in “figurative language” such as “metaphor, hyperbole, understatement and irony” [17], whereas Lehmann Oliveros found inherent ambiguity in “silence-phenomena,” which are not “always clearly distinguished” from “language-phenomena” [15]. Across a spectrum of styles and contexts an element of inherent ambiguity in communication is observable. Part of this inherent ambiguity could emerge along with communication itself from within the individual. As Derrida explained, “representation mingles with what it represents...as if the represented were nothing more than the shadow or reflection of the representer [*sic*]. A dangerous promiscuity and a nefarious complicity between the reflection and the reflected which lets itself be seduced narcissistically,” and that “in this play of representation, the point of origin becomes ungraspable” [18]. Through this process communication becomes ambiguous. With inherent ambiguity sketched, it is possible to summarize the key points developed here in regard to communication.

Whereas communication can be considered generally essential to societal development, debate persists around the notion as to the possibility of not communicating. These topics were briefly reviewed along with aspects of inherent ambiguities in communication. With these aspects of communication presented, it is possible to focus now on a narrower aspect of communication: translation.

B. Translation

For those involved in the communicative aspects of international business, both correctly interpreting and translating business terms becomes essential to personal and organizational success. Any blunder with either translating to or from a native language can prove to be a source of embarrassment for the individual, and more consequently, devastating to the business. As businesses continue to globalize and engage more meaningfully in international business, interpreting and translating become increasingly important and relevant to business models.

Effectively enacting this aspect of international business calls for a richer appreciation of both language and culture. As suggested by Belenkova and Davtyan, it is imperative to have interpreters and translators with an increased level of proficiency in languages when participating in any sort of international relations. Furthermore, they explained that there were subtle nuances based on psychological mechanisms in written and oral communication by stating, “oral kind of speech can be articulated and heard, whereas the written kinds of speech translation including are quite visible and perceived by the eyes” [19]. Expanding the focus on translation reveals added insight.

Zhu emphasized the importance that international businesses accurately translate information about “products, services, transactions and management methods across cultures to users of the target countries” [20]. In order to alleviate some of this burden, he analyzed translation issues and provided recommendations for circumventing problems and ways to resolve these issues. Effective communication, of which translation is a significant aspect, is important otherwise it can affect international business adversely. Placing translation errors in a context of business is helpful for grasping the desultory effects more clearly.

Survey research conducted by Zhu revealed that 57% of respondents identified an advertisement that incorrectly translated English into another language. About 50% of respondents stated they ignore the message if there are errors and 65% said that it shows the business doesn’t have an interest in the consumer. These findings illustrate how translation errors can affect international business on both a reputation and monetary level. Zhu outlined six areas where translation issues can occur: 1) lack of word sensitivity (word sound, word form, word meaning, and syntactical errors), 2) lack of cultural awareness, 3) lack of knowledge of special terms employed in a professional capacity, 4) deficiency in translation skillset, 5) completely trusting machine translation, and 6) carelessness. In order to conduct international business successfully, these issues will have to be remedied [20]. Accurate translation might require something more than simply understanding a language, as cultural considerations might lurk behind and within the subtitles and nuances of communication.

Conducting a study which compared the opinions of translators to those of students using different experience levels of people who worked at international legal corporations and firms, Belenkova and Davtyan found that all participants agreed that a profound knowledge and fluency of a foreign language was required of translators. As if such knowledge wasn’t difficult enough, they observed that the ability to do research linguistics is important in addition to being able to speak, read and write a foreign language. Compounding the complexity of the task further, they found that it was also important to have a breadth of knowledge in the history, culture, and political system of the country with which one is doing business [19]. Collectively, these findings suggest that translation, if done well, extends beyond language transformations and requires deeper knowledge of a given language-context.

Based on these findings, it is crucial to ensure that business terms are accurately interpreted and translated to be successful in international business endeavors. As

corporations continue to globalize on an increasingly larger scale, language becomes an ever more important aspect of doing business abroad and worthy of enhanced consideration. Doing so requires confronting the uncertainties of language.

C. Uncertainty

Translating between languages, as previously developed, presents certain choices and challenges in communication. However, as Lacan contends, one is always forced to translate one’s desires into the language of the *other* [21]. In some respects, this casts the ambiguity of communication as an interpersonal, existential concern, rather than exclusively as an interpersonal, social one. What is ambiguous is quite obviously uncertain. Along with the uncertainty associated with business, and the application of probability theory to address those concerns, the existential aspects of ambiguous uncertainty are addressed here.

How does one define the project that is one’s life? Whereas the specific content of one’s response will be individual, existentialism provides insight into approaches to and consequences of answering or avoiding this question. Contrasted with Camus’ notion of the *absurd* [22], De Beauvoir constructed her existentialist ethics in response to the ambiguity of existence, in which “the fundamental ambiguity of the human condition will always open up...the possibility of opposing choices” [23, p. 118]. While initially seeming to be a point of equivocation conflating the *ambiguity* of existence with that of communication, these two forms of ambiguity are not necessarily distinct at the level of experience. As Weinberg explained, “the meaning of existence cannot be considered apart from the meanings of meaning” [24]. Taking this turn, it is possible to more narrowly focus on the existential consequences related to the ambiguity of meaning in communication. Part of the ambiguity of communication stems from the fact that, “all definitions are arbitrary” [24]. At the core of ambiguity is that the form of understanding available is limited by the experiences of the receiver. As Weinberg described, “All that words...can do is evoke sensations and feelings which the reader or listener has already experienced. They can never transmit new experiences” [24]. The ambiguous uncertainty which exists within and between each of us is in some respects easier to observe and more difficult to resolve within a business context.

Dealing with uncertainty in business in general, and international business in particular, holds a host of unique challenges in terms of both understanding and action. Nonetheless, what is uncertainty as it relates to business? Spencer defined such uncertainty not as “a simple lack of knowledge or probabilistic risk” but instead as something which “emerges from inaccessible data or an unknowable future...business uncertainty is the sum of all the unknowns surrounding decisions” [25]. Vidal provided a definition which comes closer to the semantic ambiguity addressed here. For Vidal, “uncertainty as ambiguity stems from an equivocal situation in which a set of stimuli can receive several plausible interpretations” [26]. Ambiguity is not some trifle in the execution of business to dismiss quickly, but rather infuses its very core. Vidal explained, “ambiguity is seen as a central characteristic of organizational life and

influences most activities” [26]. If organizations avoid confronting such ambiguities forthrightly, Crossman and Doshi contend that such behaviors are a form of “damaging delusion” [27] which hinders one’s ability to make sense of situations. Spencer asserted that the overarching approaches for managing uncertainty can be grouped into the general strategies of buffering, planning and adaption [25], whereas Vidal contended that some form of *intervention* is required for its removal [26]. Applying probability theory to model uncertainty and inform managerial decisions can be viewed as such a form of intervention.

While not new, the application of probability theory to business has recently experienced important advancements to consider. Placing this development into its broader historical context, Bernstein noted, “more than any other development, the quantification of risk defines the boundary between modern times and the rest of history” [28]. If accurate, the application of probability to deal with our problems represents a monumental step forward in human development. Such an eventuality could help explain why Raftery found that probabilistic forecasts are becoming more common [29]. Within the context of this study, it is interesting to note that Raftery contended that “communicating uncertainty is inherently a challenging problem” [29]. One can imagine that dealing with the meta-concern of communicating the uncertainty of the inherent ambiguity associated with communication itself is no less challenging of a problem. If one is dealing with elicitation of subjective probabilities, the work of Fox and Clemen is particularly informative and useful, especially as it relates to partition dependence [30]. Whether the probabilities are objective or subjective, in the final analysis it is important to determine if people can actually employ such probabilistic approaches in a meaningful way. Raftery found that, “people can use and understand probabilities and probabilistic forecasts, even if they do not have advanced training in statistics” [29]. With this in mind, it seems that developing an approach for dealing with inherent and translation-induced semantic ambiguity is sufficiently promising.

In this section, the ambiguity of communication was presented as a concern with existential dimensions. From this perspective, the uncertainty of language can be seen as an internal, psychological concern as well as a social one. Given that this concern resides in each of us, it is not surprising that it would follow us into our daily business exchanges. Elements of uncertainty in business were explored here along with aspects of the application of probability theory to address business concerns. Based on research presented here, and in particular the finding that people in general are sufficiently adroit at dealing with probabilities, developing an approach for dealing with communication uncertainty is potentially useful. A methodology for doing so is presented in the next section.

III. METHODOLOGY EQUATIONS

Due to the constraints of available space, the methodology presented here is admittedly concise. An attempt was made to provide only the essential aspects for understanding, along with key references to more fully

developed treatments, without getting bogged down in the minutiae of broader application theory. The methodology is comprised of a brief overview of the three central facets of this study: a) text selection, b) sentiment analysis and c) approach to probability assessment. The information related to text selection is presented first.

Text selection for this project started with the assumption that common business terms would be useful for developing an approach for dealing with semantic ambiguity. Initial English terms came from, *English Business Administration Vocabulary: 20 Words to Take You to the Top* (<http://www.fluentu.com/blog/business-english/business-ad>), whereas the French terms came from an online study aid, *French Business Vocabulary* (<https://study.com/academy/lesson/french-business-vocabulary.html>). The list of English terms was reduced to a “top ten list” based on word frequencies from the corpus *American English 2006*, while the list of French terms was reduced to a top ten list based on word frequencies in the corpus *Europarl 3: French* (both corpora are available from the Corpus Query Processor (CQPWeb) at Lancaster University). Hardie noted that “CQPWeb...has been used to give broad access via the web to newly-developed corpora” and its usability has “made it suitable as a conduit by which corpus techniques can be made accessible...to scholars in other humanities and social science fields” [31, p. 389]. Two definitions were obtained for each of the identified terms. To more closely approximate current search techniques, online dictionaries were used to obtain term definitions. English terms were defined using both *Merriam Webster* (<https://www.merriam-webster.com>) and *Oxford British English* (<https://en.oxforddictionaries.com>) dictionaries. Whereas French were defined using *Larousse* online (<https://www.larousse.fr/dictionnaires/francais>), and then translated first by the author and a second time using Google Translate. Where statistical tests were determined useful, the nonparametric Mann-Whitney U test was used. This determination was based on the characteristics of the data and the less restrictive assumptions of the test. This approach resulted in a list of ten English and ten French business terms, with two sets of definitions for each word, which are sufficiently common to illustrate the semantic ambiguity which resides in business communication. Getting to this ambiguity requires sentiment analysis.

Sentiment analysis can be defined “as the extraction of emotional content from text, often in combination with other forms of data suitable for machine learning approaches” [32, p. 142]. In this study, sentiment analysis was conducted in RStudio using the Syuzhet package and NRC sentiment dictionary using the coding approach presented by Jockers [33]. The NRC sentiment dictionary was selected because it provides one with an objective and repeatable way of assessing the emotive content of texts. As such, it provides the closest approximation of how one might respond existentially when confronting the ambiguity of meaning. According to Mohammad and Turney, “terms may evoke different emotions...the term-emotion association lexicon will be useful for evaluating automatic methods that identify the emotions associated with a word” [34, p. 437]. And while a French Expanded Emotion Lexicon (FEEL) is available for sentiment analysis, the NRC was used here in

an attempt to standardize the initial inquiry of English and French business terms, especially since part of the focus is on translation-induced semantic ambiguity rather than the emotive sentiment resident in the native language. Further, “to date, most existing affect lexicons have been created for English” [35, p. 835]. The sentiment analysis was conducted at the definition level, meaning that a given term might have several, distinct and potentially competing sentiment outcomes. Given that a given term does not necessarily contain a sole sentiment, the ability to communicate successfully a desired sentiment becomes a matter of probability. An overview of aspects of probability theory used in this study are provided next.

Dictionary definitions are frequently based on observed usages [3]. For the purpose of this study the definitions were considered descriptive rather than prescriptive and were treated as being presented in order of observed frequency. In this way, if a given term contained multiple definitions, the first definitions was considered the most frequent, the second definition as the next most frequent, and so on until the last definition, which was considered to be the least frequent usage of the given term. Two sets of probabilities were then constructed for each term based on the number of definitions available. A maximum difference probability was devised which created the largest gap between the first and second definition. This approach is appropriate when the first definition is considered dominant. A minimum difference probability was constructed which made the difference between the first and second definition as small as possible. This approach is appropriate when the respective definitions are roughly equivalent in terms of accepted usage. In order to maintain the assumption of definitions being presented in frequency order, the probability for each definition had to be at least 1%-point more likely than the subsequent definition. These devised relative frequencies, for the purpose of this study, were treated as the probabilities of a given semantic understanding of a given term. This approach resulted in a range of probabilities (i.e., an upper and lower bound) associated with the respective emotive sentiments for the twenty identified terms. When bigrams were analyzed, a simple, multiplicative approach was used to determine the combined probabilities for two-word phrases.

While limited in its development, the methodology presented here for text selection, sentiment analysis, and approach to probability assessment should be of sufficient depth for one to understand the results of this study, if not for full replication. The strategic intent of this study was to capture frequently used business terms in English and French, analyze the various definitions of these terms using an objective sentiment package, and assess the probabilities associated with competing definitions and word pairings. The methodology describes how this was accomplished. Results of this study are presented in the following section.

IV. RESULTS

Discussed throughout this paper is the notion that communication is ambiguous. Results for this study indicate that at least in this specific examination, ambiguities are both inherent and translation-induced. The results are

consistent with the sequence presented in the methodology. As such, there are three major categories of results: a) text selection, b) sentiment analysis, and c) probability assessments. The results associated with the text selection are presented first.

Insights into the results of this study start with an understanding of the selected terms themselves. Initially there were twenty English and twenty-one French terms on the respective lists of business terms. Linking each of these terms to the particular corpus-based frequencies enabled the construction of two, prioritized top ten lists based on observed usage. The ten English words were: *budget* (verb), *communicate* (verb), *distribution* (noun), *document* (noun), *implement* (verb), *inventory* (noun), *negotiate* (verb) *process* (verb), *schedule* (verb) and *supervise* (verb). Whereas the ten French words were: *les actions* (nom), *un associé* (nom), *la baisse* (nom), *les bénéfices* (nom), *un bilen* (nom), *un collègue* (nom), *une évaluation* (nom), *une entreprise* (nom), *la hausse* (nom) and *un partenaire* (nom). At the word-level, one can observe that most of the English terms (70%) are verbs and all of the French terms are nouns. While one might quip that such a finding suggests that English business is more action-oriented, a more plausible explanation is that the French list was constructed primarily as a study aid and that its focus consequently was on understanding the primary agents associated with conducting business in France. Once these twenty terms were identified, definitions for each were cataloged.

As indicated, both an American and British English dictionary were used in defining the English terms. The average number of definitions per term in American English was 3.7 whereas it was 1.8 for the same ten terms when defined using British English. The average number of British English definitions was determined to be significantly fewer than that of American English based on the Mann-Whitney U value of 22 which was less than the critical value of 27 (one tail test, α of 0.05). A similar test was not conducted on the French terms as they were defined using only a single online dictionary (*Larousse*). The average for the French terms was 3.6 definitions per term, which is closer to that of American English results. In the translation of the definitions from French into English, there was no discernable difference between the author's translation and that of Google Translate except for the term *un partenaire*. The author's translation of this term resulted in a person with whom one might dance, have a sexual relationship, discuss or converse. In Google Translate, the result was “no one with whom” one might do such things. This negative construction for *un partenaire* seems to mischaracterize the essence of the term. In total, there were 122 definitions in this study. Each definition was individually analyzed in terms of its emotive sentiment.

Using the Syuzhet package and NRC sentiment dictionary in RStudio, each definition was analyzed in terms of its respective emotive content. This was done both at an overarching level of sentiment (i.e., positive, negative, neutral), and at a finer emotive level (i.e., trust, fear, anticipation, anger, sadness, joy, surprise and disgust). In terms of its overarching sentiment, 62% of the English definitions were positive, compared to 47% of the French definitions. Alternatively, 38% of the French definitions

were neutral and 15% were negative, whereas the English definitions were 28% and 10% respectively. In general, a greater proportion of English definitions were positive, where the preponderance of the French definitions were either neutral or negative in overarching sentiment. Examining the detailed results of the emotive sentiment available through the NRC dictionary reveals further points of distinction. This is presented graphically in Fig. 1.

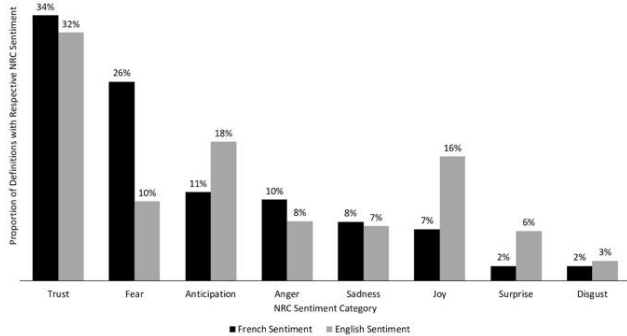


Fig. 1. Comparison of English and French definition sentiments.

In terms of trust, there is a degree of similarity between the English (32%) and French (34%) definitions. Similarity between the two sets of definitions can also be observed in terms of the emotion sadness (7% English, 8% French) and disgust (3% English, 2% French). However, potentially interesting differences are also observable. The emotion of fear is more prevalent for the French definitions (26%) than in the English definitions (10%). Conversely, the emotions of anticipation (18% English, 11% French), joy (16% English, 7% French) and surprise (6% English, 2% French) are more common among the English definitions than they are among the French. These results are consistent with those presented at the overarching positive/negative level of analysis. An aggregation methodology was used to determine if a dominate emotive value existed. In case of a tie, if the polarity/emotive value was tied with neutral, neutral was used to categorize the dominate value. In case of a tie between two emotive values, (e.g., fear and anticipation) these were categorized as being split. Words categorized as split might reasonably be considered as highly ambiguous. The results of the twenty words are presented in alphabetical order in Table I.

TABLE I: DOMINATE EMOTION AND GENERAL SENTIMENT BY TERM

Term	Dominant Emotion	Dominant General Sentiment
Budget	Trust	Positive
Communicate	Neutral	Positive
Distribution	Neutral	Neutral
Document	Trust	Positive
Implement	Trust	Positive
Inventory	Neutral	Positive
La Baisse	Split	Positive
La Hausse	Split	Neutral
Les Actions	Split	Neutral
Les Benefices	Split	Positive
Negotiate	Trust	Positive
Process	Split	Positive
Schedule	Split	Neutral
Supervise	Neutral	Neutral
Un Associe	Trust	Neutral
Un Bilan	Neutral	Neutral
Un Colleague	Trust	Positive
Un Partenaire	Neutral	Neutral
Une Entreprise	Split	Positive
Une Evaluation	Neutral	Positive

As exhibited in Table I, the only dominate emotion among the twenty terms was trust (30%). Seven of the terms (35%) resulted in a split determination and seven of the terms (35%) were determined to be neutral. These consistencies are in some respects an artifact of the aggregation methodology. Examining a set of definitions for a selected term, or pair of terms, provides more insight into the ambiguity associated with the emotive content of terms. An example of this finding is illustrated in the results section related to probabilities. Before examining that aspect of the research, it is important to add a note on the results.

Two caveats should be made. First, since the lists of terms are different between the English and French, some of the observed differences in sentiment could be the result of term selection rather than a reflection of inherent differences in the respective languages. Second, English translations of French terms were analyzed. It is possible that a sentiment analysis calibrated to French would generate different emotive sentiments. As such, one should avoid inferring beyond the results. However, with this in mind these results are useful in highlighting inherent and translation-induced semantic ambiguity resident in communication and how probability theory can be applied to illustrate and contend with this ambiguity. This is presented next.

As described in the methodology, a general approach was developed and employed to ascertain a maximum and minimum probability between the first and second definitions of a term, subject to a 1%-point differential requirement for each subsequent definition. This approach resulted in a consistent outcome with the specific values depending on the number of definitions for a given term. In the maximum-delta approach, the last definition was always 1%, with each preceding definition increasing by 1%-point until the first definition which has a probability of one minus the sum of all assigned probabilities for definitions 2 through n. The minimum-delta approach results in probabilities, nearly equivalent while maintaining the 1%-point differential. The outcomes of three- and five-definition terms might help to illustrate this more clearly. For a three-definition term, the maximum-delta probabilities were: $D1=0.97$, $D2=0.02$, $D3=0.01$, and the minimum-delta probabilities were: $D1=0.34$, $D2=0.33$, $D3=0.32$ respectively. For a five-definition term, the maximum-delta values were: $D1=0.9$, $D2=0.04$, $D3=0.03$, $D4=0.02$, $D5=0.01$, whereas the minimum-delta values were: $D1=0.22$, $D2=0.21$, $D3=0.20$, $D4=0.19$, $D5=0.18$.

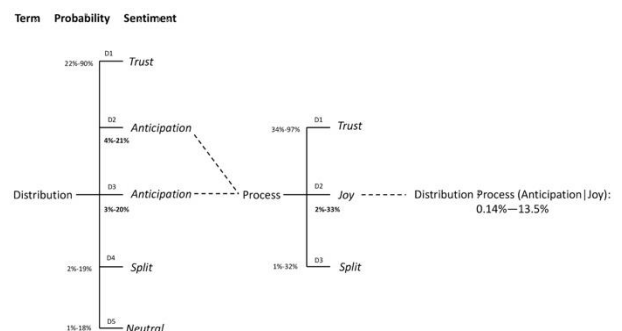


Fig. 2. Probability assessment of phrase "distribution process".

When examining the probabilities of a given emotive sentiment for a given singular term, these values provide the

upper and lower bound. However, more interesting insights emerged when looking at the combined probabilities which emerge for a particular business bigram phrase. This is presented graphically in Fig. 2.

As illustrated in Fig. 2, the phrase distribution process contains several potential emotive sentiments with different probabilities. Assuming the sender is trying to communicate the anticipatory joy that is possible through a business 'distribution process,' one would desire communicating either definition two (*D2*) or definition three (*D3*) for the term 'distribution,' and definition two (*D2*) for the term 'process.' Using the additive principle for the two possible definitions for 'distribution' which convey anticipation results in a range of probabilities between 7% and 41%. When combined with definition two (*D2*) for the term 'process' using the multiplicative approach, the combined probability is between 0.14% and 13.5%. Alternatively, if one wanted to focus on a singular notion of trust, the maximum probability for communicating this sentiment is 87% (0.9×0.97). One consequence of the multiplicative approach is that relatively likely events become improbable in combination. The inherent ambiguity resident in communication, and presented in Fig. 2, is compounded by translation. An example of the web of translation selection is illustrated in Fig. 3 for the term *communicate*.

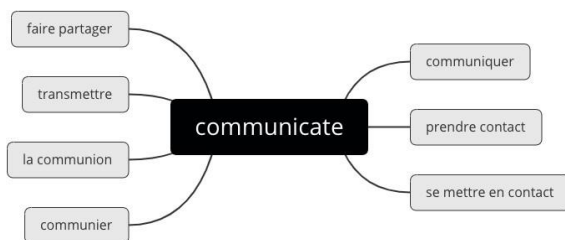


Fig. 3. Translation selection web for the term "communicate".

Translation necessitates selection. Fig. 3 illustrates a case in which one can select from seven French terms to translate the English term *communicate*: *faire partager*, *transmettre*, *la communion*, *communier*, *communiquer*, *prendre contact*, and *se mettre en contact*. The actual selection made will be influenced by context and desire. While those with limited fluency can likely decide between transmitting (*transmettre*) and making contact (*prendre contact*), it should be clear that any selection within such a web of translation increases points of ambiguity.

In some respects, these results might overstate ambiguity. After all, successful communication seems to occur nearly effortlessly across a spectrum of contexts. Several reasons could contribute to this. First, there are frequently contextual cues which facilitate understanding. Second, familiarity with a particular industry or communicator provides one with experiences which can aid interpretation. This being said, inherent and translation-induced ambiguity resides at the core of international business communication. When one attempts to communicate a mood rather than a simple concept, one will experience degradation in assured meaning as combined probabilities decrease with phrase length, as illustrated by the phrase 'distribution process.'

Top ten lists of business terms were created and analyzed for English and French terms. The definitions of these terms were analyzed at a general and refined level. The analysis revealed both similarities and differences in the emotive

sentiment of definitions between the English and French business terms. In terms of probabilities, it was shown that given a set of definitions ensuring that the desired emotive sentiment is communicated is challenging, and that such an endeavor becomes increasingly remote as the length of the business phrase increases. With these findings in mind, it is now possible to summarize the key points examined here.

V. CONCLUSION

Malgré this attempt at illumination, ambiguity continues to lurk in the shadows of communication. Casting light in this direction allows one to see what is happening more clearly but does little to resolve the issue. Clarity in communication remains elusive. Perhaps like the axiom, one cannot not communicate [4], given the multitude of potential meanings associated with words, it is reasonable to posit its correlate: *one cannot not communicate without a degree of ambiguity*. Even if this concern remains unresolved, by acknowledging this peculiar aspect of communication one is able to approach meaning more constructively. Results of this research provide some initial insights in this direction.

Given the small sample of *les mots* selected for this study, one should avoid overgeneralizing the findings. With this in mind, some results are interesting enough to review. In terms of basic sentiment, the ten words in English are collectively more positive than those in French. When examined at a finer level of granularity, one observes both consistency and divergence. The most common emotive sentiment for both the English and French terms was "trust." For the English terms the second most frequent sentiment was "anticipation," while for the French terms it was "fear." While these aggregate results are potentially interesting, the findings at the word-level are more problematic for assured meaning. In terms of dominant, general sentiment, only two of the terms *en anglais* (i.e., *budget* and *implement*) were found to be consistent among the given definitions, and only *budget* was found to be consistent at the emotive sentiment level. Remarkably similar results were found for the French terms, with two (i.e., *la baisse* and *une évaluation*) consistent at the dominant, general sentiment level, and only *la baisse* being consistent at the emotive sentiment level as well. These findings suggest that in terms of both general sentiment and emotive content one cannot be assured the intended meaning will be effectively conveyed. En fait, it is more likely than not that it won't.

Given that sentiment cannot be assured, one benefits from assessing meaning probabilistically. At the word-level, one can do this simply by examining the number of definitions, and making a few basic assumptions based on how dictionary definitions are constructed. *Cette approche* provides one with an upper and lower range of probabilities for a given set of definitions. If one wishes to examine word-pairs, or phrases, combined probabilities are helpful. Specifically, a simple, multiplicative approach used here to model the combined probabilities of a desired emotive outcome associated with terms used in conjunction.

The limited scope used here was designed to sketch the contours of an approach for modeling the ambiguity of language in an international business context. Future studies might extend this research in several ways. To begin, it

would be useful to examine more than twenty terms related to international business. Likewise, this study could be extended to address languages other than English and French. *En plus*, one could use alternative sentiment analysis packages to assess the semantic content of words. *Enfin*, the simulation methodology could be extended to account for more complex word groupings beyond simple pairs (e.g., sentences, paragraphs, etc.). Collectively, such extensions might show that ambiguity in communication is even more prevalent than this initial research suggests.

Capturing the deconstructive ambiguity existing between and among languages, Aimee Mann explained in her song *Invisible Ink*, "Something gets lost when you translate. It's hard to keep straight. Perspective is everything. And I know now which is which and what angle I ought to look at it from. I suppose I should be happy to be misread. Better be that than some of the other things I have become" [36]. Perhaps humans ask too much of communication. A paradox might reside at its core, as one seeks through communication to be understood completely without becoming vulnerable through what one has revealed. Maybe each of us writes our hopes, desires, fears and anxieties in invisible ink; the meanings of which are only fully interpretable by a few who intuitively understand.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

RJ and AR jointly identified the sources of high-frequency terms; AR conducted the research and translation of all French terms; RJ created the data visualizations; AR and RJ conducted the analysis and interpretation of results together and collaboratively wrote each section of the paper; both authors approved the final version.

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