



International Market Selection Decisions – A big data artificial intelligence approach

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ABSTRACT This article examines the role of big data analytics (BDA) in international market selection (IMS) decisions. It is based on a study of South African companies that used the TRADE-DSM (Decision Support Model) big data analytics tool to help in making these decisions. While there is much theory on the potential use of big data analytics and artificial intelligence for international business in general and international market selection decisions in particular, there is very little research on how these tools are used when making this important decision. This article reports on a study that examined: whether big data analytics was used in making international market selection decisions, how important it was relative to other sources of information; how it was used in the international market selection decision-making process; and what factors led to acceptance of big data analytics output. Results from the surveys and interviews both with those who generated the TRADE-DSM reports and the users of the reports (the decision-makers) are presented to provide deeper insights into the role of big data analytics in international market selection decisions. The results showed that while big data analytics is very important (rated third-highest information source), it is one of many sources of information used in the process and that human sources (visits to the market, attendance at trade shows and conferences) are considered the most valuable. Regarding what prompts the acceptance of big data analytics in the international market selection process, the study found that knowledge of the system, trust in the person providing the report and the relationship between the person providing the report and the decision-maker are the most important factors.

KEYWORDS: International market selection, big data, big data analytics, artificial intelligence, decision-making

INTRODUCTION

Calof and Cekuls (2023) explored emerging trends in competitive intelligence, based on the SCIP 2023 European conference. Most notable was the broadening of the field's domain, as reflected in SCIP changing its name from 'Society of Competitive Intelligence Professionals' to 'Strategic

Consortium of Intelligence Professionals'. This name change recognizes fields such as foresight, big data analytics (BDA) and artificial intelligence (AI) as being part of the consortium. This broadened consortium approach is similar to Calof and Bishop's (2020) discussion about anticipatory systems. Calof and Cekuls (2023) also noted that another change was the shift towards

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research and articles focusing on how competitive intelligence can be used to support a broader range of decisions.

This article uses this new and expanded view of intelligence to investigate the role of BDA within a competitive intelligence framework and how it is used to make the IMS decision. Based on this new approach and because of weaknesses in the IMS literature, which will be described in the literature review section, this article examines:

- i. Whether BDA is used in making IMS decisions and how important it is relative to other sources of information;
- ii. How BDA is used within the IMS decision-making process; and
- iii. What factors lead to acceptance of BDA output.

This article reports on a study that examined how 14 companies used the output of the TRADE-DSM (Decision Support Model) BDA tool/system in making their international market selection decision. Results from surveys and interviews with both the people who generated the TRADE-DSM reports and the users of the reports (the decision-makers) are presented to give the reader deeper insights into the role of BDA in IMS decisions.

LITERATURE REVIEW: INTERNATIONAL MARKET SELECTION, BIG DATA ANALYTICS AND ARTIFICIAL INTELLIGENCE

The IMS decision is, according to much research, one of the most important decisions for companies (Fish and Ruby 2009; Gaston-Breton and Martin 2015; WEF 2016; Ashley et al. 2022). Indeed, it is one of the decisions in the internationalization process that has the greatest impact on the success of firms in international markets (Lopez-Cadavid et al. 2023). Thus, it is critical.

The literature confirms that the IMS decision is not only important but is also well suited to competitive intelligence and, in particular, BDA. One can ask: why?

a) Many international market selection models

A substantial number of models have been developed, some as early as in the 1960s (such as Hodgson and Uytterhoeven (1962)).

Since then, several articles have proposed IMS decision models and there have been several articles that examine and classify the many different IMS models, such as Papadopoulos and Dennis (1988), Vanegas-López et al. (2020) and Deaza et al. (2020). Some studies have even examined BDA systems for IMS. For example, Aucamp et al. (2023) looked at the TRADE-DSM, Gravity modeling and ITC Trade Map. Vanegas-López et al. (2020) allocated the many IMS models to analytical categories that, again, look well suited to a BDA or AI type of system: qualitative analysis, Chi-square tests, hierarchical-regression analysis, structural-equation modeling, econometric model, IMSP model, factor and cluster analysis, multicriteria approach, shift-share analysis, regression analysis and longitudinal data.

b) Large numbers of information sources needed

A large number of information sources have been identified in the literature for making IMS decisions. Two streams of research provide extensive lists of information in this regard. In the first stream, articles that propose an IMS model generally identify the information needs associated with it. For example, Ozturk et al. (2015) proposed a model called the FMOA (Foreign Market Opportunities Analysis), which included six demographic environment factors, three political environment factors, 10 economic environment factors, four socio-cultural environment factors, three sector-/product-specific indicators and four firm-specific indicators. The authors used all these factors to develop country responsiveness factors, growth potential factors and aggregate market factors.

In the second stream, articles identify specific information that companies should gather to make their IMS decision. Such articles include Aucamp et al. (2023), Crick (2005) and Cameron (2021). Baena-Rojas et al. (2023) listed the following information requirements: cultural differences; legal environment; social factors; political and economic conditions (e.g. GDP growth rate); export competitiveness; international competition; market access; market concentration; market growth; market size; revealed trade advantage; local production

capabilities; geographical distance; and cost of logistics. Thus, a myriad of information is required to make IMS decisions, particularly for BDA and AI-type approaches.

The examination of both the sources of information used in the IMS decision and their relative importance has also been an area of academic inquiry for decades. In 1983, for example, Walters (1983) tested the relative importance of export information from the following sources: export agent, state agency, US Department of Commerce, company executives' foreign market investigations [rated #1 in importance], foreign import agent, industry association, banks, personal business contacts, consultants rated #2 in importance], magazines, newspapers and US Chamber of Commerce (Walters 1983). McAuley (1993), expanding on the list from Walters (1983), noted that foreign agents, personal contacts abroad, trade fairs and trade fair contacts were the sources with the greatest utility, while public libraries, commercial libraries and professional institutions were among those with the least utility.

Since then, the list of information sources (both of a primary and secondary nature) has expanded dramatically. Moreover, 'mega' sources have emerged, such as Globalede and Google Gapminder, which link users to multiple information sources. López-Cadavid et al. (2023), in looking only at electronic sources of information (for a BDA study on IMS), noted the following as sources of information for IMS decisions: World Bank, Transportica, Freightos, OECD, UN Comtrade, Transparency International, Hofstede insights, KOF Swiss Economic Institute, Numbeo, Procolombia, World Risk Report, Sea-Distances, The Heritage Foundation, World Economic Forum, Global Trade Alert and World Trade Association.

Further examples of mega sources, which provide access to large amounts of relevant data, methodologies and systems/tools to assist IMS decisions, are:

- *Datasets that have been suggested for use in making IMS decisions:*

UN Comtrade (United Nations Commodity Trade Statistics Database). UN Comtrade provides free, detailed global trade data on goods imports and exports, reported by the

statistical authorities of nearly 200 countries or areas. It covers annual trade data from 1962 to the most recent year. Figure 1 is a screen capture of the UN Comtrade. Note that it uses HS 6-digit codes (see: <https://comtradeplus.un.org/>).

CEPII (BACI) dataset: Founded in 1978, the CEPII provides data on bilateral trade flows for 200 countries at the HS 6-digit product level (5000 products). The CEPII is the leading French center of research and expertise on the world economy. It contributes to the policy-making process through its independent, in-depth analyses on international trade, migrations, macroeconomics and finance. The CEPII also produces databases and provides a platform for debate among academics, experts, practitioners, decision-makers, and other private and public stakeholders (see: <http://www.cepii.fr/CEPII/en/cepii/cepii.asp>).

WITS-SMART: WITS (World Integrated Trade Solution) is software that includes several databases provided by partner international organizations and other sources. SMART is a partial equilibrium modeling tool included in WITS which is used for market analysis. It focuses on one importing market and its exporting partners and assesses the impact of a tariff change by estimating new values for a set of variables (see:

<https://wits.worldbank.org/simulationtool.html>).

Gapminder: Created by Google, Gapminder brings together hundreds of datasets and links to datasets that can be used in making the IMS decision. Figure 2 is a screen capture of Gapminder, showing several categories of information that can be accessed for making IMS decisions.

- *Modeling big data to assist in IMS:*

Gravity model: Gravity modelling is a fundamental statistical tool in international economics that predicts bilateral trade flows between countries (Koçaslan 2017; Aydin and Ülengin 2022; Fagiolo and Rughi 2023). This model is grounded in the notion that trade is proportionate to the sizes of the economies in question and inversely proportionate to the distance between them. It estimates the relationship between trade volume and economic/geographic factors.

The model simplifies by using distance as a proxy for transportation costs, disregarding actual transportation routes. Despite this simplicity, the model's theoretical foundation is robust, making it a popular choice for

modeling international trade flows. Krisztin and Fischer (2015) clarify that the gravity model is not inherently a big data tool but is adept at handling large datasets.

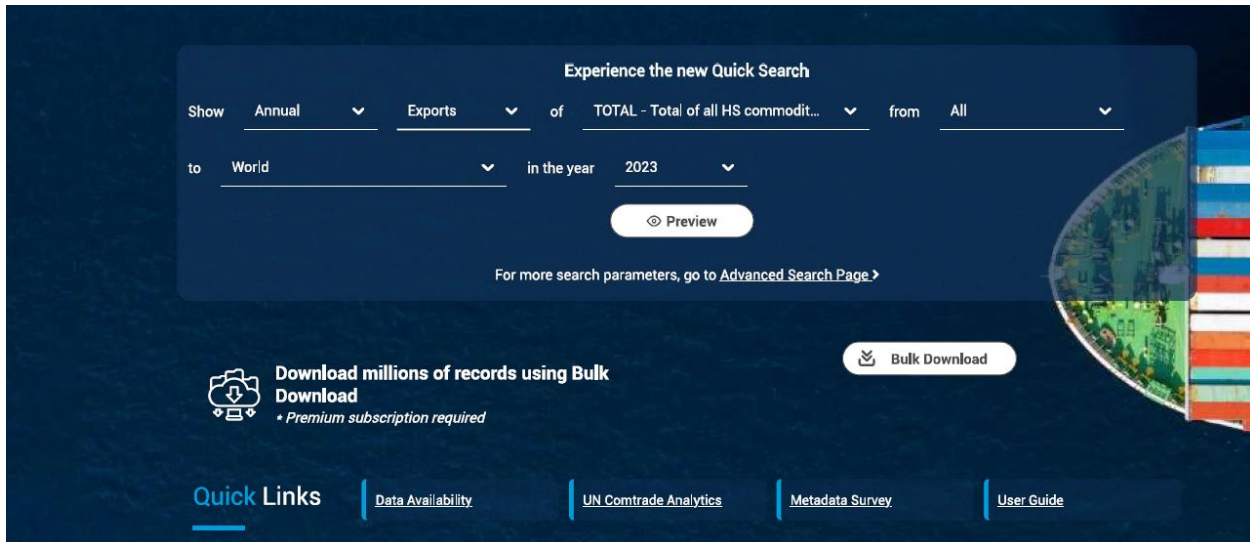


Figure 1. Screen capture of UN Comtrade

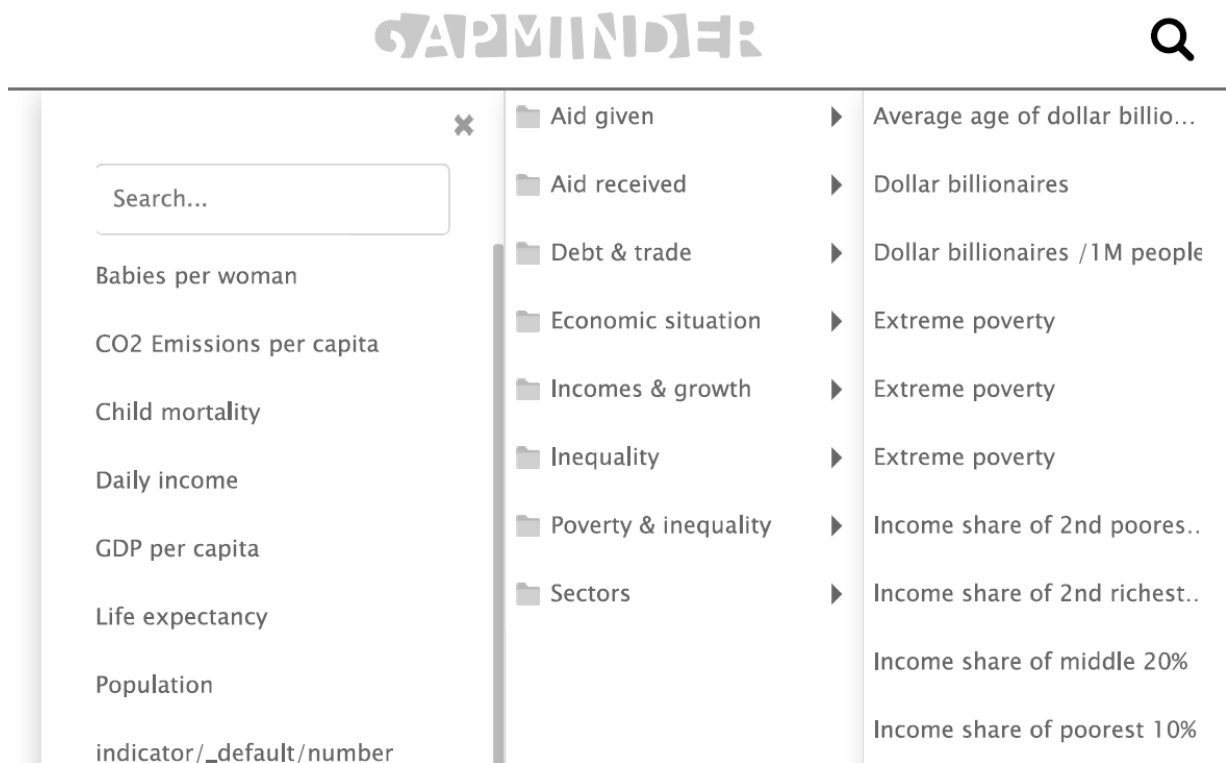


Figure 2. Screen capture of Google's Gapminder

- *Big data methodologies/systems/tools to assist in taking IMS decisions:*

Commercial:

ITC Export Potential Map/ITC Trade Map: Cheong et al. (2018) describe this as a tool to identify a country's products or sectors that have export potential in existing or new markets. Its methodology is grounded in a

comprehensive assessment of supply, demand and market access conditions. It utilizes detailed trade and market access statistics over a five-year period, with the aim of measuring the unrealized export potential at the sector level (see: <https://exportpotential.intracen.org/en/>).

Trade Data Monitor: This database publishes monthly trade statistics for over 115 countries, encompassing a staggering 99% of global trade. The database, which spans decades, is searchable by HS code, country, value, weight, currency and, when available, port and region (see: <https://tradedatamonitor.com/about-us/>).

Quantec EasyData International Trade Service: This is a detailed, up-to-date historical dataset of South Africa's merchandise trade which also provides an overview of bilateral global trade (see: <https://www.quantec.co.za/easydata/international-trade-subscription/>).

TRADE-DSM (Decision Support Model): This system/tool helps in identifying and assessing export opportunities, and prioritizing potential export markets based on market potential, accessibility and concentration (Cuyvers, et al. 1995; Cuyvers and Viviers 2012; Cuyvers et al. 2017; Calof and Viviers 2020; Aucamp et al. 2023; Konstantakopoulou and Tsionas 2023) (see: <https://tradeadvisory.co.za/>).

Proprietary systems:

Several organizations have developed their own proprietary systems. For example, Global Affairs Canada developed a system called Market Potential Finder which is used by trade officers to help identify and assess export opportunities.

Several articles have also looked at hybrid approaches or multiple models used in making IMS decisions – see, for example, Dyczkowski, et al. (2015) and López-Cadavid et al. (2023).

Everything described above illustrates that there is a plethora of information, gathered from numerous sources, that can be run through one of several models (including BDA software) to make IMS decisions. This places the general concept of the IMS challenge clearly in the realm of BDA (Cameron et al. 2017; Calof and Viviers 2020).

Certain studies have also looked at the perceived importance of the different sources of information, such as Crick (2005) and Robertson and Wood (2001). However, past studies on the importance of information sources have not included the BDA output.

International market selection as a big data problem

According to the literature outlined above, massive amounts of data can be used in IMS decisions. Big data requires specialized tools and technologies for efficient storage and analysis (Tan et al. 2017; Tabesh et al. 2019; Ulman et al. 2021; Anon 2022). Thus, a solid grasp of the fundamental concepts of BDA is crucial for navigating the complexities of large datasets and creating a pathway from big data to 'big impact' (Tabesh et al. 2019; Persaud and Schillo 2017). To this end, the 5Vs framework of big data is used to discuss how international market selection fits within the big data field:

- i. **Volume:** The vast amount of data that is generated means that there are massive volumes of data that can be used for IMS decisions. Cameron et al. (2017) described how they tackled the big data challenge in IMS by effectively identifying the most promising export opportunities at a given point in time from the confusing mass of information that is constantly spilling into the public domain in the form of datasets, research findings, industry and government analyses, and government commentaries (Cameron et al. 2017).
- ii. **Velocity:** The velocity or speed at which data is generated and processed necessitates real-time analysis to gain insights and make informed decisions (Tabesh et al. 2019; Anon 2022; Tan et al. 2017). Denicolai et al. (2021) underscored the potential of big data to improve the speed and success rate of international expansion.
- iii. **Variety:** This refers to the different types of data generated from various sources, including structured, semi-structured and unstructured data (Tan et al. 2017; Tabesh et al. 2019;

- Anon 2022). The IMS decision is complex and, as mentioned earlier, relies on a wide range of data relating to international trade flows, tariffs, market concentration, market accessibility and many other aspects (Pearson et al. 2010; Naude and Cameron (2020).
- iv. Veracity: Souchon and Diamatopolous (1996) and Kuhn and Viviers (2012) highlighted the importance of accurate data in IMS. Therefore, the information derived from BDA must be trustworthy (Persaud and Schillo 2017; Anon 2022).
 - v. Value: The ultimate goal of BDA is that the insights gained from analyzing the data are useful (Anon 2022;). Denicoalai et al. (2021) emphasize the importance of BDA to extract value from an analysis of new customer and market opportunities, while Cameron et al. (2017) stress the need for practical means to derive valuable insights from big data in IMS. Mandal (2018), in turn, suggests that BDA offers valuable perspectives on global trends, consumer behaviour and market dynamics, thus helping organizations to make more informed decisions about their global operations. The analysis of large volumes of information also leads to more accurate decisions and is of paramount importance in international trade (Anon 2022).

The 5Vs framework therefore captures the nature and complexity of big data, reinforcing its significance in the contemporary organizational landscape where well-informed IMS is a hallmark of international trade.

Given the multiple sources, multiple models and multiple information sources that support each of the five Vs, it is not surprising that BDA theories and models were developed to help steer the IMS decision. However, little research has been conducted on the use of big data and BDA

and their effects on international firms (Gnizy 2019; Dam et al. 2019). Ulman et al. (2021) also assert that, notwithstanding the importance and complexity of international business decisions, little research attention has been given to the role that technology-mediated systems (or BDA) play in supporting managers in the internationalization process. According to Dam et al. (2019), the adoption of big data in an internationalization drive is still an emerging area of research, especially as it relates to SMEs which face resource constraints and limited organizational support for internationalization.

Artificial intelligence

There have also been several articles suggesting that artificial intelligence (AI) tools/packages can be used in IMS decisions. The themes of a few of these are as follows:

- The self-organizing map (SOM) is used to assist SMEs in identifying export gaps and ranks countries on the basis of gap size and market size (Fish and Ruby 2009)
- The latent dirichlet allocation (LDA) model is adapted to countries' exports, treating countries as documents, products as words and components as topics. Using alternative trade nomenclature, it analyzes component participation in countries' export baskets and complements traditional metrics in understanding international trade (Kozłowski et al. 2021).
- In the fuzzy neural network model, factors such as market potentiality, obstruction and industry power are represented using fuzzy sets. The model combines fuzzy set theory and neural networks to handle vagueness and uncertainty (Zhang et al. 2007).
- The multi-attribute decision-making approach uses Z-number-valued information to evaluate countries on the basis of institutional proximity, economic proximity, social and cultural proximity, and structural competition proximity. It measures the proximity of alternatives (countries) based on fuzzy and

partially reliable information (Aliev et al. 2022).

- The fuzzy-based decision process generates rule sets, defining weights and variation ranges based on linguistic attributes. It captures the experiential dimension of entrepreneurs, reducing cognitive biases and helping small firms with IMS (Marchi et al. 2014).
- The AI foreign market screening method (AIFMSM) assists SMEs with their internationalization drive by evaluating foreign markets on the basis of criteria such as size, growth rate, competition and cultural distance. SMEs' AI readiness positively influences their international performance, especially in terms of export intensity (Denicolai et al. 2021).

In summary, the comprehensive integration of BDA and AI-powered screening in IMS decisions encourages informed market selection, optimal product–market combinations, and improvements in trade and logistics, collectively providing organizations with a powerful toolset for navigating the complexities of the global marketplace.

Summary of the literature review – the research gaps

From the results of the literature review discussed above, it appears that there is a

great deal of theory on the potential use of BDA and AI for international business in general and IMS decisions in particular, but:

- Very little research has gone into how BDA and AI have been used to arrive at actual decisions. Instead, things have remained very theoretical, with (in some cases) data being used to show how – hypothetically – it would help IMS.
- Little is known about how important BDA or AI is to IMS decisions, relative to other information sources.
- Little is known about what prompts acceptance of BDA or AI in IMS.

It is these weaknesses in the literature that this study seeks to address.

METHODOLOGY

Figure 3 provides a conceptual view of the study. BDA output is generated, which uses analytics to provide IMS recommendations. The BDA output is then given to a decision-maker in the company who then uses it (or does not use it) in the IMS decision-making process. From a methodological perspective, this suggests that, in order to address the above-mentioned research gaps, the study needs access to:

- Individuals who generated BDA output for IMS; and

Decision-makers who received this BDA output.

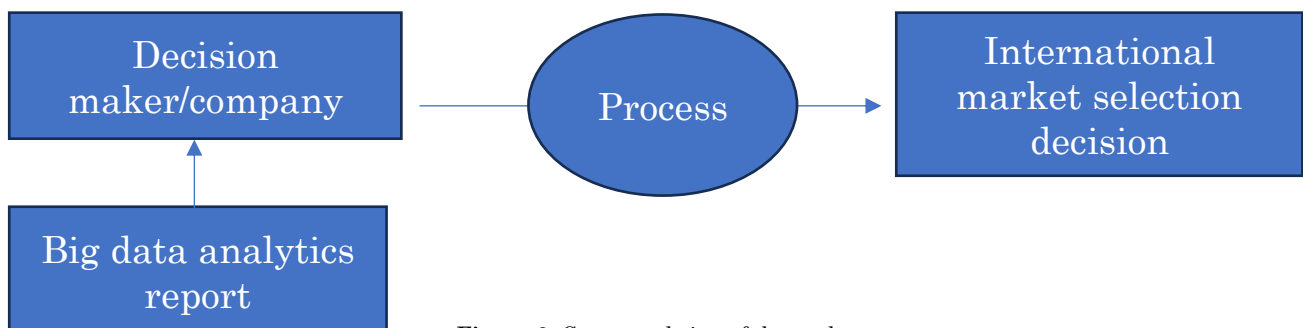


Figure 3. Conceptual view of the study

TRADE-DSM

In developing the sample frame for the study that included these two groups, the researchers selected the TRADE-DSM BDA

system. Limiting the study to one BDA system controlled for many factors, such as differences in the quality of and access to

information. The TRADE-DSM was specifically chosen for several reasons:

- i. The TRADE-DSM provides a means of reducing vast amounts of unstructured data to manageable proportions. This methodology aids in overcoming the ‘big data’ challenge in the context of IMS (Cameron et al. 2017).
- ii. Calof and Viviers (2020) refer to the TRADE-DSM as a BDA system designed to screen large quantities of market information and identify advantageous product–market combinations. In fact, several studies have used the TRADE-DSM to assess export opportunities and prioritize potential export markets (for example, see: Cameron 2021; Konstantakopoulos and Tsionas 2023).
- iii. There is extensive literature on the TRADE-DSM, dating back to the early 1990s (Cuyvers et al. 1995; Kanellopoulos and Skintzi 2016; Calof and Viviers 2020; Konstantakopoulos and Tsionas 2023; Aucamp et al. 2023).
- iv. Regarding its applicability to those making IMS decisions, the TRADE-DSM is widely used around the world and received favourable reviews from the International Trade Centre, a joint agency of the United Nations, and the World Trade Organization (ITC n.d).
- v. One of the authors of this article was part of the TRADE-DSM development team and therefore had access to all the users of the system.
- ii. **Filter 2:** Product–market import demand characteristics (relative size and growth trends); import data per HS6-digit product and country for all product–market combinations over a six-year period;
- iii. **Filter 3:** Product–market market access conditions, including aspects such as market concentration (sub-filter 3.1) and accessibility in terms of relative levels of tariffs and transport logistics (distance and time – sub-filter 3.2); and
- iv. **Filter 4:** Categorisation of each product–market combination according to the home market’s current exports and the target market’s size, growth patterns and accessibility, as well as the home market’s current revealed comparative advantage (RCA) and revealed trade advantage (RTA).

As mentioned in the literature review, BDA IMS systems access many external datasets drawn from sources known to be reliable. The TRADE-DSM similarly extracts its data for analysis from many different sources, i.e.:

- i. Filter 1a): Economic size and growth (general market potential): UN Comtrade data (<https://unstats.un.org>) and economic forecasting from the IMF World Economic Outlook
- ii. Filter 1b): Political and commercial country risk: This data is drawn from ONND (Credendo) (<https://www.credendo.com/about>).
- iii. Filter 2: Product–market potential: Multiple datasets are used for this filter, including CEPII BACI, UN Comtrade and ITC TradeMap (<http://www.trademap.org>).
- iv. Filter 3: Product–market access conditions: Concentration plus accessibility. Data for this filter is drawn from the World Bank Doing Business Report 2017, UN Connectivity Index, shipping companies’ schedules (e.g. Maersk, MSC – top 10 container shipping companies), GoogleMaps (land-based routing), searates.com,

The TRADE-DSM system uses four filters or processes to identify and rank markets:

- i. **Filter 1:** Broad general market potential, as reflected in economic size, growth, and political and commercial risk;

worldfreightrates.com, as well as various country reports and studies.

- v. Filter 4: Export opportunities with comparative advantage and revealed trade advantage: Categorizing the realistic export opportunities (REOs) in a TRADE-DSM Map.

Based on these four filters and the corresponding datasets accessed for the filters, approximately 6.3 billion data points are analysed in the application of the TRADE-DSM for one country, using the HS6-digit codes.

The sample frame

With the BDA system (TRADE-DSM) chosen, the sample frame was those who had used the system and those who had used the output (TRADE-DSM report) from the system. Again, for convenience but also to control for regional variability, the research was focused on Africa. The researchers obtained the list of all TRADE-DSM clients in Africa. There were 10 different organizations using the TRADE-DSM system. These included consultancies, government departments responsible for export/trade, and investment promotion and trade and investment promotion agencies (TIPAs). As it was important to interview those who had significant experience of the system (given the nature of the study), only those users who had used the system for more than one year and had run at least 20 reports were approached. This resulted in a sample of six (of the 10) users. All six agreed to be interviewed as part of the study.

The next step involved gaining access to the decision-makers – that is, those who received TRADE-DSM reports for the purpose of making the IMS decision. Of the six users of the TRADE-DSM reports, only two sent the TRADE-DSM reports to companies. The others integrated the reports into overall advice or used them internally for their own strategic planning. It would be difficult, if not impossible, to disentangle from the decision-makers' perspective the advice that was provided specifically from the BDA system/tool. Therefore, the researchers focused on companies receiving TRADE-DSM reports from the two users.

The researchers examined the client files of the two organizations and identified companies that had received the TRADE-DSM report at least two years, and no more than five years, prior to this study. The time frame was chosen to ensure that the results could have been used in a decision-making process and also that the decision was made not so long before that there was a risk of inaccurate recollection. These time frames were arbitrary.

In reviewing the client lists of the two organizations (that had produced the TRADE-DSM reports), 44 companies were identified, with several having received multiple reports (relating to separate IMS decisions, for example). This represented over 100 TRADE-DSM outputs. Companies were eliminated from the sample frame if the person who ran and provided the report to the company did not agree to participate in the study (this eliminated five companies); if the company employee who received the report (the client) was no longer the decision-maker at the company and could not be interviewed (this eliminated four companies); if the person who ran the report (normally a trade promotion officer) had no recollection of the report and the company (this eliminated five companies); or if the company was not an exporter (this eliminated one company). This left 29 companies as the sample frame for the study. This resulted in a sample frame of 29 companies all of which were contacted about the study. Of these, 20 agreed to participate (69%) and nine did not respond (31%).

Of the companies that were in the final study (there was a pre-test which will be described below), the majority were small, with fewer than 50 employees. The threshold of 50 employees is in line with South Africa's Department of Small Business Development's (2019) definition of a small enterprise.

The international experience/sophistication of the companies participating in the study, according to a Likert scale of 1 to 5 (with 5 being highly internationalized), was relatively evenly spread over all the levels.

RESEARCH INSTRUMENTS

Information importance survey

Several research instruments were developed and/or used in this study. First was the instrument to identify the importance of the TRADE-DSM in the IMS decision-making process. The importance of different information sources for decision-making has been covered extensively in the competitive intelligence literature.

For example, Fehringer et al. (2006), in a study on competitive intelligence practices of SCIP members, asked respondents to rate the importance of 10 information sources to their intelligence program using a four-point Likert scale (1 = not at all important, 2 = not very important, 3 = somewhat important and 4 = very important). Sources listed included: company employees, suppliers, customers, conferences/trade shows, industry experts, publications.

Using the Fehringer et al. (2006) survey instrument as a basis for their study, Calof et al. (2017) modified this list based on competitive intelligence scholarship in the intervening years. They used a five-point Likert scale (1 = not at all important, 5 = extremely important) and the following information sources: publications (print and online), internet websites (free), social media (blogs, Twitter, LinkedIn, Facebook etc.), internal databases, company employees, customers, suppliers, industry experts, government employees, trade shows/conferences and association employees. Using this as the base, a survey form was developed in which the decision-maker was presented with the following information sources and asked to rate them: internet websites (free), commercial databases (fee), social media (blogs, Twitter, LinkedIn, Facebook, etc.), internal databases, company employees, customers, suppliers, industry experts, expert panels, meetings, industry consultations, government employees, association employees, TRADE-DSM, visits to the market, and trade show in the market, among others. This survey instrument is provided in Exhibit 1 at the end of this article.

Interview guides

In addition to the survey discussed above, two interview guides were developed – one for interviewing the company that had received the TRADE-DSM report on their

IMS decision and the other one for the person (consultant or trade officer) who had prepared and given the report to the company. The purpose of the company interview guide was to obtain a deeper understanding of the decision-making process, including any comments about the information sources themselves. The interview guide associated with this part of the study appears as Exhibit 2.

The person who had prepared the TRADE-DSM output was also interviewed so that they could classify the company in terms its experience in international decision-making/international experience/knowledge, its big data experience/knowledge, its knowledge/experience of the TRADE-DSM, the sophistication of its international decision-making, its commitment to/preparedness for big data, how well TIPA/the consultant understood the company's needs, how well the TIPA/consultant knew the person at the company whom they were dealing with, and the type of relationship that the TIPA/consultant had with the decision-maker at the company.

The interview guide for the person who had prepared the TRADE-DSM report asked the user to evaluate these aspects on a five-point Likert scale. The researchers then classified the companies using measures largely based on prior studies (for example, Johanson and Vahlne's (1977) stage of internationalization). The form for this part of the process is provided in Exhibit 3. It should be noted that there were very few differences between the two assessments, but when there was a difference the researchers' assessment was used.

The study instruments were pre-tested on five of the companies as well, with three of the trade promotion agencies and two of the consultants being interviewed.

STUDY RESULTS

Importance of big data analytics for international market selection decisions

After the pre-test, interviews were held with the two power users, who prepared the report for the companies, and with the decision-maker, who received the report in 14 of the companies.

In terms of the first research question (the importance of BDA in the IMS decision), the average rating was 3.3. This was the third highest rating for any of the information sources, with trade shows in the markets and visits to the markets being rated higher, while talking to customers tied with the TRADE-DSM (see Table 1). Clearly, the TRADE-DSM (BDA report) was seen as very important to the companies interviewed and surveyed in their IMS process.

It should be noted that with the survey and interview size (14 companies), the results (covered in section 5.2) may not be statistically significant. However, in the interviews, respondents either felt they were among the most important sources of information (4 or 5) or the least important source (0 or 1). This dichotomy will be explored below.

Table 1. Rating of information sources used in the IMS decision-making process

Information source	Avg
Trade show in the market	4.0
Visit to the market	3.5
Customers	3.3
TRADE-DSM	3.3
Internet websites (free)	3.2
Industry experts	2.5
Government employees	2.2
Suppliers	2.2
Publications	2.2
Social media	2.2
Association employees	1.9
Our employees	1.9
Expert panel, consultations	1.9
Commercial database	1.5
Internal database	0.9

How the TRADE-DSM was used in the international market selection process

This section reports on the results from the interviews themselves. The interviews provided a valuable context for the way in which the TRADE-DSM output was used in the companies' IMS decision-making process and, in particular, the interaction between the TRADE-DSM and other information sources. The TRADE-DSM was used:

- To help confirm the research that the respondents had already conducted. In some of the interviews, the respondents mentioned that they had gathered information prior to receiving the

TRADE-DSM report and they had already identified a shortlist of countries. The TRADE-DSM was then used to confirm their list. Many companies interviewed stated that while in most cases their findings were confirmed, the system also identified other countries that they had not considered. As one of the respondents remarked: "The TRADE-DSM results indicated a few interesting countries – "some being lower than what we would have expected and some surprisingly higher."

- To help start the IMS decision-making process. In other interviews, the researchers were told that the TRADE-DSM was used to start their thinking about which markets to focus on. "The TRADE-DSM was in essence our starting point; then we had to make sense [of] the results and cross-reference with what we already knew and what we would gather from other sources of info."
- In combination with other sources. The respondents in almost all cases stated that they used the TRADE-DSM and other sources of information:
 - "The TRADE-DSM points you/focuses you, but multiple sources are used, and the TRADE-DSM report was not used in isolation. It is highly appreciated."
 - "The TRADE-DSM report was just the tip of the iceberg; we had further meetings."
 - "Countries were identified – then we went there. Visiting these countries to get experience of the market."

It was noteworthy that the final decisions relied on human sources. Visits to the market, going to trade shows/conferences and talking to others were mentioned in most interviews, as was the use of what has been referred to in the competitive intelligence

literature as “friendlies” (Calof 2022). Other statements included:

- “Visits to markets are important.”
- “Contacts are important – I used my contacts.”
- “Mining connections and expats are very important.”
- “When out of your comfort zone, you must rely on others.”
- “Human factor – important – nice to talk to someone who understands the complexity of trade and trade agreements and routings.”
- “To get into Nigeria, I used my Ghana contacts, next step – DTIC application to go to a trade show.”
- “Trade shows and visit to the market are important.”

From the interviews and survey results it was clear that while BDA output is important, human sources were considered the most valuable.

Why the TRADE-DSM was important in the international market selection decision-making process

As mentioned in the methodology section, the researchers studied the perceived importance of the TRADE-DSM in IMS based on a series of factors. These factors are shown in Table 2, along with their correlation with the importance of the BDA system/tool. The extent to which the decision-maker trusted the TRADE-DSM report and felt that the person producing the report understood them and their company, and the perceived strength of the relationship between the person who produced the report and the decision-maker were the most significant factors in terms of their links to the importance attached to the TRADE-DSM. Knowledge of the TRADE-DSM was the next most important factor but at a .10 level of significance. Other classification variables, such as commitment to big data and extent of international experience, had the smallest correlations with the importance of the TRADE-DSM.

Table 2. Correlations between company factors and the importance of the TRADE-DSM in the international market selection decision-making process

Factor	Correlation coefficient
Extent to which the person trusts the TRADE-DSM report	.93**
Extent to which the TIPA/person who produced the report understood them/ the company	.74**
Relationship with the TIPA/person who produced the report	.69 **
Knowledge of the TRADE-DSM	.57*
Information sources used (adding up of the evaluation of source importance)	.50
Extent to which the person understands the dimensions of information sources (depth and understanding of each source)	.40
Process sophistication (internal: pre and post TRADE-DSM)	.23
Organizations’ use and commitment to big data and BDA	-.01
Stage of internationalisation	-.06

**Statistically significant at the .05 level

* Statistically significant at the .10 level

The interviews made it possible to look more deeply into these results. Those who rated the TRADE-DSM higher stated:

- “Nice to talk to someone who understands the complexity of trade. It gave me peace of mind” (in reference to the person who produced the report).
- “It is the only BDA tool (TRADE-DSM) with the level of detail and depth and ease to use – I don’t see any other tool.”
- “I trust its developers (North-West University) and I trust the consultant.”
- “The data used in the TRADE-DSM is UNCTAD CEPII (BACI) – it’s globally reliable.”

For those who received the report but did not rate it highly, several issues presented themselves. One was that the perceived lack of usefulness (the report or the person who prepared it) or the perception that the report was not a priority of the trade promotion agency that had prepared it resulted in the report being rejected or not even read in the first place. One respondent commented: “They (the TIPA) gave us global opportunities report and we only have the rights for Africa – they did not know us.” Someone else said: “I know our industry is not important to the trade promotion agency, they don’t really care about us.”

CONCLUSIONS - THE RESULTING MODEL

Based on the results of both the survey and the interviews, the researchers developed a model of BDA and the IMS process, which is outlined in Figure 4. The results suggest that knowledge, trust and relationship are the key drivers of how much importance is attached to BDA for the IMS:

- i) Knowledge of the BDA system – not just on the part of the user but also of the client – that is, the decision-maker. This knowledge relates to the strengths and weaknesses of the system and how these can be appropriately leveraged or addressed.
- ii) Relationship between the decision-maker and the person who produces the BDA report. Important questions are: to what extent is there trust between these two? To what extent does the decision-maker feel that the BDA report is being prepared by someone who knows the decision-maker and the company?

These results are remarkably similar to those from a recent study by Calof and Colton (2023) that looked at what led to the results of a foresight project (an area related to competitive intelligence) being accepted by decision-makers. The authors referred to the requirements for impacting decisions as the consultant's toolkit – including the requirement to gain the decision-maker's trust and develop a good understanding of the decision-maker's needs and perspectives. Clearly, technical knowledge (how to use the BDA system/tool) is important but over and above that, trust and knowledge are required if the results are to be accepted and implemented.

Finally, it is remarkable that the information sources deemed most important have not changed much since the Walters (1983) paper. Despite the increasing availability of mega sources and BDA systems, personal sources and visits to markets/trade show remain the most important information sources for IMS. Perhaps an AI-type system, which can integrate both the big data sources and the personal information sources, should be examined in a future study.

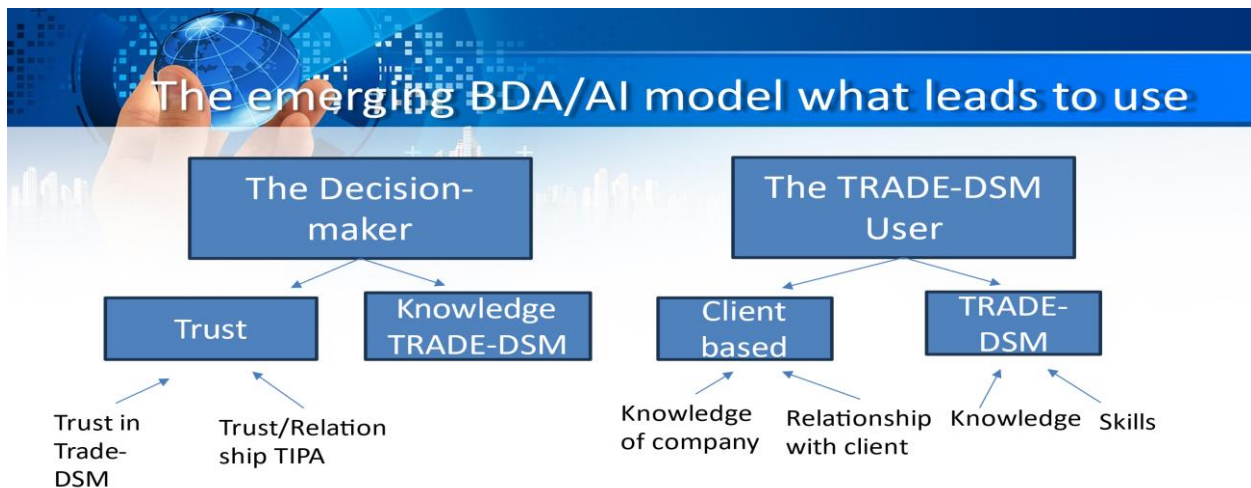


Figure 4. The emerging model

LIMITATIONS AND AREAS FOR FUTURE RESEARCH

As one of the first studies to explore the use of and impact of BDA on actual IMS decisions, it makes a meaningful contribution to the IMS literature. However,,

because of various study methodology choices, future research is needed to be able to generalize the results.

For example, while 68% of all firms that met the sample requirements were surveyed and interviewed, the actual number was low, i.e.

14. This precludes using more advanced statistics to better understand the nature of the relationships identified in this study. To achieve a larger number, a future study could use the same methodology but apply it to more countries that have used the TRADE-DSM tool/system. Alternatively, future research could focus on other BDA systems that have more users. For comparison purposes, it would be interesting to also conduct a similar study in other countries. In addition, more empirical research should be conducted to assess the uptake and effectiveness of BDA and AI in decision-making (and IMS). Finally, multiple case studies could be considered that focus on the use of BDA and AI for IMS in different companies.

While this study focused solely on BDA, a similar study could perhaps examine the use of AI for IMS. The latter is an important area to address as there is little literature on the topic (but a great deal on BDA). Finally, future research should work towards building a roadmap for addressing the challenges and opportunities of BDA and AI in international trade and IMS decision-making more specifically.

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