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EDITORIAL

To sustain competitiveness, firms are adopting innovation-oriented strategies that leverage innovation through international alliance portfolios and networks – IAP/networks. Consequently, it is important to analyze the relationship between the characteristics of IAPs/networks and innovation performance to find out which ones influence positively the latter. Based on social network theory alliance portfolio – AP can be conceptualized as an ego-centric network, or ego-net (for short) that refers to the network configured by the firm, its direct alliances to partners as well as those between partners. When strategically relevant, linkages between partners´ partners are also taken into account and the AP is analysed considering the focal firm´s value net, i.e. the network formed by all actors - partners and non-partners - and their interdependencies. The literature emphasizes this by proposing the expression "AP/network". As to IAP, it is defined as an AP/network that includes alliances with foreign partners. Alliances are defined in keeping with Gulati (1998) as voluntary arrangements between firms, involving exchange, sharing or co-development of products, technologies or services; they are classified according to their intensity that has been associated with performance (Contractor & Lorange, 1988). Firm´s innovation performance refers to the quantity of new or significantly improved products, services or processes that it has both developed and commercialized. When the share of these is at once new to the firm and the market, innovation is radical; it is incremental when the share of these is only new to the firm but not to the market (Beers & Zand, 2014), or if these have been improved significantly.

The first research paper by Macedo-Soares, Turano, Esteves, & Porto presents the results of bibliographic research performed between 2001 and 2014 whose objective was twofold: i) to identify firm IAP/network characteristics that have a positive effect on innovation performance; ii) to formulate propositions and present a conceptual model to help analyze the relationship between the most significant firm IAP/network characteristics and innovation performance, considering intervening variables. Since global technology alliances now increasingly include partners from emerging economies (Jacob et al. 2013), special attention is given to IAPs involving the latter.

For the classification of IAP characteristics that influence innovation performance, authors propose a variation of the four alliance network dimensions of Macedo-Soares´s (2011) Global SNA (Strategic Network Analysis) Framework. This framework aimed at helping firms that operate in the global market through multiple alliances to carry out their strategic analyses, taking into account the impact of at once industry structural, organizational and relational factors. The IAP/network key dimensions are: 1) IAP/Net; 2) IAP/Net Composition; 3) IAP/Net Linkage Modalities 4) IAP/Net Management. These dimensions and associated constructs originally drew on Galaskiewicz and Zaheer´s (1999) as well as Gulati et al. (2000) who argued that network characteristics could influence firm performance.

The literature review was supported by bibliometric studies. Four databases (Scopus, Science Direct, Ebsco Host and Web of Science) were adopted to review literature on IAP published between 2001 and 2014 on alliance portfolios/networks and innovation. Authors thus obtained a sample of 812 articles. Using Bibexcel software, and limiting ourselves to the 450 articles in the Web of Science data base, due to computational limitations, they generated a co-citation matrix, and with the help of SPSS also a map of co-citations to identify clusters of cited works according to dominant theoretical lenses.

After this bibliometric phase, authors conducted a qualitative analysis of all the abstracts of their sample with a view to selecting those articles that were most pertinent to their objective of identifying IAP/network characteristics that positively influence innovation performance. They thus first found 127 articles. However, after an in-depth analysis of their content, the authors identified only 13 that contributed most to this objective.

The most striking finding of their analysis was that the most cited IAP/Net structural characteristic was that of IAP/Net diversity, also considered in terms of IAP/Net heterogeneity or complexity, with the argument that different, heterogeneous partners could lead to more new resources and information. Evidently there is a trend to associate diversity of IAPs or networks with innovativeness; a trend that sees the benefits of broader, more diverse AP/networks outweighing costs and conflicts in IAPs, namely those related to

geographic and cultural distance. However, diversity would be positive for innovation performance only up to a certain optimal point, after which it would become excessive as the high transaction and coordination costs involved in coping with it would outweigh its benefits (Faems et al. 2012). On the other hand, the negative impact of high diversity could be mitigated to a certain extent by appropriate IAP/network management capabilities. The model Macedo-Soares et al. propose highlights diversity, as well as IAP/network management capabilities as a moderator in the IAP – innovation relationship.

On the basis of their study´s findings, Macedo-Soares et al. made the following recommendations for managers of innovation-oriented firms whose IAPs involve emerging countries.

[1] In order to obtain satisfactory innovation performance through their IAP/networks, managers should ensure a fairly high level of IAP/network diversity, avoiding, however, an excessive level of diversity. Precisely, managers should guarantee that the IAP/network for leveraging innovation performance has the right mix and balance of different types of alliances/partners, notably of local and foreign alliances and of different functional alliances.

[2] Depending on the type of innovation performance aimed at – radical/explorative or incremental/exploitative, managers should give priority to, respectively, functional or geographic IAP/network diversity.

[3] To ensure the optimum level of diversity and desired balance of alliance/partner types, managers should develop IAP Management Capabilities that are appropriate to their different institutional contexts. When the IAP/network involves alliances/partners from emerging countries, and to mitigate eventual negative effects of IAP/network diversity, high levels of absorptive capacity, in association with learning capabilities, are especially important, but also dynamic capabilities, as well as skills in information sharing, in exploiting portfolio synergies or complementarities, and in coordination and strategic alignment of the IAP/network.

Small and medium sized businesses are joining a trend in the IT industry by outsourcing an important portion of their IT infrastructures called networked services. These services are core to many businesses and they include computer networks, business and network applications, and data communication systems. It is important to properly manage the outsourcing of networked services in order to achieve satisfactory results. One approach involves applying the lifecycle methodology to outsourcing management in order to provide a structured plan that helps maximize success and prevent mistakes. In the second paper by employing a four-phased lifecycle model, Gercek, Saleem & Steel develop an outsourcing management model consisting of these activities: (1) feasibility analysis, (2) contract development, (3) transition management, and (4) governance and continuous service improvement.

The first phase, feasibility analysis, includes activities which determine whether outsourcing is justified and if so, what services are candidates for outsourcing. To accomplish this, management makes a feasibility determination after consideration of the strategic and operational reasons for outsourcing while taking into account cost, risk, company strategic goals, and core competencies. Following this, the firm enters into an asset discovery mode whereby it identifies its networked services hardware and software elements and then documents the configuration of these assets.

In the second phase, contract development, the firm develops a formal outsourcing contract which describes the services to be outsourced as well as numerous considerations and requirements for the outsourcing. These include expected levels of service, response times, requirements for information security, and intellectual property protection. Once complete, the contract document helps communicate with potential vendors and establishes the standards needed for the operation and maintenance of the outsourcing relationship. The resulting contract is also used for other activities in this phase, including the identification of vendors and the systematic section of a service provider.

The third phase, transition management, begins with formal planning activities for outsourcing. Following this, the firm designs services and lays out acceptance test plans for the services to be outsourced. Another consideration requires a plan for rollout of the outsourced services that helps ensure continuous

operations during the transition itself. Finally, after additional preparation, planning and communication with stakeholders, the outsourced services are deployed. Throughout the transition phase, the firm ensures that the changes do not interrupt the smooth operation of the organization.

Finally, the last phase, governance and continuous service improvement, includes close monitoring of the services received in order to help ensure that the organization obtains the desired objectives of network services outsourcing. This includes defining the roles and responsibilities for tasks such as decision-making, issue escalation, and dispute management. Also, while outsource operations commence, the firm and the service provider control and monitor services to ensure that metrics such as contract performance and cost continue to meet expectations. Simultaneously, the firm monitors key performance indicators to identify opportunities for improving services delivery as well as the support for them. Gercek et al. conclude that with a structured approached provided by the four-phase outsourcing management approach, small and medium-sized businesses can help maximize the benefits of outsourcing while mitigating risks. This plan is an important tool for management teams who are considering the outsourcing of networked services.

Demanding business and operational environments often require firms to question the effectiveness and efficiency of their organizational processes and structures. A key organizational structure that requires continuous monitoring and assessment is the distribution network. Thus, it is critical that managers have the ability to quickly and accurately assess alternative network designs. Third research paper by Skipper, Cunningham, Boone, & Hill proposes the use of a Multiple Objective Linear Programming (MOLP) model to analyze optimal hub locations using a military based example and data. The mathematical representation of the network is created, implemented in Microsoft Excel, and instantiated with realistic data. MOLP techniques are used to determine the trade-offs between the two key network constructs, delivery time and cost. Thought presented in the third paper in a military context, authors believe the proposed model-based analytical methodology for assessing network designs has much wider application and represents a means for both military and non-military decision makers to 'what-if' multiple network design scenarios when time, cost, or both are of primary concern.

The fourth paper by Bowen & Bowen aims to explore the value of social media as a strategic tool, which is under-researched. Marketing has been quick to explore and develop social media as a tool for marketing strategy and activities. The authors of the fourth paper suggest that social media is another tool for strategic decision making and can thus improve the accuracy of strategic decision making, which enhances strategy development and ultimately business performance. The scope of the Bowen & Bowen`s paper addresses the concept of social media, the application of social media to marketing strategy, decision making ideas, decision making processes, user-generated content and its use in decision making, decision making and uncertainty, and social media and business performance. It rounds-off with implications to management, future research and research limitations and finally the conclusion.

Put simply, strategically useful decision-making requires the collection and analysis of information. However, the robustness of the decision making process would add significantly to the value of the outcomes. Robustness can be built into the decision making process by using a multi-stage approach. How social media can add value to the decision making process is by identifying patterns and behaviours that could lead to opportunities (such as when to introduce new product, define new strategic markets, product performance, competitor analysis, and invest/divest from markets) or trends that are of strategic significance. The data retrieved from the online environment used appropriately in the decision making process would provide significant insight into strategic issues and thus how they could be resolved or minimised to the advantage of the organisation. The user-generated-content from the online environment would also help to reduce the level of uncertainty in the business environment, because it would play a central role in the decision making process.

Utilising social media the strategist will have a window on user-generated-content 24/7, which not only increases the amount of available data for strategic decision making, but data could be triangulated more frequently, thus improving the overall accuracy of the decision making process. Supportive of the accuracy of the data is the honesty and transparency of the conversations online. The strategist can obtain "objective" data, which will lead to informative decision-making and potentially a competitive advantage with the ability to sustain the competitive advantage. Application of user-generated-content makes strategic decision-making more customer-centric and is then not just a marketing strategy tool. The data flow will be upwards, giving

senior management a "real" view of the business from the customers' perspective. The upward movement of the data will require management. However, a collaborative management style will aid strategic decision-making and ensure data is delivered in a "timely", "actionable" and "useable" in the strategic timeframes required by the business. The richness of the data would improve, because the data would come from "perfectly targeted communities" with participants in the communities showing commitment to share information openly. Electronic-word-of- mouth (eWoM) enables the community to be revitalised and have new blood with varying ideas and opinions that keeps the user-generated-content invigorated and updated so trends and opportunities can be identified and developed quicker and earlier in the strategic formulation process. The implementation of the suggestions to improve strategic decision-making in Bowen & Bowen's paper is an area that requires further development to build a rigorous process that supports the flow of user-generated-content and disseminate it to the strategic decision makers in the firm. Doing this will have a significant impact on the overall business performance.

The fifth paper by Hernández, García & Hernández aims to establish enterprise diagnostic through logistics business, particularly following the Logistic Model Based on Positions (LoMoBaP [MoLoBaC]), through one of its managers, the Environmental Manager (EM). To achieve the general and specific objectives, the Integrated-Adaptable Methodology for the development of Decision Support System (IAMDSS [MIASAD]) was used. Though IAMDSS arose for the development of Decision Support Systems (DSS), by its flexibility can be adapted to different types of investigation. Following the methodology, Hernández et al.'s paper presents the importance of the interrelationships of business logistics with the remaining areas of the company. As an illustration a brief discussion of the ethical aspects, new technologies and the legal aspects with some comments on the relationship between logistics and the environment has been provided.

The relationship between logistics and the remaining areas of the organizations presents four qualitative-quantitative models, which seek to cover most of the areas and aspects relating to business logistics. These models are:

- The Logistics of Supply, Production, Distribution and Inverse Logistic (LSPDI [LAPDI]) model, centered in the logistics flows;
- The Logistic Model Based on Positions (LoMoBaP [MoLoBaC]), that studies logistics through the functions performed by the managers in logistic positions in an organization;
- The Logistic Model Based on Indicators for Positions (LoMoBaIPo [MoLoBaICa]), which have a strong relationship with MoLoBaC and measures enterprise logistics through indicators and
- The Logistic, Strategic, Tactical, Operational with Inverse Logistics Model (STOILMo [MoLETOI]), which analyzes logistics through normal stages of administrative analysis: Strategic, Tacit and Operative.

The authors show a methodology that consists of six steps. However, it is the recommendation that the diagnosis must be a continuous process. Hernández et al.'s work can serve as a starting point to understand the close relations that exist between logistics and the rest of the business activity. This would help to better understand the organization as a whole and various aspects of it, such as: management of flows; analysis of the functions performed by each of the staff members, to study dispersion and repetition of functions and even functions not covered. In terms of diagnosis management, their work presents a methodology, easy to implement, that it would facilitate the realization of any diagnosis that needs to be done in the organization. In addition to indicate the steps to be followed, through work it can be seen that there are aspects that may be of special interest to diagnose. In this case it must be understood that one aspect is the interception between a coverage (an area, multiple areas or the organization as a whole) and a level of interest (Strategic, Tactical or Operational). With regard to the environment, in Hernández et al. study, several functions can or should play the Environmental Manager (EM), which will allow the managers of the different organizations, to have a document to quickly review the level of compliance in the organization. As a result, it is possible to obtain a greater benefit of each of these functions.

Nejdet Delener, Ph.D.
Editor-in-Chief

NOTE FROM THE EDITORS

As an interdisciplinary indexed journal, *The Journal of Global Business and Technology (JGBAT)* serves academicians and practitioners in the fields of global business and technology management and their related areas. The *JGBAT* is also an appropriate outlet for manuscripts designed to be of interest, concern, and applied value to its audience of professionals and scholars.

Readers will note that our attempt to bridge the gap between theory and practice has been successful. We cannot thank our reviewers enough for having been so professional and effective in reiterating to contributors the need to provide managerial applications of their research. As is now obvious, the majority of the articles include a section on managerial implications of research. We wish to reiterate once again our sincere thanks to *JGBAT* reviewers for having induced contributors to answer the "so what?" question that every *Journal of Global Business and Technology* article is required to address.

Thank you for your interest in the journal and we are looking forward to receiving your submissions. For submissions guidelines and requirements, please refer to the Manuscript Guidelines at the end of this publication.

Nejdet Delener, Ph.D., Editor-in-Chief
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INTERNATIONAL ALLIANCE PORTFOLIOS AND INNOVATION: A PROPOSAL FOR AN ANALYTICAL MODEL BASED ON BIBLIOGRAPHIC AND BIBLIOMETRIC RESEARCH

T. Diana L. van Aduard de Macedo-Soares, Lucas Martins Turano, Felipe Esteves, and Clarice Breviglieri Porto

ABSTRACT

To sustain competitiveness, firms are adopting innovation-oriented strategies that leverage innovation through international alliance portfolios and networks – IAP/networks. Consequently, it is important to analyze the relationship between the characteristics of IAPs/networks and innovation performance to find out which ones influence positively the latter. This article presents the results of bibliographic and bibliometric research that sought to identify these characteristics as well as a conceptual model to help carry out an analysis of the IAP – innovation relationship. Four databases were adopted to review literature on IAP published between 2001 and 2014, alliance networks and innovation. Portfolio diversity was the most cited significant IAP/network characteristic, although high diversity could have a negative impact. However, this could be mitigated by appropriate IAP/network management capabilities. The model highlights diversity as well as IAP/network management capabilities as a moderator in the IAP – innovation relationship. Special attention is given to IAPs involving emerging countries.

Keywords: Innovation Performance; International Alliance Portfolios; Alliance Networks, Conceptual Model, Bibliometric Study, Alliance Diversity, Alliance Portfolio Management Capabilities

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INTRODUCTION

To sustain their competitiveness in globalized markets, firms are adopting innovation-oriented strategies that seek to leverage innovation through alliances. The latter have indeed been viewed as drivers of innovation (Wuyts et al., 2004; Cui & O´Connor, 2012). Several investigations made evident the necessity to engage in multiple alliances, configuring networks (Ahuja, 2000) or alliance portfolios – APs - (Faems et al. 2005). Wassmer and Dussauge (2011, p. 47) observed that "most firms no longer rely on a single alliance: many firms maintain entire alliance portfolios comprised of multiple simultaneous strategic alliances with different partners in order to access a broad range of resources" (p. 47). Ozcan & Eisenhardt (2009, p. 246) noted that APs are theoretically important as they have "aggregate properties, such as tie diversity and mix of tie strengths that influence performance (Uzzi, 1997)", but are not significant for individual alliances. It is argued that the cross-functional integration that APs promote helps companies to generate innovation (Duysters & Lokshin, 2011), while mitigating risks associated with single alliances (Leiponen & Helfat, 2005) and thus contributes to ensuring their competitive edge.

In fact, firms are increasingly leveraging innovation through multiple cross-border alliances, configuring international alliance portfolios and networks - IAP/networks (Sivakumar et al. 2011). Indeed, "recent contributions have argued that access to international knowledge flows is especially important for firms aiming to tap into leading-edge knowledge (Griffith et al., 2006 *apud* Duysters and Lokshin, 2011, p.571). It is relevant that many of these alliances involve partners from emerging countries (Jacob et al. 2013). Given this trend, firms that seek to leverage innovation through IAPs should know which and how IAP/network characteristics positively influence innovation performance so that they can consider these in their strategic analyses and decisions. Also, they should have the necessary analytical tools. Phelps et al. (2012) carried out the first literature review (1990-2009) on knowledge networks. Stolwijck et al. (2013) made a bibliographic study on alliance network characteristics and technological development. They found that the more complex structural variables were hardly investigated. Wassmer (2010) conducted a literature review on APs. However, we did not find any that focused on IAPs and innovation performance.

This article presents the results of bibliographic research performed between 2001 and 2014 whose objective was twofold: i) to identify firm IAP/network characteristics that have a positive effect on innovation performance; ii) to formulate propositions and present a conceptual model to help analyze the relationship between the most significant firm IAP/network characteristics and innovation performance, considering intervening variables. Since global technology alliances now increasingly include partners from emerging economies (Jacob et al. 2013), special attention was given to IAPs involving the latter. The remainder of this article is divided into four parts: theoretical background, research methods, results and analysis, recommendations for managers and final considerations.

THEORETICAL BACKGROUND

We adopted Gulati´s (1998) definition of alliances as voluntary arrangements between firms, involving the exchange, sharing or co-development of products, technologies or services and classified them according to their degree of intensity that has been associated with performance (Contractor & Lorange, 1988).

> "Linkages are thus classified running the following gamut from … mergers & acquisitions — M&A, independent joint ventures, cross equity ownership, minority equity investment, joint Research and Development — R & D, production, or marketing, franchise alliances, know-how or patent licensing agreements… Apart from M&A, the other linkages are considered to be alliances when they meet our definition of alliances based on Gulati (1998)" (Macedo-Soares, 2011, p.84).

In keeping with Macedo-Soares, (2002), alliances that contribute to firm competitive advantage are strategic.

As for alliance portfolio, we found several definitions of this concept. Cui and O´Connor (2013, p. 25) define it as "all strategic alliances a firm is engaged in at a certain time (Hoffmann, 2005; Lavie 2007)". Lavie and Miller (2008, p. 623) define AP as a "firm's collection of immediate alliance partners". Based on social network theory (Ahuja, 2000; Baum et al., 2000; Kudic & Guhr, 2013; Ozcan & Eisenhardt, 2009), we defined AP as an egocentric network (Knoke, 2001). The AP or ego-net (for short) refers to the network configured by the firm, its direct linkages to partners as well as those between partners. Note that when strategically relevant, linkages between partners´ partners should also be taken into account and the AP should be analysed considering the focal firm´s value net. Brandenburger and Nalebuff (1996) define value net as the network formed by all actors - partners and non-partners - and their interdependencies when they create value that is significant for the focal firm´s competitive advantage. We emphasize this by proposing the expression "AP/network".

In the scope of his literature review Wassmer (2010) found three research streams central to APs: (a) emergence of APs; (b) configuration of APs; (c) management of APs. He identified 16 theoretical lenses adopted in these areas: 1) Social Network Theory - SNT, 2) Organizational Learning in general – OL, 3) Exploration/exploitation framework - EEF, 4) Resource-based view of the firm – RBV, 5) Dynamic capabilities – DC, 6) Knowledge-based view – KBV, 7) Relational View - RV, 8) Evolutionary Economics - EE, 9) Transaction Cost Economics – TCE, 10) Other economics - OE, 11) Agency theory - AT, 12) Contingency theory - CT, 13) Co-evolutionary perspective - COev, 14) Contract theory - CT, 15) Real options - RO, 16) Resource dependency theory - RDT (for bibliographical references, see Wassmer, 2010, Table 2, p. 147). Because of their relevance to the objective of our study, we added four lenses: International Business – IB (e.g. Dunning, 1993; Johanson & Vahlne, 2009); Institutional theory – IT (e.g. DiMaggio, 1988; North D.C 1990); AP approach (Faems et al., 2005); Absorptive Capacity – AC (Cohen & Levinthal, 1990). Note that the latter can be considered a specific concern of the OL and KBV lenses, and the AP approach a specific lens of SNT when AP is defined as an ego-net, which is the case in our study. Wassmer (2010) observed that, in many cases, "researchers chose to integrate two or more theoretical lenses to examine the issue under study" (p. 146). Overlap between theoretical lenses is thus inevitable. His review verified that most research on AP configuration uses theories grounded in SNT, RBV and OL, and research on AP capability/management uses the OL, KBV, DC and EE lenses. (N.B. for practical purposes we created acronyms for some of the above listed theories/lenses).

Here we define international alliance portfolio - IAP as an AP/network that includes alliances with foreign partners. We use the expression "IAP/network" for the same reason that motivated the "AP/network" expression. Drawing on Lavie and Miller's (2008) concept of AP internationalization, we believe that "foreignness creates unique challenges and opportunities for firms that internationalize their APs" (p.623). Jacob et al. (2013) observed that having local linkages is not enough to have access to external knowledge. Accessing the knowledge of foreign countries provides a more solid basis for learning (Cohen & Levinthal, 1990).

In keeping with the OECD´s Oslo Manual (2005), innovation can relate to a product/service, to a process, to marketing or to organizational features, and is defined here as "an invention that has been commercialized in the market by a business firm or the equivalent" (Patel et al., 2014, p. 697). Although the degree of innovation can be classified as disruptive, radical, complex and incremental (Tidd, 2001), we distinguish here between radical and incremental innovation, also characterized as, respectively, explorative and exploitative (March, 1991). A firm´s innovation performance refers to the quantity of new or significantly improved products, services or processes that it has both developed and commercialized. When the share of these is new to both the firm and the market, innovation is radical; it is incremental when the share of these is only new to the firm but not to the market (Beers & Zand, 2014), or if these have been improved significantly.

For the classification of IAP characteristics that influence innovation performance, we propose a variation of the four alliance network dimensions of Macedo-Soares´s (2011) Global SNA (Strategic Network Analysis) Framework. This framework aimed at helping firms that operate in the global market through multiple alliances to carry out their strategic analyses, taking into account the impact on the firm´s performance of not only industry structural and organizational factors, but also of relational factors, notably, firm´s

alliances and the network or portfolio that these configure. The IAP/network (henceforth IAP/Net) dimensions proposed are as follows: 1) IAP/Net Structure (IAP size; IAP density; IAP scope; IAP position/centrality; embeddedness; structural holes; IAP´s configuration of partners/resources in terms of diversity/heterogeneity/complexity); 2) IAP/Net Composition (focal firm´s identity and status; partners´ identity and status; access to firm´s innovation resources; access to partners´ innovation resources); 3) IAP/Net Linkage Modalities (strength; nature – international/local, collaborative/opportunistic, explorative/exploitative); 4) IAP/Net Management (relational governance; IAP/network management capabilities: international alliance management, learning, dynamic capability, absorptive capacity, coordination, resource and information sharing; strategic fit of IAP/network; IAP/network performance assessment).

Note that the IAP/Net structure and IAP/Net management dimensions proposed are related to two of the three main AP research streams that Wassmer (2010) identified in his literature review: AP configuration and AP management. These key IAP/Net dimensions and associated constructs originally drew on Galaskiewicz and Zaheer´s (1999) and Gulati et al.´s (2000) key network dimensions. They were adopted in Macedo-Soares´s SNA framework in its original form (Macedo-Soares, 2002; Macedo-Soares & Tauhata, 2004), as well as in its variations (Macedo-Soares et al., 2004; Macedo-Soares & Mendonça, 2010; Macedo-Soares & Schubsky, 2010), notably the Global SNA Framework (Macedo-Soares, 2011). Gulati et al. (2000) argued that network characteristics could influence firm performance, "creating opportunities and threats at industry level, and strengths and weaknesses at corporate level" (Macedo-Soares, 2011, p. 73).

RESEARCH METHOD

The literature review was conducted in two stages and supported by bibliometric studies that followed the method used by Ramos-Rodriguez and Ruiz-Navarro (2004). In the first, which was essentially bibliometric, we searched for articles on IAP/networks and innovation published between January 2001 and May 2014 in the Web of Science data base, using 5 key words (Turano, Macedo-Soares & Esteves, 2014). Our initial search yielded 1175 results, but after limiting our search to the management and business areas, we obtained the 376 articles that constituted our sample. However, when we focused on the most recent ones (2011 - May 2014), we found only 9 articles pertinent to our specific objective. This prompted us to carry out a more comprehensive literature review on the subject.

In the second stage the time frame was extended to September 2014. Four databases (Scopus, Science Direct, Ebsco Host, and Web of Science) were adopted - all in business and management fields - and four more keywords/phrases were added (Esteves, Macedo-Soares, Turano & Porto, 2015). These totalled 9 as follows: 1) "International Alliances AND Innovation" OR; 2) "International Alliance Networks - IAN AND Innovation" OR; 3) "International Alliance Portfolios AND Innovation" OR; 4) "International Networks AND Innovation" OR; 5) "International Strategic Alliance Portfolios AND Innovation" OR; 6) "Alliance Portfolios AND Innovation" OR; 7) "Portfolio of Linkages AND Innovation" OR; 8) AP Internationalization and Innovation" OR; 9) "Technological Alliances AND Internationalization" . (Nos. 6 to 9 were the ones added).

We thus obtained 812 articles that were organized using Bibexcel software (www.umu.se/inforsk/Bibexcel) into descriptive analytical tables. Excel software helped capture general data on authors and journals with most publications, and on the trend regarding number of articles on IAP or IAN innovation over the period investigated. We wanted to use Bibexcel software to count citations of all articles in our sample, but due to computational resource limitations this was possible only for those from the Web of Science database. Since the latter constituted more than half of our sample in this second stage, and because this database is one of the most comprehensive ones (THOMSON REUTERS, 2012), we decided that it was worthwhile to do so in spite of this limitation. This enabled us to identify the most cited works (articles and books) in the 450 articles from the Web of Science database (Table 3). Next we generated a co-citation matrix using Bibexcel whose analysis (at an appropriate normalized stress level – 0.103), with the help of SPSS (version 18) multidimensional scaling program, led to the creation of a map of co-citations for those works that

had more than 35 citations - precisely 26 articles or books (Figure 2). The map enabled us to identify clusters of cited works according to dominant theoretical lenses.

After this bibliometric phase, we conducted a qualitative analysis of all the abstracts of our sample of 812 articles with a view to selecting those that were most pertinent to our specific objective of identifying IAP/network characteristics that positively influence innovation performance. This led us to select 127 articles. After an in-depth analysis of their content, we chose 13 that contributed most to this objective, including four relating to emerging countries, in keeping with our special interest in the latter.

As these 13 articles were in the Web of Science database, in addition to other databases, Bibexcel software enabled us to identify the ones that were most cited (at least three times) by these articles (see Table 4). We drew up a table summarizing the most interesting findings of our analysis of the 13 articles, and also indicating to which key IAP/Net dimension the significant IAP/network characteristic for innovation, identified in the literature, pertained. Finally, on the basis of the results of our bibliographic research we formulated a set of propositions and sketched a conceptual model for analysing the IAP/network – Innovation relationship.

RESULTS AND ANALYSIS

Bibliometric Study

The first interesting result of our bibliometric study concerned authors with most publications on IAP or IAN and innovation between 2001 and 2014. As in the case of the 1st stage (sample of 376), Geert Duysters was found to be by far the leading author in the 2nd stage, with 17 articles in our sample of 812 publications. He was followed by J. Cantwell with 6 publications, and by B. Ambos, B. Lokshin, B. Park, and W. Vanhaverbeke, all with 5 publications each. Table 1 lists the 12 leading authors in terms of number of articles published in this period.

After examining the articles published by these 12 authors, we found that those by four authors – G. Duysters, D. Faems, B. Lokshin and W. Vanhaverbeke – were more explicitly concerned with AP/network or IAP/network characteristics and their implications for innovation. Thus, it may not be a coincidence that both B. Lokshin and W. Vanhaverbeke have published several articles in co-authorship with Duysters. As regards the other 8 leading authors in terms of number of publications, they no doubt provide valuable insights into the wider subject of international alliances/networks and innovation despite not taking a portfolio approach. Several (e.g. B. Ambos, J. Cantwell, R. Mudambi, R. Narula), focus on multinational companies – MNCs, oriented towards innovation, and the network of relationships with their subsidiaries, notably, the latter´s R & D units and the transfer of knowledge to and from these units, adopting what could be considered an intra-organizational network approach.

Organizational learning, knowledge or technological capability acquisition and absorptive capacity are central issues for most of the 12 leading authors (especially, J. Anand, B.I. Park and S. A. Zahra).

Table 1 – Leading 12 Authors in terms of Number of Articles on IAP or IAN and Innovation between 2001 & 2014

Rank	Authors	Qty	%	Rank	Authors	Qty	%
1°	Duysters G	17	2,09	7°	Anand J	4	0,49
2°	Cantwell J	6	0,74	8°	Faems D	4	0,49
3°	Ambos B	5	0,62	9°	Mudambi R	4	0,49
4°	Lokshin B	5	0,62	10°	Narula R	4	0,49
5°	Park BI	5	0,62	11°	Sinkovics RR	4	0,49
6°	Vanhaverbeke W	5	0,62	12°	Zahra SA	4	0,49

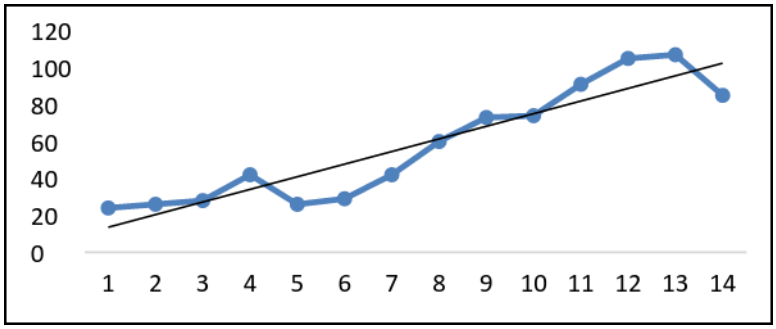
Another important result was the identification of the journals that had published most articles on the broader subject of IAP or IAN and innovation. *Research Policy* appeared in first place, followed by *International Business Review*, *Technovation,* and *Technological Forecasting and Social Change*.

Table 2 – Journals with most publications on the IAP or IAN and innovation between 2001 and 2014

Rank	Journal	I.F.	Qty	%	Rank	Journal	I.F.	Qty	%
1°	Research Policy	2.598	49	6,03	8°	Journal of International Business Studies	3,594	23	2,83
2°	International Business Review	1,489	41	5,05	9°	Industrial Marketing Management	1,897	21	2,59
3°	Technovation	2,704	34	4,19	10°	Journal of Business Venturing	3,265	21	2,59
4°	Technological Forecasting and Social Change	1,959	31	3,82	11°	Strategic Management Journal	2,993	21	2,59
5°	Journal of International Management	1,096	28	3,45	12°	Journal of Business Research	1,306	19	2,34
6°	Journal of World Business	1,907	28	3,45	13°	Technology Analysis & Strategic Management	0,841	17	2,09
7°	International Journal of Technology Management	0,492	25	3,08	14°	European Management Journal	0,817	11	1,35

Table 2 presents the 14 journals with most publications on this subject. Note that with respect to the *Journal of Global Business and Technology* - *JGBAT* - the journal where this paper is being published - we found 6 articles on innovation (Chen & Chen, 2008; Ferreira & Cardoso, 2014; Ihinmoyan & Akinyele, 2005; Ko, 2008; Lin, Shen, Yu, & Sun; Markatou & Stournaras). However, none addressed the question of the relationship between alliances, alliance portfolios/networks and innovation performance.

Figure 1 – Number of Publications by Years (1=2001, 14=2014)



Another encouraging result was to have identified a trend towards a significant increase in the number of publications between 2001 and September 2014 on the wider subject at issue. By classifying the 812 articles, according to their year of publication, we constructed a graph indicating quantities of published articles in each year. (See Figure 1 for trend line). The slight decrease in quantity between 2013 and 2014 no doubt reflects the fact that our study did not cover the whole of 2014.

The next important result was to have identified the most cited works (articles and books) in the 450 articles from the Web of Science database. As shown in Table 3, where we present a list of these up to the 52nd most cited work, Cohen & Levinthal (1990) is in first place with 164 citations. Here the authors introduce the concept of absorptive capacity - AC as the firm´s ability "to recognize the value of new, external information, assimilate it and apply it to commercial ends", (p. 128), and argue that AC is critical to its innovative performance.

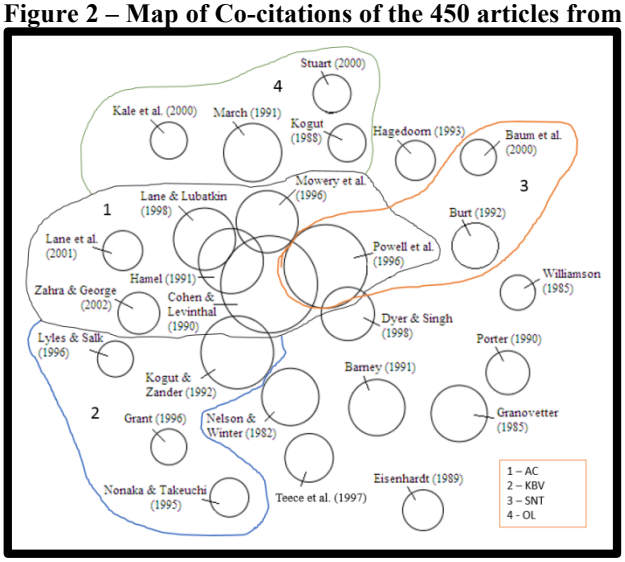
Table 3 – Most cited Publications by the 450 articles from Web of Science

Rank	Publications	Qty.	%	Rank	Publications	Qty.	%
1°	Cohen, W. M.; Levinthal, D. A. (1990) *Adm. Sci. Quart.*	164	36,4%	27°	Gulati, R. (1995) *Academy of Management Journal*	35	7,8%
2°	Powell W. W. et al. (1996) *Administrative Science Quar.*	86	19,1%	27°	Nonaka, I. (1994) *Organization Science*	35	7,8%
3°	Kogut, B.; Zander, U. (1992) *Organization Science*	75	16,7%	27°	Johanson, J.; Vahlne, J. (1977) *J. of Int. Business Studies*	35	7,8%
4°	Hamel, G. (1991) *Strategic Management Journal*	67	14,9%	30°	Teece, D. J. (1986) *Research Policy*	34	7,6%
5°	Mowery, D. C. et al. (1996) *Strategic Managem. Journal*	64	14,2%	30°	Uzzi, B. (1997) *Administrative Science Quarterly*	34	7,6%
5°	Lane, P. J.; Lubatkin, M. (1998) *Strategic Man. Journal*	64	14,2%	30°	Szulanski, G. (1996) *Strategic Management Journal*	34	7,6%
7°	March, J. G. (1991) *Organization Science*	60	13,3%	33°	Nelson, R. R. (1993) - *National Innovation Systems*	33	7,3%
8°	Nelson, R.R.; Winter, S.G. (1982) –*Evolutionary Theory*	59	13,1%	33°	Gronovetter, M. S. (1973) *American Journal of Sociology*	33	7,3%
9°	Barney, J. (1991) *Journal of Management*	58	12,9%	35°	Gulati, R. (1998) *Strategic Management Journal*	32	7,1%
10°	Dyer, J. H.; Singh, H. (1998) *Academy of Man. Review*	55	12,2%	35°	Eisenhardt, K. M.; Martin, J. A. (2000) *Strategic Man. J.*	32	7,1%
11°	Teece, D. J. et al. (1997) *Strategic Management Journal*	50	11,1%	35°	Ahuja, G. (2000) *Administrative Science Quarterly*	32	7,1%
12°	Burt, R. S. (1992) – *Structural Holes: The social Struct.*	48	10,7%	38°	Khanna, T. et al. (1998) *Strategic Management Journal*	31	6,9%
13°	Porter, M. E. (1990) – *The Competitive Advantage*	45	10,0%	39°	Oviatt, B. M.; McDougall, P. P. (1994) *J. of Int. Bus. Stud.*	29	6,4%
14°	Zahra, S. A.; George, G. (2002) *Acad. of Manag. Review*	43	9,6%	39°	Hagedoorn, J. (2002) *Research Policy*	29	6,4%
15°	Eisenhardt, K. M. (1989) *Academy of Manag. Review*	42	9,3%	39°	Podsakoff, P. M.; Organ, D. W. (1986) *Journal of Manag.*	29	6,4%
16°	Lane, P. J. et al. (2001) *Strategic Management Journal*	41	9,1%	42°	Gulati, R. (1999) *Strategic Management Journal*	28	6,2%
16°	Hagedoorn, J. (1993) *Strategic Management Journal*	41	9,1%	42°	Penrose, E. T. (1959) - *Theory of the Growth of the Firm*	28	6,2%
18°	Nonaka, I.; Takeuchi, H. (1995) - *Knowledge Creat. Co.*	40	8,9%	44°	Gupta, A.K.; Govindarajan, V. (2000) *Strategic Manag. J.*	27	6,0%
19°	Kogut, B. (1988) *Strategic Management Journal*	39	8,7%	44°	Simonin, B. L. (1999) *Strategic Management Journal*	27	6,0%
19°	Stuart, T. E. (2000) *Strategic Management Journal*	39	8,7%	44°	Cohen, W. M.; Levinthal, D. A. (1989) *Economic Journal*	27	6,0%
21°	Kale, P. et al. (2000) *Strategic Management Journal*	38	8,4%	44°	Chesbrough, H. (2003) – *Open innovation*	27	6,0%
21°	Granovetter, M. (1985) *American Journal of Sociology*	38	8,4%	44°	Tsai, W. (2001) *Academy of Management Journal*	27	6,0%
23°	Grant, R. M. (1996) *Strategic Management Journal*	37	8,2%	49°	Gulati, R. (1995) *Administrative Science Quarterly*	26	5,8%
23°	Baum, J. A. C. et al. (2000) *Strategic Management Journal*	37	8,2%	49°	Williamson, O. I. (1975) - *Markets and Hierarchies*	26	5,8%
23°	Lyles, M. A.; Salk, J.E. (1996) *J. of Int. Business Studies*	37	8,2%	49°	Inkpen, A. C.; Beamish, P. W. (1997) *Acad. of Man. Rev.*	26	5,8%
26°	Williamson, O. E. (1985) - *The Economic Institutions*	36	8,0%	49°	Podsakoff, P. M. et al. (2003) Journal of Applied Psych.	26	5,8%

In fact, in keeping with our findings for the authors with most publications (see Table 1), the majority of the most cited works are concerned with AC, with several in addition to Cohen & Levinthal (1990) focussing explicitly on AC (e.g. Lane & Lubatkin, 1998; Lane et al., 2001; Mowery et al. 1996; Powell et al., 1996; Tsai, 2001; Zahra & George, 2002). The majority also adopt OL (e.g. Powell et al., 1996), RBV (Ahuja, 2000, Hamel, 1991; Penrose, 1959, Barney, 1991) and KBV (Grant, 1996; Kale et al., 2002; Kogut & Zander, 1992; Nonaka & Takeuchi, 1995; Nonaka, 1994; Szulanski, 1996) theoretical lenses, as well as, in many cases, the relational view (Dyer & Singh, 1998) and SNT (e.g. Ahuja, 2000; Baum et al., 2000; Burt, 1992, Chesbrough, 2003; Gulati, 1995; 1998; Granovetter, 1973, Kale et al. 2000; Powell et al.1996; Tsai, 2001; Uzzi, 1998). The influence of TCE (O. E. Williamson, 1979) appears in a few of these most cited works (e.g. Kogut, 1988; Powell et al. 1996). Several adopt an international perspective (Gupta & Govindarajan, 2000; Hagedoorn, 1993; 2002; Inkpen & Beamish, 1997 Johanson & Vahlne, 1977; Lyles & Salk, 1996; Nelson, 1993; Oviatt & McDougall, 1994; Simonin, 1999) and practically all of these also take an OL and/or KBV approach.

Below, (see Figure 2), we present the map of co-citations that we created for the 26 works that had more than 35 citations. This map indicates articles that were simultaneously cited in another paper. The circles´ size reflects the number of citations that the article received, hence the largest circle for Cohen & Levinthal (1990), which was the most cited publication. When circles are close to each other the publications presumably have similar or related theoretical lenses (White & McCain, 1998). The map thus suggests that Cohen & Levinthal (1990) - proponent of the AC theory - shares similar lenses or theoretical approaches related to those of Powell et al. (1996) (OL), Mowery et al. (1996) (AC) and Lane and Lubatkin (1998) (AC), in that these were more often co-cited in our sample of 450 articles than the others.

Figure 2 – Map of Co-citations of the 450 articles from Web of Science (2001 – 2014)



By the same token, the map enabled us to identify four clusters of works according to the following theoretical lenses: (1) Absorptive Capacity - AC; (2) Knowledge-Based View - KBV; (3) Social Network Theory - SNT; (4) Organizational Learning - OL. In addition to the above-mentioned most cited works on AC, Cluster 1 also includes Lane et al. (2001) and Zahra and George (2002) that are explicitly concerned with AC. Note that Hamel (1991) also happens to be in this cluster, although it does not address AC. However, its OL approach is related to AC, when it highlights the importance of capabilities, especially core competencies and inter-partner learning within strategic international alliances. Cluster 2 includes four works that are clearly KBV. One of them (Lyles & Salk, 1996) also adopts an international perspective.

The SNT cluster - number 3 - consists of only three works, with one (Powell et al., 1996) (SNT & OL) also pertaining to the AC cluster. Note, however, that Dyer & Singh (1998), which emphasizes the importance of adopting a relational view, is shown as overlapping with Powell et al. (1996). This is probably because the relational view and SNT lenses are related (Gulati et al., 2000). The 4th cluster, OL, is composed of 4 works - Kogut (1988), March (1991), Stuart (2000) and Kale et al.(2000) - with the last two also taking a relational view, emphasizing relational capital/resources, as a basis for learning and know-how transfer between partners. March (1991) proposes an EEF to investigate exploration and exploitation in OL, and Kogut (1988) takes a TCE approach when it looks into joint ventures as an instrument for OL, specifically the transfer of organizational knowledge.

Some works that are representative of important theoretical lenses in the AP literature, according to Wassmer (2010), are isolated. This is the case of Williamson (1985) – TCE; Teece et al. (1997) – DC; Barney (1991) – RBV; Eisenhardt (1989) – Agency Theory; Nelson & Winter (1982) – Evolutionary Theory of Economic Change, Porter (1990) – Industrial Organization - IO Theory. Hagedoorn (1993) that investigates the rationale for strategic alliance partnering, criticizing TCE and adopting a more industry structure perspective, is alone in this map between the SNT and OL clusters. Granovetter (1985), the proponent of the "strength of weak ties" hypothesis that draws on SNT and KBV lenses, is also isolated between Porter (1990) – IO, and Barney (1991) – RBV, near the edges of the map.

Qualitative Analysis of the Most Important Articles

The next important result concerned the 13 articles that were selected from our sample of 812, on the basis of a qualitative analysis, in order to find those in the recent literature (2011-2014) that could contribute most to our specific objective of identifying firm IAP/network characteristics that have a positive effect on innovation performance. Note that, although insightful from a portfolio of linkages point of view, none of W.

Vanhaverbeke´s recent articles were selected because we did not find any reference to international alliances in them. Similarly, although relevant to the broader subject of international alliances/networks and innovation performance, none of the articles in JGBAT were selected at this stage because they did not explicitly address the relationship between IAP/network characteristics and innovation performance.

By comparing the works most cited (at least three times) by the 13 articles at issue (2011- 2014 time frame) (39 are listed in Table 4) with those most cited by the 450 articles in Table 3 (2001 – 2014 time frame), we found that 16 of the ones listed in the latter were also most cited by these 13 articles. However, the ranking of most of them changed, with the exception of Cohen & Levinthal (1990) – AC lens, and Powell et al. (1996) – SNT & OL lenses, that continued to be ranked respectively in first and second place. Indeed, Ahuja (2000) – SNT lens, and Baum et al. (2000) – SNT lens, that were ranked respectively in 35th and 23rd place in Table 3, occupy first place in Table 4, together with Lavie & Miller (2008) – AP approach, that did not even appear in Table 3. In second place, one can also find Faems et al. (2005) - AP approach, Uzzi (1997) – SNT lens, and Wassmer (2010) – AP approach.

In fact, the great majority, precisely, 12 out of the 15 best ranked most cited works by the most relevant articles in the 2011-2014 timeframe either adopt a SNT lens or have an explicit AP approach. In addition to those just mentioned, Duysters & Lokshin (2011), as well as Hoffmann (2005) and Jiang et al. (2010) all take the latter approach. Belderbos et al. (2006) do so implicitly when they investigate the performance impact of multiple R & D agreements with different partners.

Table 4 - Most Cited Works by the 13 Most Relevant Articles (2011-2014)

Rank	Publications	Qty.	%	Rank	Publications	Qty.	%
1°	Ahuja, G. (2000) *Administrative Science Quarterly*	6	0,46	16°	Eisenhardt, K. M.; Martin, J. A. (2000) *Strategic Manag. J.*	3	0,23
1°	Baum, J. A. C. et al. (2000) *Strategic Management Journal*	6	0,46	16°	Granovetter, M. (1985) *American Journal of Sociology*	3	0,23
1°	Cohen, W. M.; Levinthal, D. A. (1990) *Adm. Sci. Quart.*	6	0,46	16°	Gulati, R. (1995) *Academy of Management Journal*	3	0,23
1°	Lavie, D.; Miller, S.R. (2008) *Organization Science*	6	0,46	16°	Gulati, R. (1998) *Strategic Management Journal*	3	0,23
5°	Faems, D. et al. (2005) *J. of Product Innovation Management*	5	0,38	16°	Gulati, R. (2009) *Strategic Management Journal*	3	0,23
5°	Powell W. W. et al. (1996) *Administrative Science Quar.*	5	0,38	16°	Hagedoorn, J. (1993) *Strategic Management Journal*	3	0,23
5°	Uzzi, B. (1997) *Administrative Science Quarterly*	5	0,38	16°	Hamel, G. (1991) *Strategic Management Journal*	3	0,23
5°	Wassmer, U. (2010) *Journal of Management*	5	0,38	16°	Hoffmann, W.H. (2007) *Strategic Management Journal*	3	0,23
9°	Belderbos, R. et al. (2004) *Research Policy*	4	0,31	16°	Kale, P. et al. (2002) Strategic Management Journal	3	0,23
9°	Belderbos, R. et al. (2006) *Review of Ind. Organization*	4	0,31	16°	Lane, P. J.; Lubatkin, M. (1998) *Strategic Management Journal*	3	0,23
9°	Duysters, G.; Lokshin, B. (2011) *J. of Product Innovation Manag.*	4	0,31	16°	Lavie, D. (2006) Academy of Management Review	3	0,23
9°	Hagedoorn, J. (2002) *Research Policy*	4	0,31	16°	Lavie, D.; Rosenkopf, L. (2006) *Acad. of Manag. Journal*	3	0,23
9°	Hoffmann, W. H. (2005) *Long Range Planning*	4	0,31	16°	Lavie, D. (2007) *Strategic Management Journal*	3	0,23
9°	Jiang, R. J. et al. (2010) *Strategic Management Journal*	4	0,31	16°	March, J. G. (1991) *Organization Science*	3	0,23
9°	Miotti, L., & Sachwald, F. (2003) *Research Policy*	4	0,31	16°	Nieto, M. J.; Santamaria, L. (2007) *Techonovation*	3	0,23
16°	Anand, B. & Khanna, T. (2000) *Strategic Management Journal*	3	0,23	16°	Rothaermel, F.T.; Deeds, D.L. (2004) *Strategic Manag. J.*	3	0,23
16°	Archibugi, D., Coco, A. (2004) *Technovation*	3	0,23	16°	Sarkar, M.B.; et al. (2009) *Organization Science*	3	0,23
16°	Das, T.; Teng, B. (2000) *Journal of Management*	3	0,23	16°	Tether, B.S. (2002) *Research Policy*	3	0,23
16°	Dyer, J. H.; Singh, H. (1998) *Academy of Management Review*	3	0,23	16°	Wuyts, S. et al. (2004) *Journal of Marketing*	3	0,23
16°	Dyer, J. H.; Nobeoka, K. (2000) *Strategic Management Journal*	3	0,23	Total: 39 Trabalhos			

Regarding the 13 selected articles, it is noteworthy that, where innovation performance was concerned, the majority (7 out of 13) considered not just product innovation but also process and service innovation, and in one case (Costa & Porto, 2014) also new business models (organizational innovation), although most investigations´ results concerned product innovation, and only some were related to process innovation. Several referred to different degrees of innovation, considering different innovation performance levels (Figueiredo, 2011) or radical versus incremental innovation (Beers & Zand, 2014), also viewed in terms of explorative versus exploitative innovation/alliances/knowledge strategies (Duysters & Lokshin, 2011; Leeuw et al., 2014; Pandza et al. 2011).

The great majority investigated technology, R & D or more generally knowledge-intensive alliances/linkages. In fact, most of the sectors studied were high technology ones (ICT, electronics, nanotechnology). One study (Sivakumar et al. 2011) chose the pharmaceutical industry because it is knowledge-based. Investigations at issue in the remaining publications concerned various industries, although in one of these studies (Lião & Yu, 2013), almost half (45.1%) referred to the electronics sector. As noted earlier, four of the 13 selected articles involved emerging countries.

As for research methods, all of the 13 articles, except one, were based on empirical investigations with statistical treatment of data, generally gleaned from secondary databases. The exception was Faems et al. (2012), a conceptual exploration of the connections between AP structure and AP management in their relationship with innovation performance. Two of the four articles on alliances in emerging countries, respectively by Figueiredo (2011) and Costa & Porto (2014), adopted both quantitative (statistical) and qualitative (case study) methods. Lião & Yu (2013), one of the other two articles on emerging countries that stressed the importance of absorptive capacity, used a survey with interviews.

These findings were in line with Faems et al.´s (2012) observations that, "Structural alliance portfolio studies increasingly rely on merging secondary databases… Data on alliance portfolio management, in contrast, are mainly collected by means of surveys among alliance professionals"(p. 260). Regarding dominant theoretical lenses, as was to be expected, and in line with those of the works most often cited by these 13 articles (Table 4), practically all had adopted an explicit SNT or AP approach. The majority also adopted RBV, OL and KBV lenses, and almost half were concerned with AC, with less than half also using the TCE lens. Two studies also drew on Institutional Theory (Pandza et al., 2011; Lião & Yu, 2013) and two others (Jacob et al., 2013; Costa & Porto, 2014) adopted the DC lens, among others.

The most striking finding of our analysis was that the most cited IAP/Net structural characteristic, and practically the only structural one cited in several articles, was that of IAP/Net diversity, also considered in terms of IAP/Net heterogeneity or complexity. Centrality in the network (position construct) was cited merely in one article (Pandza et al. 2011) and portfolio size only in two (Faems et al. 2012a; Leeuw et al. 2014). The network structural characteristic of embeddedness was only investigated in one article (Figueiredo, 2011), which highlighted the positive implications for innovation of dual embeddedness - simultaneously in networks of internal and external relationships - in the case of subsidiaries of MNCs in emerging countries.

The other noteworthy finding concerned the IAP/Net Management dimension, with several of its constructs cited in practically all thirteen articles. AC and prior multiple international alliance experience were the most cited constructs, followed by alliance management and learning capabilities. One article, authored by Cui & O´Connor (2012), stressed resource and information sharing, as well as coordination capabilities. Another less cited but important construct, related to this dimension, was that of governance (Arranz & Arroyabe, 2012).

In Table 5 we provide a succinct summary of some of the most important findings of our in-depth analysis of the 13 selected articles. The IAP/Net characteristics identified as having an influence on innovation are classified according to the proposed IAP/Net key dimensions (see far right column). Note that since the IAP diversity construct – whether functional, geographic or institutional diversity – implies different partner and alliance types, it relates not only to the IAP/Net structure dimension, but necessarily also to the IAP/Net composition (different partner identities and the access these provide to different resources) and the IAP/Net linkage modalities (alliance types) dimensions.

Table 5 – Summary of contributions of 13 most relevant articles

Reference & Theoretical Lens/Focus	IAP/Network Characteristics	Implications for Innovation Performance	IAP/Network Dimensions – (IAP/Net) to which pub. contributed
Duysters & Lokshin (2011)/ AP approach; AC/ Technology alliances International focus	-*Complexity* of IAPs vs local APs, measured by *diversity* of partner types, *geographic scope* (foreign/domestic) *and exploitation/ exploration alliances.*	- IAP Complexity is positive in that greater *diversity* and geographic scope facilitates learning and innovativeness. - There is an inverted U shape relationship between AP complexity and innovation performance. Beyond a certain limit it can be negative. - Larger firms are more likely to have the critical size and absorptive capacity - AC required to form broader APs for innovation.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management
Figueiredo (2011)/SNT/ KBV & RBV (capabilities)/ MNC´s subsidiaries - – Emerging economies	-*Multiple Embeddedness*. – Ex.: Simultaneous embeddedness of subsidiaries in networks of internal and external relationships.	- Embeddedness is positive as it creates trust and because it is a potential source of capabilities. Dual embeddedness of knowledge intensive linkages on part of MNC´s subsidiaries has positive implications for innovation performance. - Depends on capabilities to manage it, including necessary level of absorptive capacity. Different capability levels within the networks generate different innovative performance levels.	-IAP/Net Structure -IAP/Net Management
Pandza, Wilkins & Alfoldi (2011)/ SNT, IT & RBV/ nano-technology research networks	-*Diversity* - Institutional and International; Exploration / Exploitation knowledge strategies. - Position - Centrality	- International collaboration is affected by geographic distance. -At a deeper level, it is affected by institutional and international *diversity* that can be positive for innovation when the firm has the necessary strategic managerial capabilities to deal with the challenges it creates. - Network centrality produces more innovations	-IAP/Net Structure -IAP/Net Compositon -IAP/Net Linkage Modalities -IAP/Net Management -IAP/Net Structure
Sivakumar, Roy, Zhu & Hanvanich (2011)/ TCE, RBV & KBV; not explicit AP approach/ Pharmaceu-tical firms	- Alliance expertise (experience and management of cross border alliances). -Number and *Diversity* (Alliance Partners and types). -Governance (horizontal/vertical JVs & other alliances).	- Alliance experience is positive for innovation. - *Diversity* is negative as it can lead to lesser efficiency. It is positive as it can enhance new knowledge. The mix of partner and alliance types must be carefully managed. - Governance in terms of horizontal vs vertical alliances does not impact innovation. - Alliance partner characteristics (number of alliances and diversity) should be considered holistically, i.e. simultaneously	-IAP/Net Management -IAP/Net Structure -IAP/Net Linkage Modalities -IAP/Net Composition -IAP/Net Management

Arranz & Arroyabe (2012)/SNT, TCE & RBV/10 countries-R&D projects	-Governance Transactional & relational. - Network alliance types and number of partners	- Network Governance mechanisms can influence positively innovation performance by mitigating opportunistic partner behaviour. - Importance of synergistic influence of several network dimensions (process, structure and governance)	-IAP/Net Management -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Structure
Cui & O´Connor (2012)/AP approach, RBV, TCE. AC/ International perspective: Fortune World´s Most admired Cos.- 60 industries	-AP functional heterogeneity; geographic partner dispersion - Alliance management capabilities – resource & information sharing, coordination - Alliance experience	- High partner diversity can be negative for innovation due to high transaction & coordination costs, and reduced AC. - Effective resource & info.-sharing across functions is necessary to reap benefits of resource diversity. - AP composition, alliance mgmt and market environment moderate relationship betw. AP resource diversity and innovation. Effective AP diversity management is stressed. -Alliance experience helps firms overcome lack of AC across diverse functions.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Management
Faems, Janssens & Neyens (2012)/ SNT/AP approach; Contingency theory; OL-Org. design theory, AC/ Concern with int'l partners	-AP structure – size; heterogeneity: different partners, e.g. international/ national; customer/ supplier/rival, resources. -AP management dimensions (levels of centralization, formalization and customization).	-As AP size increases substantially, AC tends to decrease hampering the effective realization of interdependencies among AP alliances. -Engaging in APs that include different types of partners/ resources has significant managerial implications. -AP Management dimensions moderate the relationship between AP structural traits & innovation performance. -Different combinations of AP management dimensions are recommended for different AP structures in terms of size and heterogeneity.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Management
Jacob, Belderbos & Gilsing. (2013)/AP approach/DC/ Technology alliances from international perspective - Developed and Emerging countries	- Geographic heterogeneity/ diversity of IAP – developed and emerging countries. - Prior experience with IAP (region specific partnering experience)	- Geographic diversity is positive for innovation as it increases external knowledge acquisition. - However, there is a risk of opportunistic behavior in international alliances, especially with emerging countries´ partners which can influence negatively innovation. - Since emerging country firms are less often at the frontier of technology development, knowledge is likely to be more applied and related to technology adaptation. - Prior international alliance experience is positive, reinforcing incentives to establish alliances in emerging countries and vice-versa, leading to an increase in IAP geographical diversity that can be positive for innovation.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management

Lião & Yu (2013/OL, AC & IT, not explicit AP approach / International - focus on emerging countries	- Diversity: Local alliances (with geographically proximate firms) vs International alliances; Institutional. - Alliance management/learning capabilities – AC	- International diversity vs local diversity, influences more positively innovation, as it involves informal ties and greater heterogeneity. - Institutional diversity influences differences in levels of absorptive capacity between developed & emerging countries, related to technology gap. -AC has a stronger moderating effect on relationship between local linkages and innovation than for int'l linkages in emerging countries, probably because of limited AC in the latter´s firms.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management
Beers & Zand (2014)/OL, AC/TCE, KBV, AP/ R & D alliances	- Diversity: Functional and Geographic Radical vs Incremental innovation performance - Experience with multiple partners	- Functional diversity leads to a variety of knowledge intake and synergetic effects needed for radical innovation. . Geographical diversity results in successful incremental innovation. - Both geographic and functional diversity increase innovation partnering efficiency - Org. determinants of both kinds of partner diversity are prior experience, patenting, and IT infrastructure.- - Multiple partner type experience avoids pitfalls in new partnerships and improves innovation performance. Experience benefit depends on AC. -AC and learning mechanisms exert a significant impact on innovation performance.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management
Leeuw, Lokshin & Duyster (2014) AP approach, RBV, TCE/ International perspective	- Diversity Partner types, alliance types (different categories of firms), geographical (national vs foreign). - Radical vs incremental innovation: exploration vs exploitation	- Partner diversity as a vehicle to access external-party resources influences positively innovation. - Exploiting synergies and complementarities in AP can lead to superior innovation performance. - Excessive diversity is negative, as it can create difficulties to manage too many new ideas – creates AC problem. - There is an inverted U shaped relationship between AP partner type diversity and radical innovative performance as well as productivity, and a positive relationship with incremental innovative performance.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management
Patel, Fernhaber, McDougall-Covin, Van Der Have, (2014)/ SNT& IB	- Diversity: Geographic (local and foreign network connections)	- Balanced geographic diversity influences positively internationalization of innovation. - At moderate levels of AP internationalization, firm innovation performance increases due to its AC and specialized collaborative routines that support the exchange of valuable network resources.	-IAP/Net Structure -IAP/Net Composition -IAP/Net Linkage Modalities -IAP/Net Management

Costa & Porto (2014)/DC International perspective – emerging country	- Dispersion of Innovation Activities - Dynamic Capabilities - Governance	- High Dispersion of innovation activities influences negatively their performance. - Dynamic capacity to innovate and manage dispersion interactions is critical for innovation in developing countries. Technological Governance affects dynamic capacity.	-IAP/Net Structure -IAP/Net Management

Discussion

The results of our bibliographic research strongly suggest that AP diversity is the portfolio/network characteristic that has been receiving most and increasing attention in AP studies that are concerned with the impact on innovation performance of APs that include alliances with international partners. They confirm what Leeuw et al. (2014, p.1840) had said regarding the fact that the alliance portfolio diversity – "APD concept…has recently received much scholarly attention." Duysters et al. (2012, p.139) even mention the emergence of "a research stream that examines alliance portfolio diversity (APD)."

Apparently, the trend is to extend prior research that associated diversity of international APs or networks with innovativeness (Lavie & Miller, 2008). As Pandza (2011) observed, the most obvious issues in international collaboration "arise from geographical distance between partners, which increases the costs of information transfer …and language differences, which may create information processing difficulties" (p. 479). Hence the emphasis put on distances between countries in international business studies. Johanson and Vahlne (1977) stressed the critical importance of the psychic distance created by different languages, cultures, business practices, etc. However, as Pandza (2011) put it, "on a deeper level, international collaboration is likely to be affected by diverse national, social, cultural and organizational background of international collaborators… (p. 479)." In other words, diversity becomes more important than distance.

In fact, this trend towards focusing on AP diversity sees the benefits of broader AP/networks as outweighing costs and conflicts in IAPs. Beers & Zand (2014) noted that geographic and functional diversity increases the efficiency of innovation partnering strategies by fostering learning cooperation and innovation skills. In part, this explains why around half of European firms´ technological alliances are established with partners outside Europe (Jacob et al. 2013). It is tempting to infer that in the case of IAP/networks, the geographic AP diversity construct is the most critical one. Lião & Yu´s (2013) study showed "that international linkages have a greater impact on firm innovation than local linkages" (p. 811), as they involve informal ties and greater diversity of innovation-related resources.

Yet, research results on the influence of IAP/network diversity have been considered inconclusive (Faems et al. 2012) because of mixed findings. On the other hand, there appears to be a consensus in the literature that, up to a certain optimal point or level, diversity is positive for innovation performance, since different, heterogeneous partners can lead to more new resources and information. After this point, diversity would become excessive, and the high transaction and coordination costs involved in coping with it would outweigh its benefits (Faems et al. 2012). Indeed, "…too much diversity … between the focal firm and its partners hinders the exchange and integration of information and resources" (Leeuw et al. (2014, p 1840). Duysters & Lokshin (2011), for example, investigated the complexity of IAPs, as measured by IAP diversity (partner types, geographic scope, explorative versus exploitative alliance types), and found an inverted U shaped relationship between AP complexity and innovation performance. Similarly, Leeuw et al. (2014) argued that "APD has an inverted U shaped relationship with innovative performance" (p.1841).

Some studies investigated different effects on the two types of innovation performance: radical and incremental. Leeuw et al.´s (2014) study of 102 Taiwanese manufacturing firms operating in China found that while a higher level of IAP diversity was better for incremental innovation, a lower level of IAP diversity was

better for radical innovation, since explorative activity needed to focus on the knowledge base. This focus was less important for exploitative, i.e. incremental innovation.

In their study of the impact of functional and geographical diversity of R&D partners on radical and incremental innovation performance of product innovating firms, Beers & Zand (2014) found that while functional diversity positively influences radical innovation, geographic diversity has a positive impact on incremental innovation performance. "Functional diversity significantly increases the sales of radically new products per employee" (p. 310), because it contributes to complementary knowledge and tacit skills. On the other hand, "geographic diversity is influential to the sales of incremental products per employee" (p. 310) as alliances with different international partners help the firm to better adjust to local markets and standards. They also found that the effects of APD on innovation performance are deeper "in high-tech and knowledge-intensive industries because of higher degrees of product complexity, market volatility, and riskiness/uncertainty of innovation projects in these sectors" (p.310).

Institutional APD is another type of diversity that strongly influences geographic diversity (Lião & Yu, 2013; Pandza et al., 2011). What is critical for innovation is the right mix and balance of different alliance types and partners within the portfolio (Sivakumar et al. 2011), as several studies on network or AP diversity have highlighted (Gilsing et al. 2014; Lahiri & Narayanan, 2013; Lavie & Kang, 2011; Ritala, 2012; Vrande, 2013). Patel et al. (2014) observed that a balance of local and foreign network connections for the development of an innovation helps bring the new product more rapidly into the international marketplace. The importance of a balanced geographic network is increased when the venture´s new product has a high level of innovation complexity and operates in industries with fast "clockspeed" (p. 697).

However, ensuring and managing this balance require specific IAP management capabilities. Practically all important articles in our review addressed the issue of the challenges of managing IAP/networks, and emphasized the need for capabilities to mitigate the negative effects for innovation performance of the great heterogeneity, ambiguity, dynamic shifts and resulting complexity associated with highly diverse IAP/networks. As mentioned earlier, in connection with our study´s results regarding especially the IAP/Net Management dimension, an appropriate level of absorptive capacity and prior multiple international alliance experience were highlighted in the literature. They have indeed been considered fundamental for acquiring the necessary inter-firm learning, as well as knowledge and information sharing skills. Other critical IAP management capabilities mentioned were skills in exploiting portfolio synergies and complementarities and in ensuring IAP coordination and strategic alignment. Costa & Porto (2014) observed that the dynamic capability to manage the interactions of innovation activities that are highly dispersed is particularly important for innovation performance in developing countries.

The critical role of management capabilities in mitigating the negative effects of high APD on innovation has prompted some researchers to formulate hypotheses regarding these capabilities´ moderating role in the relationship between APD and innovation performance. Duysters et al. (2012) whose chief concern with APD performance implications was firm performance, and not specifically innovation performance, formulated hypotheses regarding the moderating role of both alliance experience and alliance/AP management capability on the APD – Performance relationship. In addition, Faems et al. (2012) formulated several propositions regarding the moderating role of what they called AP Management dimensions – formalization, centralization and customization – in the relationship between AP structural characteristics (size and heterogeneity) and innovation performance.

Lião & Yu (2013) highlighted AC as having an especially critical role for innovation, noting that "firms endowed with higher levels of AC will be able to extract greater benefits from external knowledge, and will therefore outperform rivals in innovation activities" (p.813). They assumed that AC had a moderating role in the relationship between external linkages and innovation in emerging countries.

We would like to draw special attention to our findings regarding IAP/Net management capabilities and, in particular, AC, in the case of emerging countries. It is indeed insightful that Lião & Yu (2013) showed that AC has a stronger moderating effect in the relationship between local linkages and innovation, than in the relationship between international linkages of firms in emerging economies and innovation performance. This

weaker moderating effect of AC may have to do with the fact that firms in emerging countries "tend to possess lower levels of AC" (Ibidem, p. 823). The exception would be when both partners are from emerging economies with "more or less similar institutional patterns when it is more likely that there will be some overlap in knowledge stock, technologies, management practices, or norms" (Ibidem, p. 816). It is highly relevant that institutional diversity was found to influence the differences in AC levels between developed and emerging countries.

AC was indeed highlighted as a moderating factor between IAP/networks and innovation by some authors whose research focused on emerging countries. However, in our literature review several authors also took into account other critical IAP/Net management capabilities (IAG Mg Capabilities). We therefore concluded that, even if the focus is on emerging countries, when analyzing the IAP/network – innovation relationship, IAP Mg Capabilities in general, and not merely AC, should be considered as having a moderating role in this relationship.

Propositions and Conceptual Model

Building on the abovementioned findings of our literature review, and considering our special interest in emerging countries, we formulated eight propositions to be tested in future research:

P1. Moderate geographic diversity of IAP positively influences incremental/exploitative innovation performance of firms in emerging countries.
P2. Moderate functional diversity of IAP positively influences radical/explorative innovation performance of firms in emerging countries.
P3. High geographic diversity of IAP negatively influences incremental/exploitative innovation performance of firms in emerging countries.
P4. High functional diversity of IAP negatively influences radical/explorative innovation performance of firms in emerging countries.
P5. A high level of firm IAP Mg Capabilities has a positive moderating role in the relationship between high functional diversity of IAP and radical/explorative innovation performance of firms in emerging countries.
P6. A high level of firm IAP Mg Capabilities has a positive moderating role in the relationship between high geographic diversity of IAP and incremental/exploitative innovation performance of firms in emerging countries.
P7. The moderating role of IAP Mg Capabilities in the relationship between high geographic IAP diversity and innovation performance of firms in emerging countries is negatively influenced by institutional IAP diversity.
P8. The moderating role of IAP Mg Capabilities in the relationship between high functional IAP diversity and innovation performance of firms in emerging countries is negatively influenced by institutional IAP diversity.

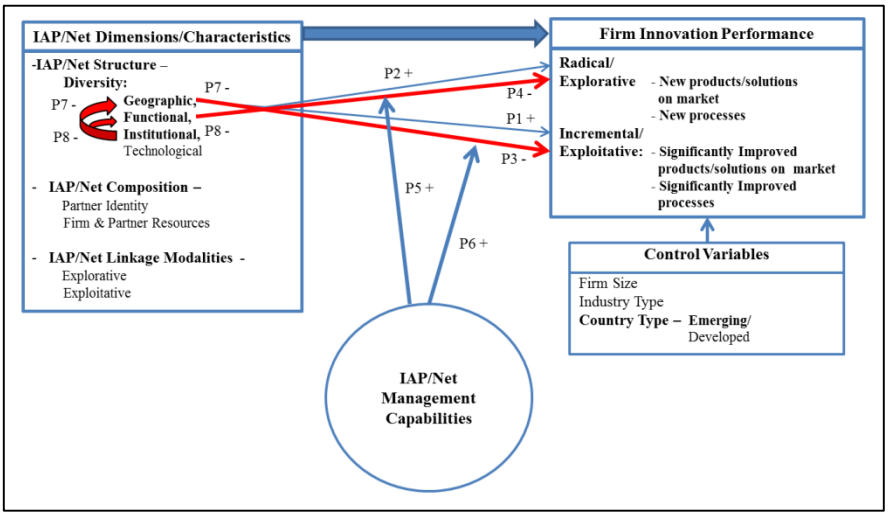
We also sketched a conceptual model for analysing the relationship between most significant IAP/network characteristics and innovation performance where we indicate the more specific relationships and variables at issue in each one of our propositions. The model was based partly on Macedo-Soares´s Global SNA Framework (2011), where the key IAP/Net Dimensions were concerned. Partly, it drew on models or frameworks found in our literature review, namely those developed by Cui & O´Connor (2012), Faems et al. (2010), and Tsai (2009), as well as Duysters et al.´s (2012) research on the AP diversity – performance relationship and AP/Mg Capabilities´ moderating role.

In our model (Figure 3) we highlight, in bold type, in the IAP/Net Structure dimension, the three different types of IAP/Net diversity considered in our propositions – geographic, functional and institutional. Because, as explained earlier, analysing IAP/Net diversity implies taking into account the IAP/Net composition (different partner types providing diverse resources) and linkage modalities (different alliance types, in

particular explorative versus exploitative), these dimensions are also included in the model even if they are not explicitly mentioned in our propositions.

A thick dark line between the two boxes that refer respectively to IAP/Net dimensions and Firm Innovation Performance – radical/explorative or incremental/exploitative - indicates that this relationship is the object of analysis. IAP/Net Management Capabilities was put in a circle between these two boxes to show that it has a moderating role in this relationship. When the propositions concern moderate diversity the lines are thinner (P1 and P2) than when they concern high diversity (e.g. P3 and P4). Positive and negative signs next to the proposition, for example P1 + or P3 - are indicative of the positive or negative influence the IAP/Net diversity characteristic has on innovation performance. In the case of P5 and P6 the signs are positive so as to indicate that in these propositions the moderating role of IAP/Net Management Capabilities is a positive one. In the case of P7 and P8 the signs are negative because in these propositions the moderating role of IAP Mg Capabilities in the relationship between respectively IAP/ geographic and functional diversity and innovation performance is negatively influenced by institutional diversity. A thick line starting from institutional diversity with an arrow pointing respectively to functional and geographic diversity indicates this influence. A box referring to control variables was put below the firm innovation box. Emerging country type is highlighted in bold because the focus is on emerging countries.

Figure 3 – Conceptual Model for Analysing IAP and Innovation Performance



RECOMMENDATIONS FOR MANAGERS AND FINAL CONSIDERATIONS

In spite of certain limitations, we believe that our research has contributed to the relatively new stream of investigation on IAP/network characteristics and their implications for innovation performance. Specifically, where emerging countries are concerned, it highlights the importance of different types of IAP diversity and how institutional diversity can affect the moderating role of IAP/Mg capabilities in the relationship between geographic and functional IAP/Net diversity and innovation performance. The bibliographic study provided the basis for a model to help test propositions regarding the relationship at issue with a view to contributing to a more effective management of innovation-oriented firms that have partners in emerging countries. Indeed, our research findings have some important managerial implications that prompted us to make the following recommendations that we believe are especially useful for managers of strategically innovation-oriented firms whose IAP´s include partners from emerging countries.

1) In order to obtain satisfactory innovation performance through their IAP/networks, managers should ensure a fairly high level of IAP/network diversity, avoiding, however, an excessive level of diversity - geographic, functional and institutional. More precisely, managers should guarantee that the IAP/network for leveraging innovation performance has the right mix and balance of different types of alliances and partners, notably of local and foreign alliances, and of foreign partners from geographically different countries/regions with distinct institutional contexts, and of different functional alliances. This is all the more important in highly dynamic sectors and turbulent environments.
2) Depending on the type of innovation performance aimed at – radical/explorative or incremental/exploitative, managers should give priority to, respectively, functional or geographic IAP/network diversity.
3) To ensure the optimum level of IAP/network diversity and desired balance of different types of alliances in the IAP/network, managers would need to develop and leverage IAP Management Capabilities that are appropriate in the light of their different institutional contexts. When the IAP/network involves alliances/partners from emerging countries, and to mitigate eventual negative effects of IAP/network diversity, high levels of absorptive capacity, in association with learning capabilities, are especially important, but also dynamic capabilities, as well as skills in information sharing, in exploiting portfolio synergies or complementarities, and in coordination and strategic alignment of the IAP/network.

The main limitations of our research stemmed from the bibliometric method and computational resource limitations. Deeper qualitative analyses of a greater number of works in a wider time-frame and from more databases could provide more fine-grained findings on research into IAPs and IANs and innovation. In addition, we recommend that the testing of our propositions be complemented by qualitative analyses, such as, for example, case studies of the firms investigated, that enable a more comprehensive understanding of the interactions between the critical factors at play in the relationships between different types of IAP diversity and innovation performance. Several authors in our review stressed the importance of taking a holistic approach, understanding interdependencies and the simultaneous synergistic effects of several critical factors and network dimensions in analyses of the impact of IAPs/networks on innovation performance (Arranz & Arroyabe, 2012; Cui & O´Connor, 2012).

Given our interest in innovation-oriented firms with partners in emerging economies, due to the latter´s growing importance as players in the IAPs of both developed and developing countries, we recommend further investigations focusing on these economies. We suggest, moreover, that these include comparisons between IAPs of innovation-oriented firms in Latin America and those of similar types of firms in Asia.

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NETWORKED SERVICES OUTSOURCING FOR SMALL BUSINESSES: A LIFECYCLE APPROACH

Gokhan Gercek, Naveed Saleem, and Douglas Steel

ABSTRACT

Networked services such as computer networks, network applications, and data communications systems may take up a significant share of the IT budget of a small business; therefore, outsourcing these services may provide an economical alternative to operating them on the small business premises. While a small business may benefit more from IT outsourcing in today's environment, it is also more vulnerable to a failed outsourcing endeavor due to the lack of adequate understanding of the dynamics and specifics of the outsourcing process. The existing IT literature is deficient in providing practical guidelines and methodologies to help a small business manager gain a conceptual understanding about the outsourcing process and the specific activities and tasks to be executed during the outsourcing process. Based on project management concepts and constructs, this paper presents a lifecycle approach to help a small business manager successfully outsource networked services in a systematic manner.

Keywords: IT Outsourcing, Small Business Outsourcing, Networked Services, Contracting, IT Outsourcing Life Cycle

INTRODUCTION

Computer networks, network applications and networked services represent strategic IT infrastructure components in business settings. Given the growth in data communication capabilities and complexities, rising network security threats, higher IT performance expectations and ever increasing application portfolios, it stands to reason that IT costs constitute a significant portion of the organizational budget and these costs are an ever growing part of the overall organizational budget. A small business, with a yearly total budget of a few million dollars, cannot have its IT budget exceed a few hundred thousand dollars. While IT infrastructure and resources can provide a strategic edge to a small business, they can also pose significant budgetary and technical challenges in maintaining them (Barau, Konana, Whinston & Yin, 2001). Outsourcing IT infrastructure and resources is becoming an increasing popular approach to contain this challenge (Gartner Forecast Analysis, 2012).

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This paper primarily addresses the outsourcing of an important portion of IT services called networked services, which include services such as computer networks, business and network applications, and data communication systems for small businesses. Networked services constitute a common core of many small businesses. Although there is not a widely accepted definition of what a small business is, small and medium size enterprises (SME) are often considered as organizations with 500 employees or less (Brown & Wiele, 1998). The methodology described in this paper is intended for such businesses. In general, outsourcing involves using external resources to perform operational tasks (Grover, Cheo &Taeng, 1994).

OUTSOURCING NETWORKED SERVICES FOR A SMALL BUSINESS

Networks and networked services are no exception to the ever-growing outsourcing trend in the IT industry. According to a recent forecast by Gartner, IT outsourcing, with Network Outsourcing as an important component of it, is expected to grow at a rate of 5.9% from 2012 through 2016, from $251.7 billion to approximately $316.5 billion (Gartner Forecast Analysis, 2012). Networks and Networked Services, being among the most commonly outsourced IT services, are also expected to undergo a comparable growth rate. Growth of IT outsourcing encompasses businesses of varied sizes. According to a survey, there are more small IT departments than medium and large departments (Fish & Seydel, 2006).

It is possible to analyze networked services in four distinct categories: (1) Networks and Networked Systems, (2) Communications Systems, (3) Remote Connectivity Systems and (4) Physical Support Assets. The first category includes network connectivity systems, such as routers and switches, network security systems and network traffic provisioning systems. The second, communications systems, includes telephone systems, line-of-sight microwave and wireless connectivity systems, and analog and digital leased lines. Remote connectivity systems are used to connect a remote network or a computer to the main business office. The third, physical support assets, includes assets that provide housing to services described above. It should be noted that some or all of the services described above can be targets of outsourcing for a small business.

LIFECYCLE APPROACH TO SMALL BUSINESS NETWORKED SERVICES OUTSOURCING

Outsourcing of networked services can easily become a daunting challenge for a small business (Koh, Ang and Detmar, 2004; Levina & Ross, 2003). Poorly managed outsourcing activities are quite likely to yield unsatisfactory results and may cause significant monetary and goodwill losses (Willcocks, Hindle, Feedny & Lacity, 2004). A small business contemplating the outsourcing of its networked services should follow a methodology comprised of well-defined steps, such as the lifecycle methodology, for the management of outsourcing activities, as it can relieve the small business from potential outsourcing mistakes and losses associated with those mistakes. An IT outsourcing lifecycle can be examined by using different terminologies and lifecycle phases (Cullen, Sedden, & Willcocks, 2005; Zeng, Zhen-Xiang & Chun-Ping, 2007; Weimer and Seuring, 2008). While some researchers use a three-phase approach (Chou & Chou, 2009), others use a four-phased approach in outsourcing activities (Cullen, Seddon & Willcocks, 2005).

This paper employs a four-phase outsourcing model: (1) feasibility analysis of outsourcing, (2) contracting for outsourcing, (3) transition from insourcing to outsourcing, and (4) governance and continual service improvement (CSI) of outsourcing. These phases will be referred to as Feasibility Analysis, Contract Development, Transition Management, and Governance and Continuous Service Improvement phases during the remainder of this paper. Subsequent paragraphs describe important aspects of each phase and present guidelines for a small business manager who is considering outsourcing.

Feasibility Analysis

Outsourcing of IT services is not a panacea for an organization. The purpose of the feasibility analysis is to examine the catalysts for outsourcing and thereby determine whether outsourcing is justified for the small business and, if so, which parts of networked services should be outsourced. In short, feasibility analysis attempts to answer the question of why outsourcing is needed and if so which networked services should be outsourced. Reasons to outsource networked services for a small business may be varied. However, the cost savings that might result from outsourcing activity is the most commonly cited reason for outsourcing (Lewing & Peters, 2006). A small business can achieve cost reduction from outsourcing in three possible ways: (1) in the form of movement of certain capital expenditures to revenue accounts as part of the revenue expenditure on the outsourced service, (2) salaries moving from the wages account to the outsourced expenditure account or (3) change in the cost structure from variable cost to fixed cost (ITGI, 2005). As will be explained shortly, strategic innovation and competitive advantage improvements can also be important considerations in outsourcing decisions (Elango, 2008).

The first step in feasibility analysis is the strategic assessment of the business and business objectives of the small business. For this purpose a small business should address six key questions from a strategic perspective to decide whether outsourcing will be beneficial for the organization (Lacity & Willcocks, 2001; Franceschini, Galleto, Pignatelli, & Varetto, 2003):

1. Financial Restructuring: Does outsourcing enhance the firm's financial position while reducing or containing costs?
2. Core Competence: Can outsourced services enhance a firm's core competencies?
3. Technology Catalyst: Can outsourcing improve flexibility in technology to underpin a firm's strategic direction?
4. Business Transition: If organizational change is a consideration, can outsourcing facilitate such a change?
5. Business Innovation: Can outsourcing assist to innovate processes, skills and technology to achieve competitive advantage?
6. New Market: Will a joint venture with an IT provider assist a company's strategic direction?

As the second step into feasibility analysis, the small business must address some key questions with regard to technical and operational reasons for outsourcing. These questions include: (1) What are the problems, and issues behind outsourcing considerations; (2) What are the key constraints for outsourcing; (3) What are the business objectives and benefits; (4) Is the entire business in alignment with outsourcing considerations; (5) What are the short and long term costs; (6) What are the service quality expectations; and (7) How much risk the business can tolerate (Douglas & Scott, 2005). The third step of the feasibility analysis follows if the first and the second steps analyses yield favorable outcomes. This step should include communication with all the stakeholders of the networked services about the prospect of outsourcing. Consequently, forming a team that includes all stakeholders in outsourcing is important in feasibility analysis. As the fourth and the last step, a networked-services asset discovery and inventory baselining should be conducted. The networked services asset discovery enables identification of networked services hardware and software elements as well as the configuration information for those elements. The discovery should be followed by the creation of a network service inventory baseline. The inventory baseline can assist in identifying networked services that are most viable for outsourcing. It may also be used during the contract phase to create a skeleton contract.

Contract Development

The contract development phase is undertaken once the feasibility analysis phase concludes that outsourcing is a viable option for the small business. Successful outsourcing requires that a formal relationship be established and managed between the client and the service provider through an outsourcing contract. This contract provides the foundation on which the service provider and the customer can build a lasting relationship. It defines the expectations, responsibilities, liabilities and course of actions to be taken in case of a dispute, between the client and the provider, with respect to the outsourced services.

There are three primary reasons for having a formal outsourcing contract: (1) it serves as a base for contract negotiation, (2) it is a working document to assist governance during the operational phase of outsourcing, and (3) it delineates the rights and responsibilities between the provider and the small business with respect to the outsourced services (Burnet, 2009). An outsourcing contract includes matters such as expected service levels, key performance indicators, service metrics, service pricing, staffing, warranty, intellectual property matters, information security, reporting, and procedures for contract amendment. This contract becomes the primary mechanism for outlining and describing the networked services that will be outsourced and delivered by the provider (Lacity & Hirschheim, 1993). In developing an outsourcing contract, the small business must ensure that its expectations are comprehensive, but realistic in terms of service coverage and service quality (Sharma, Rajasekaran & Sharma, 2011; Beulen, & Ribbers, 2003). Since a contract cannot cover every detail, it is advisable to include procedures on handling future changes and amendments to it (Gietzmann, 1996).

The contract development phase constitutes three main activities: (1) contract planning, (2) contract negotiation and (3) provider selection. The planning activity involves preparing for the contract. A contract team should be formed at the beginning of this activity that includes the stakeholders identified in the feasibility analysis phase, as well as outside technical and legal assistance. Particularly, legal assistance must be sought on issues such as intellectual properties, use of open-source software, and technology import and export. Another important task within this activity is to create a portfolio of existing networked services; the asset discovery from the feasibility analysis phase can be employed as the starting point towards this end. The networked services portfolio should become the basis for planning, discussing and subsequently negotiating for the service levels required for each networked service. The portfolio of networked services should define required service levels and expected metrics for the services. Service levels typically include technical aspects of a service such as expected availability, reliability and performance characteristic of each service. Additionally, the governance of outsourcing should also be part of the planning deliberations. The information gathered here provides valuable input into finalizing service level agreements (SLA) in the contract negotiation step. Furthermore, a survey of vendors is conducted as part of the planning process to determine potential outsourcing providers. The planning activity should result in a skeleton contract to form a basis for contract negotiations (Lee, 1996).

The contract negotiation forms the second step of the contract development activity. Here, the potential vendors identified in the first step should be invited to discuss and negotiate outsourcing alternatives. Negotiations may take place with several of them simultaneously. Contract negotiations include the business aspects of the contract such as duration, outsourcing provider responsibilities, small business responsibilities, intellectual property, software licensing, staffing, termination, warranties, indemnities and limits for liability, and change control. It also includes technical issues such as service level agreements, security issues such as confidentiality of small business data, audit requirements, continuity of service and disaster recovery. In evaluating the potential providers, a small business may seek to get information from other businesses that have had dealings with these providers (Michela & Carlotta, 2011). Subsequently, a small business may extend an invitation to bid to selected providers. Relevant details about the services under consideration and expected performance metrics must accompany the invitation, to ensure that potential providers present fair and reliable bids. It is also advisable that the invitation includes questions about the provider's experience, qualifications, compatibility, staffing, flexibility, costs and financial viability (Burnet, 2009). During this negotiation, the formal request for information (RFI) and request for proposal (RFP) processes may be followed to disseminate and acquire information. The third and final activity in the contract development phase involves carrying out a thorough comparison of the offers submitted by the interested providers and selecting the provider that best matches the requirements and expectations of the small business. Given that this comparison and evaluation can be complex and difficult, it is advisable to employ a systematic approach in undertaking this task (Ya-Ti, Chia-Li, Hsiao-Cheng & Gwo-Hshiung, 2013).

Transition Management

Transition management is a critical and important technical activity in networked services outsourcing which involves transitioning of networked services from small business premises to provider company facilities in a specified time duration. In many cases, continuity of the existing networked services during the

transition is required to provide uninterrupted computing support to the operations of the business, as the interruption of these services could prove very costly to the business. Poor management of the transition phase may easily result in disrupted services, delays and monetary losses. The transition activity should be best treated as a project and conducted per project management guidelines (Cicmil, Williams, Thomas & Hodgson, 2008). Key transition management activities include the following: (1) Transition Planning, (2) Design, Development and Configuration of Networked Services, (3) Testing and Acceptance of Services, (4) Communication, Preparation and Training for Transition, and (5) Deployment.

As the first step in the transition management phase, the small business management should appoint a competent team that would monitor and manage the transition from the existing, in-house networked services to the outsourced networked serviced. Just like any other project, this activity should include identification of transition activities to be undertaken, any specific skills and expertise required to complete the identified activities, and the schedules for the completion of these identified activities. The project manager should be responsible for the smooth transition of services and perform the important function of the information center for project communications and flow of communication (Larson & Tompkins, 2005). Timely and unequivocal communications hold the key to the success of this phase (Shi, Kunnathur, & Ragu-Nathan, 2005). Communication includes coordination and information flow among all the stakeholders within the small business, the provider company, and any other pertinent parties, which ensure participation by all stakeholders and thereby enhances the likelihood of successful transition to outsourced services (Lewis, 2006).

In the IT industry, a common framework to manage change is described by IT Service Management (ITSM) guidelines as advocated by the Information Technology Infrastructure Library (ITIL) (Hochstein, Zarnekow & Brenner, 2005). The ITIL framework provides valuable guidelines for various aspects of IT management including change and release management (Galup, Dattero, Quan, & Conger, 2009). As defined by ITIL, change and release management involves use of standardized methods and procedures for efficient and effective handling of changes to IT services to minimize the impact resulting from the current and future changes. The change management processes described by ITIL for service transition lend themselves nicely to networked services transition management.

Drawing on these standard methodologies and procedures utilized in the IT industry will reduce the likelihood of negative occurrences during the transition process. Key transition management activities include the following:

1. Networked Services Transition Planning: This activity develops a plan for the transition as to how the services will be built, tested and implemented.
2. Design, Development and Configuration of Networked Services: Hardware and software components are assembled in a controlled environment at the provider premises for testing prior to deployment.
3. Testing and Acceptance of Networked Services: The Testing and Acceptance include the functional testing of hardware, performance testing, integration testing and back-out plan testing.
4. Rollout Planning of Outsourced Networked Services: Rollout planning involves defining the processes that will be utilized during the deployment of the networked services in the provider environment.
5. Communication, Preparation and Training for Transitioning: Stakeholders should be informed about the deployment schedule, and all personnel preparation and training be carried out for the deployment of networked services.
6. Deployment: The deployment of the networked services consists of a distribution phase where the services are moved to target locations and actually deployed.

While change management is an oversight activity for the change process, release management is about implementing the change. Change management is more about managing the change than implementing the change, and therefore, requires thoughtful planning. Release management involves all the activities about implementing the changes related to transition of services. The transition phase of networked services outsourcing constitutes a significant change for a small business; consequently, it should be carried out by drawing on the methodologies and procedures for change and release management within the scope of ITSM. Following this phase is governance and continuous service improvement, described in the following section.

Governance and Continuous Service Improvement

For a small business, outsourcing of networked services to a provider should not mean a complete disassociation from the management of those services. Just as with any other such contract, outsourcing requires close monitoring of the services received from the provider company. The purpose of outsourcing governance is to manage the outsourcing process/relationship between the small business and the provider company to achieve the desired objectives of outsourcing. As stated by the IT Governance Institute,

> "Governance of Outsourcing is the set of responsibilities, roles, objectives, interfaces and controls required to anticipate change and manage the introduction, maintenance, performance, costs and control of third-party-provided services. It is an active process that the client and service provider must adopt to provide a common, consistent and effective approach that identifies the necessary information, relationships, controls and exchanges among many stakeholders across both parties" (ITGI, 2005).

Governance activities are intended not only for assuring that services are provided according to contract specifications but also for the opportunities for improvement of services. In this respect, governance of outsourcing activities should be closely tied to the continuous service improvement (CSI) activities. While feasibility analysis, contract, and transition phases exhibit the characteristics of projects, the governance of outsourced networked services phase is an ongoing process wherein participation by both the small business and provider is required. Therefore, it is fair to say that, in outsourcing, it takes two to govern (Gewald & Helbig, 2006). The IT Governance Institute identifies the following as important governance activities: (1) inclusion of an explicit governance schedule to the contract; (2) identification and management of all stakeholders, their relationships and expectations; (3) establishment of clear roles and responsibilities for decision making, issue escalation; dispute management, demand management and service delivery; (4) continuous evaluation of performance, cost, user satisfaction and effectiveness; and (5) ongoing communication across all stakeholders (ITGI, 2005).

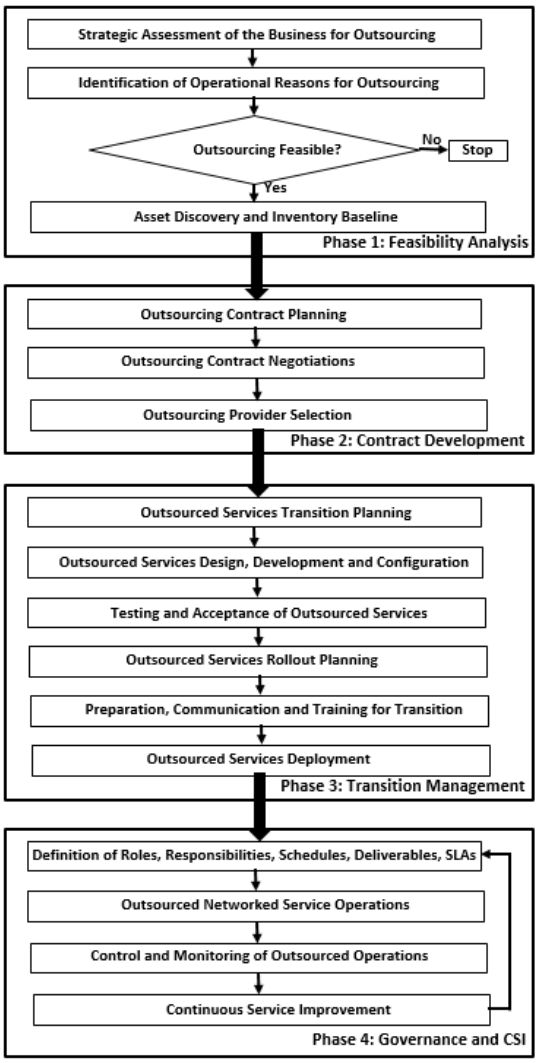
Governance activities can borrow management concepts from ITIL just as transition activities do. In particular, governance of networked service outsourcing shows significant parallelism to the ITIL Service Operation phase (Steinberg, 2011). ITIL Service Operation includes a number of management processes and functions. The processes include the following: (1) event management; (2) incident management; (3) request fulfillment; (4) problem management; and (5) identity management. The functions in this phase include: (1) technical management; (2) application management; (3) operations management; and (4) service desk functions. An important part of the governance activity is monitoring key operational and performance metrics associated with the services provided by the vendor. The details of management activities and various metrics should be included as part of service level agreements (SLA). SLAs should be clearly delineated in the outsourcing contract. SLA coverage includes, but is not limited to, items such as, agreed service hours, response times for users, incident statistics, resolution statistics, targets values for service availability, security and continuity, critical business periods and handling of holidays, business seasonality, charges and security.

As in any service, networked services outsourcing should also be subject to a continuous service improvements (CSI) process, which involves improvement of the quality of networked services, where "quality" is defined as meeting or exceeding small business' expectations. CSI aims to align IT services to changing business needs by identifying and implementing improvements to the IT services that support the business processes (Lloyd, 2011). CSI is achieved primarily by monitoring key performance indicators (KPI) which should be defined in SLAs during the contract negotiation phase. While the governance process is expected to ensure that KPI targets are met, improving on those targets is the responsibility of CSI process. Tracking KPIs allows a business to reach quality targets such as six sigma (Deshmukh & Chavan, 2012; Malik & Blumenfeld, 2012). It should be noted that, CSI is not only about improvement of the services but also improvement of support processes for those services.

OUTSOURCING MANAGEMENT FRAMEWORK

The outsourcing lifecycle phases and activities presented in this paper can also be illustrated as a flowchart-based framework to assist a small business manager to (1) develop a conceptual view of the outsourcing process and (2) gain understanding of the phases and activities involved in the outsourcing process. Figure 1 below presents this framework. This framework can be adopted as a "divide and conquer" methodology by small business managers in managing the outsourcing activities of their businesses. Likewise, it can provide a context to facilitate the interaction between members of the teams charged with the responsibilities to make decisions about specific aspects of the outsourcing process. It is stressed that each activity depicted in the framework flowchart below is described in detail in its respective section in this paper. A small business manager who is particularly interested in details of a specific phase and activity is encouraged to read the relevant sections of this paper and references cited in that section for further insight into the matter of interest.

Figure 1: Outsourcing Management Framework for Small Business Managers



CONCLUSION

Outsourcing the networked services of a small business is a multi-faceted task that demands clear understanding of the need for outsourcing, context and parameters of the networked services under consideration for outsourcing, careful planning for various phases and activities of the outsourcing process and precise execution of the plans developed for outsourcing of networked services. Consequently, a systematic approach to outsourcing is important in reducing the risk of failure and improving the quality of outsourced services. Such an approach is particularly important for small businesses, because while they are better candidates to benefit from outsourcing, they also stand a higher risk in having failed outsourcing endeavor due to lack of resources, expertise and methodology to achieve efficient and effective conduct outsourcing activities.

This paper presents a lifecycle approach to outsourcing of networked services. This approach entails the following sequential phases: (1) Feasibility Analysis, (2) Contract Development, (3) Transition Management, and (4) Governance. Each of these phases constitutes specific activities that must be completed before moving on to the next phase. Feasibility Analysis examines the factors driving the outsourcing, in order to determine whether or not outsourcing is justified for the small business, and identifies IT services that are most viable for outsourcing. The second phase, Contract Development, involves development of a written contract that clearly defines the expectations, responsibilities, liabilities and course of actions to be taken in case of a dispute. This contract essentially becomes the key mechanism for receiving services the small business expects from the provider. The third phase, Transition Management, entails transitioning of the networked services from the small business to the provider in a specified time duration. This phase is consequential, because poor transition management can easily result in disrupted services, delays and monetary losses. An important part of this phase is determining whether the current networked services will need to be continued uninterrupted. Given the significance of this phase, it may be advisable to form a team with a competent leader to closely monitor and manage the transition phase and ensure its success. Governance and Continuous Service Improvement, the fourth and final phase of the outsourcing lifecycle, constitutes management of the outsourcing process/relationship between the small business and the provider company to achieve the desired objectives of the outsourcing. Contrary to the others, this phase entails an ongoing process in which the small business and provider work together to ensure that the outsourced networked services are operating as expected, as well as that it evolves in response to the changing business needs and environment. Thus, equipped with a clear conceptual view of the outsourcing process and knowledge of the specific tasks to be addressed and outcomes to be achieved in each phase of the outsourcing process, a small business manager should be able to confidently undertake and successfully complete outsourcing of networked services employed by the organization.

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MANAGING HUB AND SPOKE NETWORKS: A MILITARY CASE COMPARING TIME AND COST

Joseph B. Skipper, William A. Cunningham, Christopher A. Boone, and Raymond R. Hill

ABSTRACT

Demanding business and operational environments often require firms to question the effectiveness and efficiency of their organizational processes and structures. A key organizational structure that requires continuous monitoring and assessment is the distribution network. Thus, it is critical that managers have the ability to quickly and accurately assess alternative network designs. In this paper, the researchers propose the use of a Multiple Objective Linear Programming (MOLP) model to analyze optimal hub locations using a military based example and data. The mathematical representation of the network is created, implemented in Microsoft Excel, and instantiated with realistic data. MOLP techniques are used to determine the trade-offs between the two key network constructs, delivery time and cost. Thought presented here in a military context, the researchers believe the proposed model-based analytical methodology for assessing network designs has much wider application and represents a means for both military and non-military decision makers to 'what-if' multiple network design scenarios when time, cost, or both are of primary concern.

Keywords: Supply Chain Management, Logistics, Distribution, Network Design, Hub and Spoke, Multiple Objective Linear Programming

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INTRODUCTION

Supply chain management by definition is a complex endeavor requiring the integration of key business processes from the end-user through the original supplier (Lambert, Cooper, & Pagh, 1998). Managing this complexity while achieving supply chain efficiencies is especially challenging (Blecker, Kersten, & Meyer, 2005). One of the most challenging aspects for managers is the design of the logistics network (Manzini, Accorsi, & Bortolini, 2014). As demand patterns change so to must the networks required to efficiently satisfy those demands. Thus, managers increasingly need tools and methodologies to help them quickly evaluate and select the best network options. This need for tools and methodologies to quickly assess network designs served as the motivation for this research. More specifically, this study examines the use of an optimization-based methodology to assist managers in assessing facility location options. Facility location decisions are a central issue in the design of all logistics distribution networks.

To be useful for managers, any tool or proposed methodology must accommodate multiple objectives. Thus, the multiple objective linear programming (MOLP) approach seems well suited to the task. The MOLP approach examined here considers network cost and time individually, or in combination providing managers the ability to quickly complete an initial network analysis and consider the trade-offs of available options.

To explore the effectiveness of the proposed MOLP approach, this paper will utilize it to examine facility location options for a military logistics distribution network. While both military and for-profit businesses seek distribution network designs that reduce cost and/or time required to provide or receive supply, the military decision maker faces added challenges. For example, logistics networks supporting a traditional retail operation remain relatively stable for extended periods of time, while networks supporting military contingencies and humanitarian relief efforts require logistics networks be designed, established, and retired with little to no notice. Thus, military supply chain managers increasingly value tools and methodologies for designing efficient and effective logistics networks. If shown to be effective in the military environment, the proposed MOLP approach is certain to have implications that extend well beyond. In fact, a number of studies (Boone, Craighead, Hanna, & Nair, 2013; Russell & Saldanha, 2003; Skipper, Bell, Cunningham, & Mattioda, 2010) highlight the point that as the private sector is forced to deal with challenges similar to those found in the military, firms should look more often to leverage the experience of the military when selecting supply chain practices and strategies.

THEORETICAL PERSPECTIVE

One key lesson firms can glean from the military is to value the distribution network as a key resource and means by which one can gain a competitive advantage. This ideal is further highlighted by resource orchestration theory which seeks to explain how firms can use their assets, or resources, more effectively (Simon, 2010; Sirmon, Hitt, Ireland, & Gilbert, 2011). The theory posits that whether or not an organization has all of the resources that it may need, it is more important to examine how the resources are managed (Ketchen, Wowak, & Craighead, 2014) across time as internal and external environments change (Sirmon & Hitt, 2009). Because the distribution network can have such a significant impact on the organization's performance (Chopra, 2003), and the network itself can provide a competitive advantage (Liotta, Stecca, & Kaihara, 2015), the network is a resource (Ndofor, Sirmon, & He, 2011). Organizations that manage and utilize this resource more effectively should develop a competitive advantage.

BACKGROUND

Increasing the efficiency and effectiveness of the distribution network is a key objective of the military. A reduction in materiel inventory and increased operations tempo drives the requirement for improved time definite delivery and increased effectiveness of the system. However, these two considerations often directly conflict with one another. There are many options available in the design of a distribution system. These range from direct delivery to a fully developed hub-and-spoke system (Azadian, Murat, & Chinnam, 2015; Schatz, 2000). These options are mathematically modeled as the facility location or the combined location problem (Bruno, Genovese, & Improta, 2014; Campbell, 1990, 1994; Laporte, 1992).

Direct Delivery

The direct delivery method of cargo distribution involves the movement of cargo (mixed or single type) from an origin to a destination. This method has the advantage of speed and in-transit visibility; however moving directly to the point of use usually results in less-than-full loads, entails the inefficient use of assets and is extremely costly (Cox, 1998; Lin, Lin, & Lin, 2003). Direct delivery also places military transportation assets and personnel in locations where the risk of loss may be high; for instance strategic airlifters would deliver cargo and personnel to the destination, often flying and landing in areas that may place the asset at risk (Bullard, 1985; Simpson, 2002).

Hub-and-Spoke

The use of hubs, or transshipment nodes, allow the construction of a network where large numbers of direct connections are replaced with fewer indirect connections centralizing the routes (O'Kelly, 1986; Yoon & Current, 2008; Zheng, Meng, & Sun, 2015). As with US domestic air carriers, cargo and personnel are moved from outlying areas to a central point and then to a final destination. Hub-and-spoke configurations reduce and simplify network construction costs, centralize handling and sorting, and allow transportation providers to leverage economies of scale through consolidation of flows between network nodes. The use of a major hub, or many hubs depending on the size of the market, enables a carrier to reduce fuel and labor expenses and allows for more flexibility in scheduling flights (An, Zhang, & Zeng, 2015; Carlsson & Jia, 2013; Stock & Lambert, 2001). The hub-and-spoke network design problem involves determining the route structure between nodes, and the placement of the hub.

When considering a hub-and-spoke network, three critical design questions are considered: (Correia, Nickel, & Saldanha-da-Gama, 2011; O'Kelly & Miller, 1994)

a. Are the nodes in the network assigned exclusively to a single hub?
b. Are direct node-to-node- linkages permitted to bypass the hub facilities?
c. Are the hub facilities fully interconnected?

In the military case, cargo is often moved to a centralized point referred to as an Aerial Port of Embarkation (APOE). The cargo is then transported to a hub in the deployed theater, an Aerial Port of Debarkation (APOD), and then parsed out for final delivery to the final destination, commonly referred to as a Forward Operating Location (FOL). While the nomenclature is different, this is very similar to processes found in many commercial distribution networks where cargo, or products, are moved from a manufacturer to a distribution center(s) and ultimately parsed to retail locations for purchase by the consumer. Due to political, fiscal, and policy constraints the military uses a single hub for peacetime supply and resupply efforts. From a fiscal standpoint, a single hub minimizes equipment and personnel requirements while simplifying network design. From a political and policy standpoint, there are often limitations or restrictions on the number of locations available for us, making multiple hub options impossible even if desired.

Node-to-node linkages are allowed for missions involving other than routine deliveries, but are minimal in number and are used primarily for repositioning equipment and personnel as needed. While the node-to-node linkages are required for very large cargo and personnel movements, they are not used as a matter of routine. Typically, direct delivery to and from a node occurs before a network is established or when significant changes in demand call for a significant change in network design.

Once a hub is selected, multiple modes of transportation (air, water, land, or rail) are used to meet operational requirements to move the cargo to where it is needed. As demand patterns arise, schedules are developed and assets are moved into place to meet those demands. At this point, the hub is fully connected to demand locations and to support locations. The airlift component of this configuration has aspects unique to the military. The military uses larger airlifters (categorized as strategic assets) to move materiel into the APOD. Smaller airlifters (categorized as tactical assets) are then used to move the materiel to the FOL. Since this delineation of assets is well established, this research does not consider any tradeoffs among the asset mix in this model.

Facility Location Problems

The Facility Location Problem seeks those hub locations to best serve customers (based on some defined objective). Typical business examples include warehouse locations and distribution center locations, while examining how end points (retail locations, production facilities, etc…) are served. The objective of these models is to minimize some cost of servicing the locations. These costs often include transportation between the nodes in the network (Anthony, Goyal, Gupta, & Nagarajan, 2010) and any interactions with other facilities. According to Campbell (1994), this type of problem is classified by the way in which demand points are assigned, or allocated, to the hubs. Each node may have its own servicing hub, the single allocation approach, or a node may be serviced by multiple hubs, the multiple allocation approach.

Air transport hub location research has focused on the civilian airline system and the small package delivery industry (Campbell, 2009; Gavriliouk, 2009; O'Kelly, 2009). These hub location models assume that passengers, or cargo, move among the various destinations in multiple directions. In the civilian marketplace most nodes serve as both point of origin and destination. In military scenarios, the origin and destination are distinct with unidirectional flow of cargo and personnel with minimal backhaul, thereby complicating the application of civilian models. While logical for transportation assets leaving a FOL to return to the hub, likely carrying materiel versus traveling empty, this reverse logistics aspect does not impact the hub location problem considered here.

Early studies in management science and operations research often classified hubs as synonymous with a central warehouse or storage facility located in the center of a demand area (Minas & Mitten, 1958). Later studies argued that a hub should be located to minimize the sum of transportation cost between the nodes of a network (Golden, Raghavan, & Wasil, 2008). These latter studies address the possibility that demand could be higher at some nodes than others (Correia et al., 2011; Yoon & Current, 2008).

The term "hub" can carry different meanings in transportation. The Federal Aviation Administration (FAA) classifies an airline hub on the basis of the percentage of total passengers boarded in that area; an airline hub may contain more than one airport (FAA, 2000). The hubs constitute a primary focal point for the transportation research programs of the FAA, and the analyses of individual cities within an area are treated in relationship to the entire area. Airlines describe their "hub and spoke" structures with a single airport serving as a hub. In the package delivery market, the term hub represents a major sorting center (Mayer & Wagner, 2002; Sim, Lowe, & Thomas, 2009; Wasner & Zapfel, 2004). The important commonality is that the flow of cargo and personnel between a supply point, or origin, and a demand point, or destination, passes through a hub.

The hub network design problem involves finding the optimal location for hub facilities, assigning non-hub origins and destinations to the hubs, determining linkages between the hubs, and routing flows through the network (O'Kelly, Bryan, Skorin-Kapov, & Skorin-Kapov, 1996). These problems quickly grow in

size and complexity. There are three initial remedies for the complexity. The first involves the adoption of a partial approach, simplifying some aspects of the model. An example partial approach assumes that transportation costs are independent of flow volume (Campbell, 1990). Unfortunately, this particular assumption devalues economies of scale. The second remedy breaks the network down into smaller sub-networks reducing the number of possible solutions and the interdependency of demand nodes (Camargo & Miranda, 2012; Chung, Myung, & Tcha, 1992). Unfortunately, the hub interdependency may increase substantially. In cases of a single hub network, this disadvantage is eliminated. The final remedy for reducing complexity seeks a local optimal solution rather than ensuring a global optimal solution (O'Kelly & Bryan, 2002; O'Kelly, Skorin-Kapov, & Skorin-Kapov, 1995). Local optimization may be acceptable but must be identified as not representative of global circumstances.

O'Kelly and Miller (1994) developed a series of protocols for hub design. The standard hub network makeup consists of a relatively large number of nodes each directly connected to only one of a small number of completely interconnected hubs--a "pure hub and spoke configuration." Their methodology is used in this study.

METHODOLOGY

This study considers locations that might be used to deliver equipment and personnel to locations in Europe. These locations were selected based on published criteria and the availability of archival data which includes a record of the time required to deliver equipment and/or personnel to all of its current operating locations and the cost of moving cargo from the APOD to FOLs. This is especially important given the goal of examining a tool for use by managers because to be useful, a model must be accurate mathematically and instantiated with real data. This is the same type of data used in the military budgeting process and is considered accurate.

Multiple Objective Linear Programming

Multiple Objective Linear Programming (MOLP) models provide decision makers with useful information regarding the trade-offs between two, or more, potentially conflicting objective functions (Ragsdale, 2001). In the current case, the trade is minimizing the time requirement and the cost of the network. Transportation by air is generally faster than transportation via ground, but is normally more expensive. MOLP models provide the advantage of accurately representing this multi-criteria nature of such real-world situations to include transportation where minimization of transportation costs, maximization of delivery speed, and maximization of goods delivered are common goals (Hachemi, Hallaoui, Gendreau, & Rousseau, 2015). Modeled as a single objective LP, any of the three goals inserted as the objective provide a single solution. It is likely none of these individual solutions, generally unique to the individual objective function value, will suffice. Instead, a solution that does a reasonable job of satisfying each of the objectives to some level and describes the trade-offs when one objective function is chosen over the other is sought.

MOLPs models require the development of target values for each of the selected objectives, or goals. These target values are defined externally, such as a minimum required by law, or are found using linear programming. Taken together, these multiple target values require using an objective function which represents a 'best-fit' solution given the various target values. The following describes the development of the two target values for this model.

Minimum Cost Model

The minimum cost network formulation meeting the requirements of the demand locations is:

Objective Function:

$$\text{Min} \quad \sum_i \sum_j X_{ij} * C_{ij} = \text{Target Cost} \qquad (5)$$

Subject to:

$$X_{ij} \leq Avail_{ij} \qquad \forall i, j \qquad (6)$$

$$\sum_i X_{ij} * CA_{ij} \geq Demand_j \qquad \forall j \qquad (7)$$

$$X_{ij} \geq 0 \qquad (8)$$

$$X_{ij} = Integer \qquad (9)$$

Where:

C	=	Cost of movement from node i to j
i	=	Node i (hubs)
j	=	Destination j (spokes)
X_{ij}	=	Number of missions between nodes i and j
$Avail_{ij}$	=	Available missions between nodes i and j
$Demand_j$	=	Demand at location j (spoke)
CA_{ij}	=	Per mission load for each mission between nodes i and j

The objective function (5) minimizes the cost associated with selecting the missions between node i (the hub) and destination node j (the spoke). Missions are air or truck, the researchers do not distinguish between them, with each of the x_{ij} mission incurring c_{ij} cost. Constraint (6) ensures the number of mission between nodes i and j, x_{ij}, do not exceed the limit, $Avail_{ij}$, defined as 250 for this model (200 ground and 50 air). Constraint (7) ensures sufficient delivery to each spoke. Each mission from node i to j delivers CA_{ij} so that $x_{ij}c_{ij}$ represents total material delivered to node i which must be at least the demand for spoke j, Demand_j. Constraints (8) and (9) ensure the x_{ij} values are non-negative and non-fractional, respectively.

Minimum Time Model

The second objective used in this study is the minimal time necessary to meet the requirements of the demand locations. The mathematical formulation for this objective is similar to the one used for the minimum cost objective, the difference being that the objective is to minimize the time required to meet demand.

Objective Function:

$$\text{Min} \quad \sum_i \sum_j X_{ij} * T_{ij} = \text{Target Time} \qquad (10)$$

Subject to:

$$X_{ij} \leq Avail_{ij} \qquad \forall i, j \qquad (11)$$

$$\sum_i X_{ij} * CA_{ij} \geq Demand_j \qquad \forall j \qquad (12)$$

$$X_{ij} \geq 0 \qquad (13)$$

$$X_{ij} = Integer \qquad (14)$$

Where:

T_{ij}	=	Time required for a mission from node i to node j
i	=	Node I (hub)
j	=	Destination j (spoke)
X_{ij}	=	Number of missions between node i and node
$Avail_{ij}$	=	Available missions between node i and node j
$Demand_j$	=	Demand at location j (spoke)
CA_{ij}	=	Per Mission load

The objective function (10) minimizes the time function. Each mission from node *i* to *j* requires T_{ij} amount of time. For X_{ij} total mission, the total time incurred is determined. Constraints (11) through (14) have the same interpretation as constraints (6) through (9). The value of (5) is defined as Target Cost while the value of (10) is defined as Target Time.

MINI-MAX Model

The MINI-MAX objective function requires establishing deviational variables and corresponding weights. To construct this model several additional constraints are required. To find the actual cost and time, the model performs a deviation calculation. The calculations start with two definitional constraints.

$$\sum_i \sum_j X_{ij} * C_{ij} = Actual\,Cost \qquad (15)$$

$$\sum_i \sum_j X_{ij} * T_{ij} = Actual\ Time \qquad (16)$$

Constraints (14) and (15) provide variable values to compute percent deviations using the general form:

(actual value – target value) / target value (17)

The MINI-MAX variable Q is introduced to provide a constraint designed to minimize the deviations from the target values. This new objective function helps to find the trade-off point where both cost and time are minimized and the requirements of the demand locations are met. With the establishment of the deviational variables listed above and the third variable to minimize the magnitude of the deviations, the objective function of the MOLP is stated as,

MIN: Q
Subject to:

w1* (Actual Cost – Target Calue)/Target Cost $\leq$ Q (18)
w2* (Actual Time – Target Time)/Target Time $\leq$ Q (19)

Constraint (18) indicates that the weighted (w) percentage deviations from the target network cost must be less than or equal to Q. Constraint (19) indicates that the weighted percentage deviation from the target level of network time must be less than or equal to Q. Thus, if the model minimizes Q, it also minimizes the percentage deviation from the target values for each of the objectives. In this way, the maximum weighted deviation from any of the goals is minimized. Changing w1 or w2 provides a means to examine a wide range of potential solutions.

ANALYSIS AND RESULTS

The model results are provided in sets of three, along with a summary of all values for all locations. The target values listed within each table represent the minimum time required to meet demand given the specific model used. Data used in the following analysis reflects twelve months of actual cargo movement within a distribution network.

Location A as Hub

The first model used the existing network configuration with Location A as the hub. An initial configuration provides a baseline against which all other options can be compared, as seen later in this section. The results of this model indicate a minimum cost of $6,742,144 and a minimum time of 17,218.2 hours. In

Table 1, the Target Value represents the minimum cost or time necessary to meet the requirements of the demand location. The value represents the goal, or absolute best performance, that the network can achieve. The trade-off cost, or actual cost, given the stated constraints is $7,354,974. This cost is slightly higher than the Target Value. The same is true for the actual time requirement, 18,779.8. The 'weight' column represents a user-defined preference for either cost or time. In this case, the weight is the same for both categories. Additional runs of the model are provided later in this study to demonstrate the results of unequal weights. Table 1 lists the results of the model with Location A as the hub under Equal Weight, Time Precedence, and Cost Precedence constraints. Note that as priorities change the number and type of mission's change as well as the cost and time values.

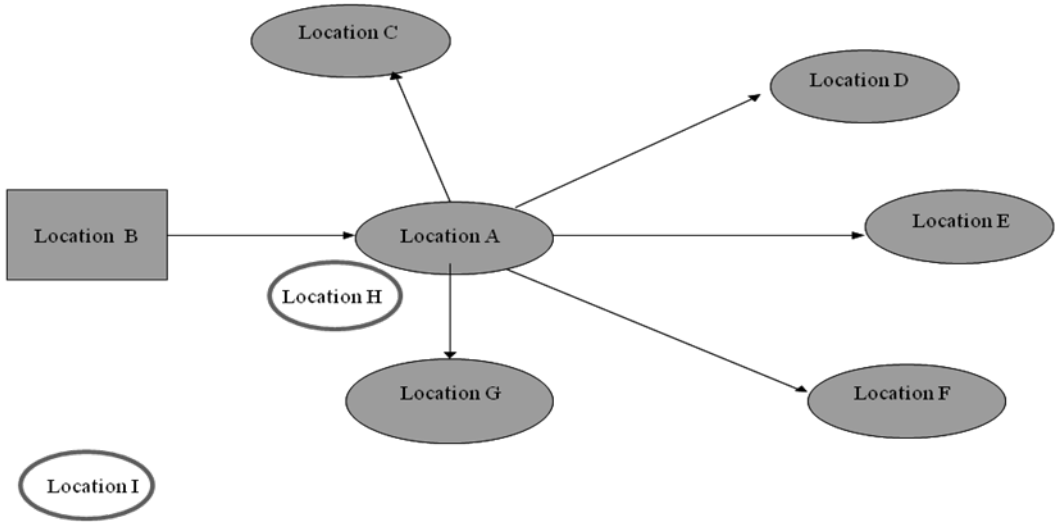
Table 1: Location A Model Results

Location A Results		Total	Target Value	% Deviation	Weight
Equal Weight Model	Time (hrs)	18779.80	17218.20	9.07	1
	Cost ($)	$7,354,974	$6,742,144	9.09	1
Time Precedence Model	Time (hrs)	18250.20	17233.00	5.9	2
	Cost ($)	$7,541,410	$6,742,144	11.85	1
Cost Precedence Model	Time (hrs)	19670.80	17233.00	14.15	1
	Cost ($)	$7,218,490	$6,742,144	7.07	2

Other Locations as the Hub

Models for each of locations H, I and F as hubs were considered.

Figure 1 - Network Representation



Location F is one of the demand locations so it was expected that a large portion of the actual time and cost figures would be reduced. With Location F as the hub, there is no requirement to forward deploy to that location via ground or intratheater airlift. Tables 2, 3 and 4 provide the numerical results for models with locations H, I and F as the hubs, respectively. These specific results are the basis for the summary data in which the hub location options are compared.

Table 2: Location H Model Results

Location H Results		Total	Target Value	% Deviation	Weight
Equal Weight Model	Time (hrs)	19682.00	18249.70	7.85	1
	Cost ($)	$7,664,036	$7,108,323	7.82	1
Time Precedence Model	Time (hrs)	19102.00	18249.70	4.67	2
	Cost ($)	$7,781,234	$7,108,323	9.47	1
Cost Precedence Model	Time (hrs)	20528.00	18249.70	12.49	1
	Cost ($)	$7,555,560	$7,108,323	6.29	2

Table 3: Location I Model Results

Location I Results		Total	Target Value	% Deviation	Weight
Equal Weight Model	Time (hrs)	19246.00	17314.60	11.16	1
	Cost ($)	$8,252,408	$7,416,795	11.27	1
Time Precedence Model	Time (hrs)	18963.10	17818.60	6.42	2
	Cost ($)	$8,385,472	$7,416,795	13.06	1
Cost Precedence Model	Time (hrs)	20926.00	17818.60	17.44	1
	Cost ($)	$8,061,666	$7,416,795	8.69	2

Table 4: Location F Model Results

Location F Results		Total	Target Value	% Deviation	Weight
Equal Weight Model	Time (hrs)	14161.50	12371.40	14.47	1
	Cost ($)	$6,687,501	$5,839,685	14.52	1
Time Precedence Model	Time (hrs)	13407.80	12371.40	8.38	2
	Cost ($)	$6,831,674	$5,839,685	16.99	1
Cost Precedence Model	Time (hrs)	15132.10	12371.40	22.32	1
	Cost ($)	$6,496,464	$5,839,685	11.25	2

Hub Location Comparison

Table 5 includes the results of 'Equal Weight' models and represents the trade space between minimum time and minimum cost required to meet demand. These results demonstrate that the Location F hub provides both the lowest cost and lowest time requirements. This is largely due to the fact that in this scenario, Location F is both the hub and one of the demand locations. Removing the additional time and cost requirements of forward movement from the hub to the demand locations means a much lower total cost and time requirement for the hub.

Table 5: Equal Weight Comparison

Equal Weight Comparison		Total	Target Value	% Deviation	Weight
Location A	Time (hrs)	18779.80	17218.20	9.07	1
	Cost ($)	$7,354,974	$6,742,144	9.09	1
Location H	Time (hrs)	19682.00	18249.70	7.85	1
	Cost ($)	$7,664,036	$7,108,323	7.82	1
Locaiton I	Time (hrs)	19246.00	17314.60	11.16	1
	Cost ($)	$8,252,408	$7,416,795	11.27	1
Location F	Time (hrs)	14161.50	12371.40	14.47	1
	Cost ($)	$6,687,501	$5,839,685	14.52	1

The military faced some scenarios, similar to commercial industry, where time is more important than cost. Such situations might include contingency or humanitarian support. Planners must be aware of the trade-offs inherent in trading time for cost or cost for time. Table 6 provides the results of the four hub locations when time is given precedence over cost. Here again, the Location F hub seems to be the least expensive and least time consuming.

Table 6: Time Precedence Comparison

Time Precedence Comparison		Total	Target Value	% Deviation	Weight
Location A	Time (hrs)	18250.20	17233.00	5.9	2
	Cost ($)	$7,541,410	$6,742,144	11.85	1
Location H	Time (hrs)	19102.00	18249.70	4.67	2
	Cost ($)	$7,781,234	$7,108,323	9.47	1
Location I	Time (hrs)	18963.10	17818.60	6.42	2
	Cost ($)	$8,385,472	$7,416,795	13.06	1
Location F	Time (hrs)	13407.80	12371.40	8.38	2
	Cost ($)	$6,831,674	$5,839,685	16.99	1

Finally, cost precedence model runs are examined. Similar to the previous comparison, there are times when planners must be primarily concerned with cost. Table 7 provides a comparison of the models run with cost as the higher weighting factor. Once again, the Location F hub scenario provides the least cost and the least time consuming solution.

Table 7: Cost Precedence Comparison

Cost Precedence Comparison		Total	Target Value	% Deviation	Weight
Location A	Time (hrs)	19670.80	17233.00	14.15	1
	Cost ($)	$7,218,490	$6,742,144	7.07	2
Location H	Time (hrs)	20528.00	18249.70	12.49	1
	Cost ($)	$7,555,560	$7,108,323	6.29	2
Location I	Time (hrs)	20926.00	17818.60	17.44	1
	Cost ($)	$8,061,666	$7,416,795	8.69	2
Location F	Time (hrs)	15132.10	12371.40	22.32	1
	Cost ($)	$6,496,464	$5,839,685	11.25	2

Least Time Consuming Cost

Planners and decision makers are often forced to select the hub that provides the quickest service to demand locations. Table 8 provides the results of the model run to minimize time and provides the actual cost associated with the solution.

Table 8: Cost for Minimized Time Comparison

Cost for Minimized Time Comparison	Target Time Value (hrs)	Cost
Location A	17233	$7,776,636
Location H	19102	$7,781,234
Location I	17819	$8,957,829
Location F	12371	$7,033,639

Table 8 illustrates that the Location F hub alternative provides the lowest target value for time, at the lowest cost. Note that the cost is higher than in the previous results because the network maximized the use of air transport (increased speed). This result provides the planner, or decision maker, a lower bound on delivery time with which to better understand the cost incurred in order to achieve this most expedient delivery. Decision makers need this information in times where a transition from routine demand to urgent demand is expected or in the construction of a new network where multiple alternatives are being analyzed. For the commercial industry, the same comparison is used for preferred customers.

ASSUMPTIONS AND LIMITATIONS

All models and all modeling efforts require assumptions. First, it was assumed that an optimal peacetime network can adapt to meet the initial demands of a contingency scenario. To construct an optimal network based on minimizing cost, it was necessary to collect data from a time-period of relatively fixed, non-dynamic demand. This research utilized data from the stable, peacetime operations of a selection of locations that form the peacetime core of the distribution network. In other words, this research assumes that any contingency situation would use the existing network as a starting point.

The second assumption is that contract cost and transportation cost will remain constant for a minimum of one year. This is reasonable, considering that after an initial start-up period, the cost of operating each spoke or route normalizes. The stabilization is seen once contracts are negotiated for ground transportation, and because the cost per flying hour, if air transport is used, is consistent. If rates were dynamic for the same route with no known trend, the changes would make any model or forecast extremely difficult and reduce the validity of the model.

This research also assumes continued access to and use of current locations and facilities and thus does not specifically consider these costs. Similarly, the cost of establishing the basic capabilities to act as a hub are relatively constant regardless of which location is chosen so that the cost of operating the hub location can be omitted from the cost calculations. Thus, cost calculations in this study include only the transportation cost of equipment and personnel.

Finally, the researchers assume that the route, or tour, schedule has been established, the network is reliable, and the time requirement is known and relatively fixed. Any varations introduced due to disruptions or contingencies (i.e. weather, production, or maintenance of aircraft) are not included.

CONCLUSION AND IMPLICATIONS FOR MANAGERS

The results of the multiple model runs shows Location F as the network hub provides the least expensive and least time consuming option of the four alternatives considered. This use of one of the demand locations as a hub eliminates the need for forward movement from that hub to any demand location. What was unknown was the actual amount of savings in both time and cost that could be realized.

This study adds to a growing body of literature on hub location. The model, as a tool for decision makers, provides the capability to put 'facts and costs' in place of 'gut feeling'. While there are certainly more advanced models in existence for these types of problems, most require advanced training and interpretation in order to be useful by managers and decision makers. This particular model requires little additional training and can be constructed and run at very low cost using Microsoft Excel. This capability is very useful in exploring different courses of actions or the exploration of alternatives.

Additionally, this model provides the initial data on which a hub decision might be made. Based on the objective at hand, the model provides a straightforward understanding of which location provides the fastest throughput, the least expensive, or the best of both possibilities. Understanding the trade-offs between the objectives provides a unique perspective for managers. The model also allows decision makers and managers to 'what if' different scenarios for different customers. Several research efforts have investigated the need to treat different customers differently, applying leverage and cost savings methodologies as necessary (Lambert & Pohlem, 2001; Morash, 2001).

As in the military case described in this study, the global business environment is extremely dynamic. A model that provides managers with the ability to understand the cost and advantages of trade-offs across the spectrum of possible solutions greatly increases a decision maker's ability to explore multiple alternatives. At a minimum, the model will provide a subset of options that can be further explored with attention to additional objectives such a societal, environmental, or political concerns.

As stated in the introduction, traditional private sector networks remain stable for extended periods of time. However, increasing emphasis is currently being directed on supply chain disruptions, risk and risk planning/management in the private sector. The model developed herein could aid firms either when a disruption occurs, or in planning for contingencies in case a disruptions happens. A key factor in reacting to a network disruption, from whatever the cause, is rapid development of alternative networks to ameliorate the effects of the disruption. In addition, some scenarios would be time sensitive, some cost sensitive, and most would need to consider both, in order to analyze the tradeoffs between the cost of the new network and the cost of the disruption. This model can consider the requirements, both a quick and easy analysis and cost/time tradeoffs. This is even more important as industry moves to more global networks, which increase their complexity and probability of disruptions.

Another use of the model, and referred to earlier, is in the areas of humanitarian and disaster relief. These require logistic networks to be designed, established and retired with little or no notice, and in a short period of time. In many instances there is no existing network that exits, or the existing networks are not available. This would be useful to both nongovernmental organizations (NGO), such as the Red Cross, Doctors Without Borders, and others, as well as governmental entities in addition to the military, such as FEMA and various state agencies. In these instances, this model's major benefit is the ease and quickness with which it can be utilized.

While the current study utilizes military data in a military setting, the scenario faced is no different than that faced in many commercial settings and offers valuable insights for all managers charged with logistics network design. In addition, this effort introduces resource orchestration theory as a useful theoretical lens through which to view logistics network design because it highlights the importance of viewing the logistics network as a resource and if properly managed, a source of competitive advantage.

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SOCIAL MEDIA: A STRATEGIC DECISION-MAKING TOOL

Gordon Bowen and Deidre Bowen

ABSTRACT

Social media is seen very much as a marketing tool, and there is little in the literature that considers its use as a strategic decision-making tool. This conceptual paper is an attempt to redress the balance. Social media user-generated content from blogs or consumer feedback is one way that social media can support effective strategic decision-making. However, the business and organisational environments are influential on the effectivity of the data collected and, ultimately, its analysis. The decision-making approach—single or multistage—are significant influencers on the quality of the decisions. Multistage decision-making is supportive of controversial decision making, which leads to better utilisation of the information and, consequently, better decision making. Ultimately, robust decision-making is underpinned by the effectiveness of the decision-making process.

Keywords: Social Media, Marketing Strategy, Uncertainty, Strategy, and Decision Making

INTRODUCTION

Decision making is required by all organisations; however, the approaches used to come to a decision will vary. Consequently, many books have been written on decision making, because of its importance to businesses and to organisational functioning (Hoy & Tarter, 2010; and Litchfield, 1956). Decision making is constraint by time and revisiting a decision is a bounded process that is also time-consuming (Hoy & Tarter, 2010). Decision making requires a degree of optimism and participation (Connolly & James, 2006; Gigerenzer, 2000; and Gigerenzer et al., 1999). However, other authors view decision making as a nonoptimistic process (Kahneman et al., 1982; and Kahneman & Tversky, 1973). This does beg the question: is social media more supportive of a particular approach to decision making or is social media's role in decision making unrelated to the decision-making approach? Decision-making requires the identification of patterns, and these patterns guide the individual especially in the formative years and they become ingrained (Calabrese & Zepeda, 1999).

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Decision-making requires the identification of patterns, and these patterns guide the individual especially in the formative years and they become ingrained (Calabrese & Zepeda, 1999). Social media is a tool that can leverage the patterns and enhance the decision-making process. Decision-making assessment will require criteria referencing (Calabrese & Zepeda, 1999). Carroll and Johnson (1990) used criteria referencing to identify conflicting reference points. Examples of these reference points are purposeful versus nonpurposeful, consistent behaviour versus inconsistent behaviour, and reasoning versus prone to error. Calabrese and Zepeda (1999) suggest that a 'good' decision maker rarely makes a 'wrong' decision, because a good decision maker keeps an eye on the present and also on the future. This suggests the good decision maker has vision and can link current decisions to future decisions. They understand how decisions today could affect future decisions. Knowledge is a key influencer on decision-making and its ability to influence the cognitive pattern recognition is highly individualised (Calabrese & Zepeda, 1999). How the decision makers interact with the organisation to form a dynamic relationship is influential on the quality of decision-making (Saiti & Eliophotou-Menon, 2009). Collaborative approaches to decision making are not easy and simple (Connolly & James, 2006).

Social media and marketing are becoming a prevalent tool for developing and maintaining engagement of customers and they have been found to influence purchase shopping behaviour (Ruane & Wallace, 2013). Traditional marketing is viewed as a unidirectional process; however, social media is a multi-interaction process (Scott, 2010). Social media is more effective for pull-marketing strategies, thus using social media to provide communication of information, knowledge, values, and ethics about the product or service offerings (Lagrosen & Grund´en, 2014). The literature on social media focuses on marketing aspects such as marketing communications (Mount & Martinez, 2014; Lagrosen & Grund´en, 2014; Ruane & Wallace, 2013; LaPointe, 2012; Booth & Matic, 2011). Social media can be used as a strategic tool and thus can improve decision making, and leveraging social media to improve the level of decision making is scarcely covered in the literature. This conceptual paper contends that the application of social media as a strategic decision-making tool is neglected and social media has an important role in ensuring the robustness of decision making.

THEORETICAL FRAMEWORKS

Social Media

Research in social media became business-focused in 2006 and one of the first studies was by McAfee (2006, 2009). McAfee coined the term 'Enterprise 2.0' to identify social media within or between companies, their partners, or customers. McAfee's work focuses on the benefits for business (Deans, 2012). Marketing and social media are popular areas of investigation in the academic literature (Deans, 2012; Angel & Sexsmith, 2009; Baker 2009).

The social media framework (Figure 1) devised by Cook (2008) suggests the four C's: communication technologies, connection, cooperation, and collaboration. The framework is a reference point for business and aids understanding of how to evaluate technology in the business environment and consider their business implications (Deans, 2012). Cross-cultural communications play an important role in business decisions (Buderi & Huang, 2006; Huang, 2010). Experimentation with communication technologies across cross-cultural borders may prevent business failures such as product launches and outsourcing due to cultural misunderstandings (Ricks, 2006). Social media is changing communications across borders (Bernoff & Li, 2008). Social media will become a pervasive tool of communication as younger people, who grew up with social media, enter the workplace in increasing numbers. Western countries will need to communicate across cultural borders to engage the middle class in emerging countries, as an example (Deans & Miles, 2011). Strategy based on ideas or variety suggests that an abundance of ideas will help to improve the robustness of the strategy. Applying the communication advantages of social media to strategic decision-making would help organisations to leverage their competitive advantage and update their strategic ideas more readily.

Connection technologies such as Facebook, LinkedIn, or Twitter enable individuals to remain in contact in the workplace or socially. LinkedIn is a popular social network for business people to stay in contact. However, countries such as China, are not supportive of social networks. Mash-ups are potentially

powerful, connecting or combining applications to develop new ones that provide added value (e.g., Zillow.com is a mash-up of real estate data and Google maps). Really Simple Syndication (RSS) is another connection tool that provides information feeds, thus connecting publishers with consumers. RSS feeds are an effective method to channel and distribute information (Cook, 2008). Decision-making is reliant on information that is effective and efficiently directed and interactions between individuals, which is an attribute of social media connectedness (Cook, 2008; Calabrese & Zepeda, 1999; and Heck & Marcoulides, 1991).

The framework below (Figure 1) is a method to understand social media technology in an organisational and business context. Social media technologies that are classified under communication require interaction with people and focus on relationships (Cook, 2008). This implies that supportive relationships are required to maximise 'interactivity' between people. Communication is important for cross-border activities by firms (Rifkin, 2006). Social media is a game-changer for communications across borders (Bernoff & Li, 2008). Western companies will need to find new ways to communicate and connect with emerging middle classes in developing countries to promote their goods and to encourage consumers in these countries to purchase them (Deans & Miles, 2011). Social media technologies that are under the connection classification require little direct contact with people. Interaction takes place over time and individuals (Cook, 2008). Connection software is an approach to bring together friends, business colleagues, and family. They allow global connections that are seamless, cost-effective, and transparent. Mash-ups are a combination of online applications, such as real estate and use of Google Maps (Cook, 2008). Cooperation technologies support group activities, but each contributor retains authority over their ownership of the information (Cook, 2008). The posting of information on video and photo-sharing sites are classed as cooperation social media technologies. It demonstrates the ability to relay information in real time across the globe. Information is also shared in a timely manner (Deans, 2012). Business decisions require information that is timely and thus make this technology valuable in strategic decision making. The final dimension is collaboration technologies and this requires participants to have common goals and apply a coordinated approach to achieving tasks (Cook, 2008). Collaborative technologies facilitate 24/7 working and is extremely useful for bringing a group of people in virtual locations together to solve a problem (Deans, 2012). These technologies save time and reduce travel costs for firms that have heavy travel commitments (Heck, 2009). Social media technologies have a role to play in decision making from improvement in the decision-making process to informing the robustness of the information used.

Figure 1: 4C framework of social media technologies

Cooperation
- Social Bookmarks
- Media Sharing
- Social Content
- Ranking Sites

Communication
- Blogs
- Twitter
- Instant Messaging
- Virtual Worlds

Connection
- Social Networks
- Mash-Ups
- Web RSS

Collaboration
- Wikis
- Conferencing/Teleconferencing
- Electronic Meetings

Source: Cook (2008)

Social Media and Marketing Strategy

Social media assists in basic marketing techniques; however, the target market group must be defined. Segmentation in the online environment is easier than in the offline environment (Scott, 2010). Weber (2009) argues that segmentation has changed because of the advent of social media. Segmentation is focused on psychographic and behavioural characteristics because of social media, which is ideally suited for the target group of young people. Importantly, marketers can 'listen' (monitor) to the target group risk-free and 24/7. Target groups can express their opinion openly facilitated by smartphones and mobile Internet. (Smedescu, 2013). Listening to 'conversations' will help marketers learn about specific problems on a brand, which face-

to-face dialogue would not elicit. Listening to conversations is also known as 'opinion mining' or 'conversation sentiment analysis'. The purpose of opinion mining is to detect the state of the conversation, i.e., positive, neutral, or negative (Smedescu, 2013). Snyder and Barzlay (2007) and Pang and Lee (2012) have attempted to develop a more complex scale for conversation sentiment analysis. Sentiment analysis is learning through human interaction but suffers from drawbacks such as the level of accuracy given language is complex and is influenced by cultural norms and context. However, sentiment analysis does give a general idea of the feeling and general direction of the conversation. Recording the information will also give the impact of the conversation on social media and enable negative trends to be identified earlier. Monitoring of influencers, e.g., Facebook friends and Twitter followers, is an important aspect of monitoring (Smedescu, 2013).

Social media marketing is part of Internet marketing. Social media is a promotion tool and a sales support tool. The sales support activities of social media are normally referred to as 'social customer relationship management (sCRM). In the promotional role, it assists in raising brand awareness and enables sharing of the latest product/service deals. This demonstrates the flexibility and multiple uses of social media (Smedescu, 2013). According to Stelzner (2013), social media marketing is a tool to improve brand awareness, Web site traffic, leads, market research; build brand loyalty and search ranking; and grow useful business partnerships. Smedescu (2013) considers social media marketing to be new, where prompt customer-centric action is always required, because social media has given consumers increased power.

Firms should think of social media not simply as a marketing channel but an approach to build beneficial relationships with their customers. Companies need to respect the voluntary nature of social media users and accentuate the positives and suppress the negatives. They should provide interesting issues that engage their users to produce relevant content and spread voluntarism (Lee, 2010).

Lee (2010) states that firms must be careful with the tone and manner of the delivery of the content. Developing a unique tone that is 'fun', 'sincere', and 'quick' is a good approach. This is important to communicate an effective message to their customers.

Lastly, Lee (2010) suggests that a cross-media strategy, so that social media is supported with other media and is not considered an alternative. An integrated approach to social media is required to ensure a smooth communication process. A multifaceted approach to blogs is desirable such as the approach used by Intel, Twitter, Facebook, and YouTube. Use of a multifaceted approach to blogs generates a richness of information that is diverse and can be shared with customers.

DECISION-MAKING

Decision-making is about doing the right thing (Beech, 1990). Individual interactions drive the decision-making process and these different interactions drive the overall decision-making process, such as the direction of a business or school (Calabrese & Zepeda, 1999; Heck & Marcoulides, 1991). Simon (1960) suggests that decision-making has three phases: finding a need for making a decision, defining a course of action, and selecting the course from the available actions identified. Decision-making needs to be based on understanding and not based on prescriptive recipes (Richardson & Lane, 1994). Decision making in organisations is influenced directly by internal political concerns, beliefs about the process, organisational concerns, and, indirectly, information collected from senior decision makers such as a principal in a school (Heck et al., 1989). The expectation is that organisational context and size will influence the decision-making process. However, Heck and Marcoulides (1991) and Monk (1987), found that the size of an organisation does not affect the decision-making process, at least in a school. However, Salley et al. (1979) found that school size was an important variable that influenced principals' attitudes about staffing. Decision-making in schools is relatively uncertain (Heck et al., 1990) and senior staff cannot have all the information required (Heck & Marcoulides, 1991). Uncertainty is affected by political conditions and the external environment, and these become important factors in situational decision making (Heck & Marcoulides, 1991). A clear understanding of the context in which the decision choices are embedded is of significance in the understanding of organisational processes (Heck & Marcoulides, 1991).

Decision-making assessment can be considered rational or normative and is associated with the decision maker following a logical and sequential set of steps. The other approach to decision-making assessment is the descriptive approach, which focuses on what the decision maker is doing (Glasman & Fuller, 1992). An effective decision-making process is a combination of the normative and descriptive approaches, with descriptive decision makers operating under an umbrella of ambiguity and complexity (Glasman & Fuller, 1992; Gorton, 1987). Rational decision making in environmental uncertainty was conducive to organisational outcomes such as schools (Glasman & Biniaminor, 1981). The principal's vision for the school and the conversion of the vision to expectations are attributes that affect positive organisational decision making (Glasman & Fuller, 1992). There are differences in decision making between effective principals and less effective principals, and one significant difference is how they acted to improve student improvement (Glasman & Fuller, 1992; Patterson, 1984). Glasman and Fuller (1992) found differences in their perceptions to how their administrative roles relate to the delivery of the outcomes. Decision making should move away from a recipe approach to solving problems to 'learning mentality' in the preparation of a senior decision maker to use critical analysis (Richardson & Lane, 1994, p. 14).

Decision-Making Processes

Social media gives customers and consumers increased power because of its pervasiveness and young people are more active on social media networks (Smedescu, 2013; and Deans & Miles, 2011). Is a central decision-making process appropriate for organisations that intend to use social media as a strategic decision-making tool? Instinctively, the answer would be probably not. However, one needs to consider benefits and drawbacks of using centralised decision making. The guidelines are defined by the organisation for decision-making, but the decision-making process influences how policies or strategies are determined (Saiti & Eliophotou-Menon, 2009).

Greater participation in decision-making increases costs, and several studies have supported decisions based on participation over hierarchical decision making, which is less effective than participative decision making (Deetz & Brown, 2004; and Lawer, 1999). Diversity in perspective encourages creativity and leads to better and faster decisions. Problems tend to move from a low level of complexity to higher levels of complexity; 'effective measures', such as participative decision-making, need to be adopted. The more complex the problem, the more important organisational buy-in becomes (Saiti & Eliophotou-Menon, 2009, p. 447). Factors that support participatory decision-making are the environment (political and social); the size, structure, and departmentalisation of the organisation; and the characteristics of the decision makers, such as their ability, dedication, and motivation (Miller & Lee, 2001). Connolly and Jones (2006) suggest that collaborative work in educational institutions requires participation at every level of the organisation. Furthermore, it demands flexibility, adaptability, and fluency in communications. A study by Saiti and Eliophotou-Menon (2009) on a school in the Greek educational system suggests that there is limited stakeholder involvement in the decision-making process. The study identified a number of weaknesses in the Greek case of centralised decision-making. Decision-making on Greek educational policy (design and implementation) is the sole responsibility of the Minister of Education. Final decisions on educational policies are made by an administrative hierarchical system of the Ministry of Education. The centralised structure at the Ministry of Education inhibits diversity in participatory decision-making. Given that education is a major investment for a country, it would be expected that a collaborative approach to decision making would be a strong contender. Collaborative leadership is necessary to form inclusive relationships that bring in experienced actors and smooth the successful implementation of educational plans. Research by Drucker (1993) and Ghoshal and Bartlett (1995) have demonstrated that most successful organisations harness the commitment and knowledge of their managers to create an environment that promotes creativity and speed up implementation. The interaction between the organisation and the decision makers contributes to an effective decision-making process (Saiti & Eliophotou-Menon, 2009).

The above analysis has implications for strategists who use social media as a decision-making tool. Conversations from social media are voiced openly and the polarity of the information is typically honest and unbiased. This is because of the nature of the target group, who are young (Smedescu, 2013). In mature organisations, the top decision makers tend to be older than the target groups and the application of a

centralised decision-making process would have similar consequences to the Greek educational case. Social media extends across global borders, operates 24/7, and gives customers and consumers increased power. This implies that decision-making processes need to be responsive to customer-centric needs. Collaborative leadership aids decision making, which is responsive to customers' need, because it would be inclusive of knowledgeable actors with diverse experience. However, participative decision-making is slow and time-consuming. There needs to be a trade-off between centralised decision making and participative decision making when decisions are made on social media sentiment analysis.

Decision Making and User-Generated Content (UGC)

One source of rich information for making strategic decisions is the application of user-generated content (UGC) in social media and in particular blogs. This is important when developing strategy based on user-generated content from blogs to understand how it will affect decision-making. Studies on user-generated content on decision making from blogs assume it is a single-stage process (Dellarocas et al., 2008; and Forman et al., 2008). Ignoring the multistage concept of decision making for information generated by blogs may introduce bias in the process and the parameters (Andrews & Manrai, 1998). The multistage process for decision-making may generate managerial insights that are not offered in the single-stage models (Gensch, 1987). Evaluation of the information is known as the screening stage, followed by the choice stage, which requires additional information for due diligence. The final stage is the contract stage, which, in the case of venture capitalists (VC), discusses terms of finance. The stages identified are applicable to ventures seeking finance from venture capitalists (Tyebjee & Bruno, 1984).

Culman et al. (2010) identified the challenges faced by organisations in implementing social media applications such as blogs to interact with customers. They found three factors—mindful adoption, community building, and absorptive capacity. Increase in negative posts attract additional readers and initially will rise exponentially and then stabilise at a point in time (Aggarwal et al., 2011). Readers of blogs exhibit a variety-seeking behaviour (Singh et al., 2010; and Huang et al., 2010). Traditional mass media was not as influential as social media applications such as blogs, YouTube, and MySpace were on U.S. presidential candidates' performance in 2008 (Wattal, et al., 2010). To develop a strategy, the user-generated content should be representative of the users and the challenge is to encourage users to engage with the blogs. Firms need to ensure the implementation of the blogs are successful and be mindful of the three factors identified by Culman et al. (2010).

One of the earliest works on user-generated content is by Godes and Mayzlin (2004) and they demonstrated that online conversations can measure user-generated content. The relationship between financial information associated with eWOM and final financing with data predominately from an online blog (VentureXpert) demonstrated the ability to create user-generated content from VentureXpert and its influence on the financing decision in new ventures (Aggarwal et al., 2012). Chevalier and Mayzlin (2006) examined the relationship between online reviews on the relative sales of two online booksellers (Amazon (Amazon.com) and Barnes & Noble (BN.com)). Increased reviews on one site for a given led to an increase in sales compared to those on the other site, and negative reviews had a greater impact on sales than positive reviews. Forman et al. (2008) found that an increase in reviews leads to increased sales regardless of the state (positive or negative) of the reviews. Liu et al. (2010) investigated the forecasting accuracy of user-generated content on box office sales. The result demonstrated that the volume of user-generated content at different phases of the movie life cycle can significantly improve the accuracy of box office sales in the first week and total box office sales. Useful information can be elicited from user-generated content and they can be used for forecasting, which is a valuable attribute for developing strategy. The quality of the data provided from online surveys is important, and revolves around respondents misreading questions and not discriminating between answers so the end result is many questions have a similar response. To minimise the issues identified strategies are available such as "traps" and "bumps". Traps direct the respondents to particular responses and bumps slow the respondents down adding different styles of questions (Maronick, 2009). This is not so much a problem for user-generated-content.

The next discussion is user-generated content on multistage decision making. Multistage decision-making is used when limited resources are available and can reduce the high cognitive processing for large quantities of data (Roberts & Lattin, 1997). Screening is required where limited information is available and time is limited (Bettman et al., 1998; Bettman & Park, 1980). One benefit of screening is that decision makers can reduce the processing required at different levels and can spend more time actively seeking comprehensive information for each stage (Aggarwal & Singh, 2013). Research suggests that a multistage decision-making process is more effective than single-stage decision-making. The influence of the attributes varies across different stages (Roberts & Lattin, 1997; and Manrai, 1995). Research by Roberts and Lattin (1997), Andrews and Srinivasan (1995), and Roberts and Lattin (1991) suggests that multistage decision-making improves the predictive accuracy over single-stage decision-making. Research by Aggarwal and Singh (2013) on the influence of blogs on venture capital multistage decision-making indicated that blog coverage helps with the screening phase and indirectly influences the final stage (contract in venture capital parlance). More decision makers help to create better alternatives to a negotiated agreement. The context of their research implies that wrong decisions lead to significant losses for the decision makers. It would appear that there is considerable motivation to collect and analyse information at the choice stage of decision-making. Previous research suggests that the research context (positive or negative) does not lead to significant losses for the decision makers. The contradiction in the results may be that the decision makers in the previous studies were not highly motivated to collect data beyond the user content–generated information. Aggarwal and Singh's (2013) work is applicable to situations where the motivation to avoid making a wrong decision is high. They give the example of car buying, but this is also true for strategic decisions. Aggarwal and Singh (2013) suggest that strategic decision making should gather user-generated content information and also gather additional information to improve the decision-making process and minimise the risk of coming up with bad or wrong decisions. Strategists cannot rely only on user-generated content information and should use a process of triangulation to gather additional information to validate and expand it. Male and female shopper's online exhibit a significant difference in the frequency of shopping (Ergin & Akbay, 2008). The may influence the accuracy of user-generated- content, because an equal balance between the genders would have a positive result on accuracy. However, this may not be a problem when a product online is geared to a particular gender.

Decision-Making and Uncertainty

The uncertainty surrounding vital complex decisions in organisations has long become a barrier to effective decision-making (Cohen & March, 1974). However, Tjosvold et al. (2012) found from their research that uncertainty has a positive role (Kahnesman & Klein, 2010). When managers recognise uncertainty in decision-making, that recognition leads them to seek opposing views and ask questions from those with different views (Tjosvold, 2008, 1998). Tjosvold et al. (2012) suggest that recognition of inadequacies in one views can lead managers to seek controversial views in an organisational setting. Situations where uncertainty is decreasing will lead to less intellectual and emotional demand on managers and thus improve the effectiveness of the decision-making (Berry, 2000; and Cohen & March, 1974). When managers recognise and experience uncertainty, this leads to the promotion of decision-making (Tjosvold et al., 2012; Reynolds & Hrudey (2006); and Bukszar, 2003). Notably, this uncertainty can lead managers to seek open-minded discussions of diverse ideas to develop solutions, which they consider to be effective (Tjosvold et al., 2012). Confidence that one is right can impede controversial seeking decision-making ideas, but confidence that one can potentially understand the problem does not inhibit controversial seeking decision-making ideas (Kahnesman & Klein, 2010).

Cooperative goals and uncertainty complement controversial seeking decision-making. Managers who have cooperative relationships are disposed to controversial seeking decisions even when uncertainty is not much. Such managers may think conversations are productive even if they have confidence in their opinion. In a competitive environment, managers need to feel unsure before openly conferring with colleagues (Tjosvold et al., 2012). Superiors see their views and goals as cooperative when approaching subordinates, but subordinates, when approaching superiors, are more likely to view their goals as competitive (Tjosvold et al., 2012; and Hogan et al., 1994). Individuals who adopt a constructive controversial and open-minded discussion of opposing views are an important antecedent for an effective individual manager decision-making and has also proved to be an effective antecedent for team decision making (Tjosvold et al., 2012). Because of the

nature of strategic decision-making, uncertainty is prevalent and the literature is suggesting that controversial seeking decision-making will lead to more effective solutions.

Participants who are in a negative mood gathered, elaborated, and processed information and more cautiously made decisions with more fluency and flexibility than participants in a positive mood. It would appear that negative moods give rise to a systematic approach to decision making. Positive moods induce heuristics processing. Participants exposed to negative mood states decreased their positive mood states and increased their negative mood states. Those inducted to positive mood states increased their positive mood state and decreased their negative mood state (Mohanty & Suar, 2014). Negative mood states increase the involvement in the problem (Mackie & Worth, 1989). User-generated content that is negative on the organisation will induce better information processing, leading to more effective decision-making. This assumes that the negative content will induce negative mood states. Should organisations using social media user-generated content look for negative outcomes and ignore positive outcomes to promote effective decision-making? Does pessimism make for more effective decision-making? Higher perceived uncertainty leads to lower behavioural intentions to undertake the activity. Perceived uncertainty is lowered if the actors in the environment play a role in decreasing the uncertainty (Yen, Hung, & Liu, 2014). Top management needs to articulate the benefits of the strategy to decrease the level of perceived uncertainty in the organisation (Yen, Hung, & Liu, 2014). Uncertain outcomes sometimes generate negative evaluations and other times positive evaluations. Affective decisions are influenced by uncertainty, with consumers preferring uncertainty in the outcome over simply offering more to consumers. When promotions involve uncertainty, increased information helps cognitive and affective decisions. The more gifts that are included in the promotion, the greater the decrease in uncertainty for the consumer, but it could be detrimental to consumer purchase behaviour. Cognitive decisions require information and consumers making such decisions view information as positive. However, consumers making affective decisions view uncertainty as positive (Laran & Tsiros, 2013).

Strategic decisions are made frequently, but not all are important or publicised. Some strategic decisions are data-driven (large quantity of historical data) and others are based on judgement and not based on historical data. The decision makers would have no measures to judge the uncertainties. Whether it is the combination of the above approaches or a singular judgement plays a crucial role. An emerging tool to help with judgmental strategic decision-making is the prediction market. Prediction markets require a market to be developed and a set of bets is placed by individuals based on their desired outcome. When the event occurs, the market is closed. The individuals will buy a contract for less than a dollar, which equates to the probability of the outcome for the event. This approach is suitable, for example, on whether the elected U.S. president will be a Democrat in the 2012 election (Borison & Hamm, 2010). The presentation of the information on certainty affects decision-making and better ways of conveying estimation and presentation of uncertainty is paramount. Forecasts especially made on managerial judgment need to be conveyed clearly and effectively (Goodwin, 2014). Decision makers with more business experience are able to apply and adopt causation-based logic in making the decision than less-experienced managers. The manager's experience of the organisational environment affects the decision-making process by influencing the interpretation of different schemas and allows him to make diverse interpretations and thus decisions on similar 'situations' (Nummela et al., 2014). The implication is that experienced managers are better placed to make strategic decisions, as they have the knowledge to apply the 'what if' approach. Should only experienced business managers make strategic decisions based on user-generated content?

SOCIAL MEDIA AND BUSINESS PERFORMANCE

E-tailers' use of social media draws upon social capital and social networks to promote their online business (Qu, Wang, & Zhang, 2012). Social capital is defined as 'the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998, p. 243)'. Embedded resources can be information and advice (Zagenczyk et al., 2008) and emotional support (Mehra et al., 2006) and reputation due to their central position in the network (Balkundi & Harrison, 2006). These resources can lead to a competitive advantage (Brass et al., 2004). The addition of hyperlinks to other e-tailers' storefronts undermine business performance of the focal e-

tailer and hyperlinks pointing to the focal e-tailer's main storefronts boost the e-tailer's business performance (Stephen & Toubia, 2010). However, Qu, Wang, and Zhang (2012) found that hyperlinks were beneficial to e-tailers' storefronts because they reveal their social alliance network.

The number of inquiries is related to business performance. A high number of inquiries is a positive outcome for business performance. It should be noted that 80 percent of the inquiries were resolved satisfactorily. E-tailers seeking advice in online communities may cause social risk to the e-tailers, and they could be portrayed as incompetent and inexperienced by potential buyers, which will undermine their business performance. Friendship ties (positive social relationship) have a positive effect on business performance. Bi-directional or unidirectional friendship ties are beneficial for business performance. Sharing information online is beneficial; seeking information without contributing undermines online business performance. Advice seeking should be balanced by advice giving (Qu, Wang, & Zhang, 2012).

Implication to Management

The decision-making process requires the collection and analysis of information. However, the quality of decision making is improved and the robustness of the outcomes strengthened by using a multistage decision-making process (Andrews & Manrai, 1998; Gensch, 1987; and Simon, 1960). The implication is that strategic decisions should be based on a multistage approach and 'lesser' decisions could be based on the single-stage decision-making process. Social media can help to unravel patterns and behaviour, which are valuable in spotting opportunities and trends. It is clear social media has a role in strategic decision making for online businesses. There is a level of risk when business environments exhibit uncertainty and this uncertainty will affect the decision-making process. Businesses will always experience risks in the environment, so it is important to minimise the uncertainty risks in the decision-making process.

One approach to minimising risks is to listen to conversations online. Conversations are open and unbiased in the online environment (Smedescu, 2013). Consequently, constant monitoring of social media will provide rich information that can be utilised in the strategic decision-making process. If online information gained from social media is valuable in making strategic decisions, this could imply that the decision-making process should be near or at the top of the organisation. Centralisation of decision making is not necessarily a good thing and weaknesses have been identified in this method of decision making (Saiti & Eliophotou-Menon, 2009).

One source of information that helps the strategic decision-making process is user-generated content, such as blogs and feedback (incoming and outgoing). The issue for management is decoding the information because information being collected in an open environment does not necessarily mean patterns and trends are easy to discern or are reliable. Although social media can provide valuable information for strategic decisions and strategic planning, a level of triangulation of the information is necessary. One approach is that user-generated content is subject to a multistage decision-making process (Andrews & Manrai, 1998), which will improve decision-making because it will foster a collaborative and participative environment (Saiti & Eliophotou-Menon, 2009). A participative and collaborative environment in an organisation requires all levels to be involved in the decision-making process. This approach to decision making is supportive of an organisational environment that uses an emergent approach to strategy development. The diversity of information used in developing emergent strategy should focus on the negative outcomes and will lead to effective involvement (Mackie & Worth, 1989). However, the positive and negative outcomes could be contradictory and thus is one method to condense the information before focusing on the negative outcomes to facilitate decision-making.

Decision-making can be based on affective and cognitive approaches; both may be appropriate for environments that are subjected to uncertainty. Cooperative organisational environments complement uncertainty and can lead to controversial seeking decisions (Tjosvold et al., 2012). Strategic decision-making in uncertain environments needs to be different and unique if business performance is to strengthen. There is no benefit in making strategic decisions that are similar to your competitors. User-generated content provides additional information that minimises the effects of uncertainty in business environments. Strategists analysing

user-generated content should be of an optimistic temperament because in this mood state, the processing of information would be more effective, and Nummela et al. (2014) found that experienced managers make better decisions. The use of social media as a tool to improve decision-making and, ultimately, business performance gives rise to a positive outcome. However, if the information is not presented so that it is understandable and can be used for forecasting, then no amount of tinkering with the decision-making process can overcome this.

FUTURE RESEARCH AND RESEARCH LIMITATIONS

This paper is a conceptual paper and is thus a research limitation. The work in the chapter could be developed by defining the different stages and roles in a multistage decision-making process that uses user-generated content. The implementation of a multistage decision-making process that is supportive of an emergent approach to strategy development is an area that is underdeveloped in the literature. Review of the literature supports a decentralised approach to the decision-making process, but sometimes this is not always possible or desirable. Under what conditions is a centralised approach appropriate when using user-generated content?

CONCLUSION

The use of social media as part of the decision-making process influences business performance. How the information derived from user-generated content is filtered and used will affect the significance of its usability. Information that is subjected to a multistage decision-making process makes for better problem solving and controversial decision-making. The mood of the persons in strategic decision-making is an influencer on the quality of decision-making. Decisions that are made in a collaborative and participatory business environment are factors that improve decision-making. The analysis suggests that controversial decision making depends on the organisational and business environments and leads to decision making that is effective and makes a difference to the organisation's business performance positively.

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ENTERPRISE DIAGNOSIS AND THE ENVIRONMENTAL MANAGER OF LoMoBaP

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ABSTRACT

Organizations need enterprise diagnostics that benefit them as a whole. Business logistics are used throughout entire organizations. A new practice is to make diagnoses with the use of the Logistic Model Based on Positions (LoMoBaP), which is based on the functions of the logistics positions. A useful position to perform diagnoses is the Environmental Manager (EM). Thus, the objective of this work is to generate enterprise diagnostics based on the functions performed by the Environmental Manager of LoMoBaP. To achieve this objective, the Integrated-Adaptable Methodology for the development of Decision Support System (IAMDSS), which has generated successful results in various previous research problems, will be used. With regards to limitation and scope, there will be no field studies. The enterprise diagnosis, through the Environmental Manager, will be performed under a hypothetical situation to encompass a wider approach.

Keywords: Environmental, Enterprise diagnosis, Enterprise Logistics, Logistics Models, Logistic Model Based on Positions (LoMoBaP), Management Indicators, Environmental Manager (EM)

INTRODUCTION

A new way of seeing business logistics is through their interrelationships. In this sense, logistics are both an advantage and a disadvantage; they relate to almost all areas of an organization. For example, they can relate to:

- The legal aspects: The legal aspects are present throughout the logistics and can be found in many instances. In particular, legal agreements with suppliers and customers should be established (Cavinato, 2004), as well as legal agreements governing contracts covering drivers or carriers (Rodrigues et al., 2008). Also many legal aspects must be covered when logistics are applied to global markets (Blackhurst, Scheibe & Johnson, 2008).

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- The new technologies: The following examples represent only a few of the many ways new technologies are related to business logistics. The Radio Frequency Identification (RFID) (Friedewald & Raabe, 2011; Gnoni, Elia & Rollo, 2012), directly and through new derived technologies, enables identification of products, as well as facilitates the transport and tracking of these products. The Smart cities (Albino, Berardi & Dangelico, 2015; Castelnovo, Misuraca & Savoldelli, 2015) use new technologies to improve the processes of loading and discharging goods in large cities, thus improving customer service. Lastly, Information Technology (IT) (Lerher et al., 2015; Mazzarino, 2012; Neirotti et al., 2014), which relates to logistics primarily through information systems, enables better management in many areas of logistics, primarily inventory management, storage and transport.

- The ethical aspects: Beyond the practice of business ethics (Goldman, Nienaber & Pretorius, 2015), an early vision of the relationship between ethics and logistics can be found in Stock (1997), who analyzed the relationship of ethics in logistics by examining the influence of ethical propositions in the decisions of logistics. Some of these decisions were in the hands of the managers of procurement who, as Wu & Dum (1995) remarked, are always facing social ethical responsibilities. Drake, Griffin & Swann (2011) used one of these ethical decisions to illustrate a case study in the classroom, where they analyzed ethical decisions in the logistics network. Another aspect of ethical character is the use of logistics to help with food distribution in countries with great poverty, as indicated by Schumann-Bölsche, Schön, & Streit-Juotsa (2015).

Finally, this following area also has a high relationship with logistics and will be the focus of this paper.

- The environmental aspects. The first relationship between logistics and environment is seen through green marketing, as mentioned in Dief & Font (2010). Lin & Ho (2011) showed this relationship is more intense and extensive when studying the green practices in the logistic industry in China. Cai et al. (2008) examined the connection through the Green Supply Chain (GSC) and Perotti et al. (2012) extended the concept to Green Supply Chain Practice (GSCP). Furthermore, Öberg, Huge-Brodin & Björklund (2012) stressed the importance of studying the relationship between logistics and environment, especially transport, as it can be a cause of environmental degradation. Finally, González-Benito & González-Benito (2006) presented a more complete relationship to involve the practice of management logistics as the element that handles this relationship between environment and logistics.

Analyzing these and all other areas covered by or related to business logistics could result in certain complexity, which might interfere with the objective to teach logistics. By the need to minimize the difficulty of teaching logistics, four qualitative-quantitative models have been created in academia (García, Hernández & Hernández, 2013; 2014a; Hernández, García & Hernández, 2012; 2013; 2016). These aim to cover the majority of the areas and aspects that have relation with the managerial logistics, while trying to facilitate the teaching of the same. These models are:

- The Logistics of Supply, Production, Distribution and Inverse Logistic Model (LSPDI, in Spanish el modelo Logístico de Abastecimiento, Producción, Distribución e Inversa [LAPDI]), which centers on the logistics flows (García, Hernández & Hernández, 2014a);
- The Logistic Model Based on Positions (LoMoBaP, in Spanish Modelo Logístico Basado en Cargos [MoLoBaC]), which studies logistics through the functions performed by the managers in logistic positions in an organization (Barreto, 2012; Hernández, García & Hernández, 2012; 2016; Jeney et al., 2015);
- The Logistic Model Based on Indicators for Positions (LoMoBaIPo, in Spanish Modelo Logístico Basado en Indicadores de Cargos [MoLoBaICa]), which has a strong relationship with MoLoBaC and measures enterprise logistics through indicators (Guerrero, 2013; Guerrero et al., 2014; Hernández, García & Hernández, 2013) and
- The Logistic, Strategic, Tactical, Operational with Inverse Logistics Model (STOILMo, in Spanish Modelo Logístico, Estratégico, Táctico, Operativo con logística Inversa [MoLETOI]), which analyzes logistics through normal stages of administrative analysis: Strategic, Tacit and Operative (García, Hernández & Hernández, 2013).

The second of these models, MoLoBaC, consists of forty-four positions, grouped into twelve areas, which are then combined into six stages. One of these positions is the Environmental Manager (EM), which will be the focus of this work. Several topics related to business logistics have been studied through the positions of the MoLoBaC.

- The flows (García, Hernández & Hernández, 2014a), making use of the model LAPDI

- The management indicators (Guerrero, 2013; Guerrero et al., 2014; Hernández, García & Hernández, 2013), using the MoLoBaICa
- The generation and management of knowledge (Barreto, 2012; Hernández, García & Hernández, 2012; 2016; Jeney et al., 2015), using functions of the MoLoBaC.

In the work of Hernández, García & Hernández (2012), the analysis of knowledge management was illustrated with the functions of the Customer Service Manager. However, to do this, an analysis of the enterprise diagnosis was also performed. This possibility of performing diagnostics through a MoLoBaC position opened a line of research.

From this line of research and understanding, the Environmental Manager (EM) of the MoLoBaC is related to practically all the areas of an organization, which stimulates the interest to study it in greater depth. Hence, the objective of this work arises: generate enterprise diagnostics, based on the functions performed by the Environmental Manager of MoLoBaC.

This general objective involves three specific objectives:

-To regulate an approach to perform enterprise diagnoses;

-To present the functions of the Environmental Manager of MoLoBaC and;

-To illustrate how managerial diagnoses supported on the functions of the Environmental Manager can be performed.

To achieve general objective and specific objectives, the Integrated-Adaptable Methodology for the development of Decision Support System (IAMDSS, in Spanish, Metodología Integradora-Adaptable para desarrollar Sistemas de Apoyo a las Decisiones [MIASAD]) will be used (Barreto, 2012; García, Hernández & Hernández, 2013; 2014a; 2014b; Guerrero et al., 2014; Hernández, García & Hernández, 2013; 2016; Jeney et al., 2015). Although IAMDSS arose for the development of Decision Support Systems (DSS), as shown in García, Hernández & Hernández, (2014b), due to its flexibility, it can be adapted to different types of investigation by selecting from its twenty basic steps only those considered essential at the moment of application. Similar to what was done in previous investigations, (Barreto, 2012; García, Hernández & Hernández, 2013; 2014a; 2014b; Guerrero, 2013; Jeney et al., 2015) this work will follow the following steps:

a) Define the problem that, as indicated in the objectives, is to generate enterprise diagnostics based on the functions performed by the EM of MoLoBaC;

b) Prepare the first prototype, where users of the final product are identified. As this is a scientific article, it should be directed to a specific population. These readers will be business logistics scholars, especially those who are interested in new approaches, which will allow for better understanding of its global vision. Also targeted are those interested in understanding the relationship of logistics within the whole organization and those willing to use new qualitative-quantitative models. Over all, those who seek to have new skills for conducting diagnoses and those who are interested and studious of the environment are added to conclude the population. Article structure will be established with the first prototype, which in addition to this introduction, will consist of three main chapters The first chapter will present the importance of business diagnostics, as well as building a methodology or the basic rules. The EM of MoLoBaC, with a focus mainly on their functions, will be presented in the second chapter. The third and key chaper will illustrate how MoLoBaC can make business diagnostics through the functions of the EM;

c) Obtain data from all available sources, in this case on enterprise diagnosis, logistics models, environmental aspects and functions of the EM;

d) Establish the alternatives, or the different ways that could compute enterprise diagnoses for the EM given the functions to be performed by this manager;

e) Evaluate alternatives, taking into consideration for each the possibilities and facilities to produce business diagnostics for each of the functions of the EM that have been defined;

f) Select the best alternative, as a product of the previous evaluation process, and based on the secondary objectives, tacit or explicit, being considered;

g) Implement the best alternative, generally by establishing mechanisms that allow the chosen alternative to be carried out in practice; in this case, it is to illustrate how enterprise diagnoses can be performed through a few functions of the EM and;

h) Establish controls and mechanisms that recognize if the alternative selected continues to be valid over the course of time. For this study, it is sought to verify that diagnostics can continue to be performed with the selected functions.

It is necessary to clarify that in this work, a chosen alternative must not be a function, but in general, a set of functions.

With regard to limitations and reaches, any fieldwork may be performed, but the illustration of the managerial diagnosis using functions of EM is through a hypothetical example to provide a more general view.

BRIEF COMMENTS ABOUT ENTERPRISE DIAGNOSIS

The continuous need for organizations to meet their performance objectives forces them to make diagnoses with a high frequency. The term diagnosis comes from the Greeks (Salama et al., 2009; Wojtowicz, 2010) and is associated with knowledge, or more accurately, to deepen knowledge. Commonly, when diagnoses are spoken of in the bussines world, they refer to diagnosis in medicine. (Belacel, Raval & Punnen, 2007; Ghodeswar & Vaidyanathan, 2008; Ilgin & Gupta, 2010; Salama et al., 2009). It is also common, as noted in Hernández, García & Hernández (2012), to find business terms in medical diagnostics such as routine patient management (Friedman & Jacobson, 2002) or enterprise image (McEnery et al., 2003; Wendt & Peppler, 2003). In the same way, managerial diagnosis use terms taken in direct form from medicine such as health management (Smith, Schroeder & Masquelier, 1999) or health diagnosis (Low, et al., 2010).

But more important than the origin of the word diagnosis and its close relationship with medicine, is knowledge of some aspects that can be revealed through a diagnosis, in particular a diagnostic which starts with business logistics:

From an operational point of view, it is necessary to make measurements of the day-to-day performance and diagnoses can generally be focused on failures. In the field of logistics, diagnoses can try to measure, among others, the proper: performance of transport, store use, management of customer orders, material handling in production centers, and customer service, besides having a clear view of products and other inputs purchased and the quality of the products shipped to markets and services rendered.

From a tactical point of view, under the vision of business logistics, it is possible to know the good use of the spaces of the organization, the rotation of the products, the availability of the raw material and other inputs in the medium term, the lifetimes and maintenance programs of the machines, the availability of the vehicle fleet and the relations and dependency of the logistic operators. Diagnoses can also detect existing irregularities early on.

Finally, from a strategic point of vew, there are aspects that go beyond logistics, taken or inspired mostly from Wojtowicz (2010), that allow companies to: identify opportunities offered nearby; know strengths and market position, measured in relation to main competitors; establish lines of development and review processes that stimulate the organization; identify weaknesses and strengths to develop established strategies; identify weaknesses and strengths to develop competitive advantages; and optimize the product portfolio. All of these are aimed to ensure better customer service.

In addition, to know what is expected of a diagnosis, it is necessary to establish a methodology to carry it out. This will follow the steps set by Hernández, García & Hernández (2012), which were initially inspired in Sarache, Ramos & Cespón (2002).

1. Determine the area and frequency with which the diagnosis will be performed. This first step also clearly defines the purpose, the start and end date of diagnosis, and the process of gathering the information. Involved parties are identified, as well as the areas to be evaluated and who is to report the results. While a start and end date of diagnosis is mentioned, business diagnosis is ideally a continuous process.
2. Organize the teamwork. In many cases, it is recommended that individuals who are external to the organization are incorporated and in most cases, especially when contemplating very sensitive aspects for the organization, it is preferable that this team is mixed, composed of internal and external elements. The advantage of having external elements is to help identify behaviors that might be overlooked by internal

groups, because they are usually obvious to the members of the organization, as they represent their daily activities. They need always to have internal staff of the organization to ensure that learning takes place within the organization and to make the diagnosis a permanent process.

3. Generate the instruments and mechanisms for gathering information. Perhaps the most suitable tool, especially if one thinks of diagnosis as a continuos process, is through observation. Interviews might also be necessary and will require the formation of guidelines. If this is the case, questionnaires must be prepared to compile the information to be processed. Independent of the instrument to get the information used, the data must be obtained so that it is easily manageable and measurable, and so that it can be converted into information that becomes useful over time.

4. Collect the data. This is usually done in two phases: first, the phase of observation and document review and second, the application of questionnaires, interviews or both if necessary. The observation and revision of documents are intended to monitor all the spaces of the organization and the aspects that it wants to measure to detect any abnormality. At the same time, the revision of the data that depends on documents are intended to determine the frequency of occurrence of all these events. The interviews and questionnaires often point out relevant aspects and measure them in such a way that can be quantified without any difficulty. When collecting data, one should be thinking about what quantitative model will be used later, although at times it is the application of the tools for the collection of data and the ending results that suggest what quantitative model should be used. The important thing is to be able to convert data into information that will be used continuously through time.

5. Identify and quantify the problems and opportunities. Rather than measuring the depth of possible failures that may occur within an area or the organization as a whole, one should seek opportunities for improvement and integration, to get the most out of the knowledge obtained. This better understanding of the organization will allow it to better deal with potential problems. Emphasis should be placed on potential, because the intention of having a continuous diagnosis is to be able to detect problems before they arise and not after that have become evident.

6. Present possible solutions. In the case of problems, steps to solve the problem should be established. In the case of opportunities, strategies should be developed to capture the advantage. In fact the solutions go beyond the diagnosis, but if the process is seen as a continuum, these steps are taken one after the other with no major breaks.

With these six steps, it is clear how to carry out the diagnosis, especially if it is a continuous process for the organization. To generate this information that maybe useful at any time, the use of management indicators is recommended.

Without excluding the use of another quantitative tool, either on an individual basis or together with management indicators, the use of these is recommended because they allow updated information to be available to use in any moment. Two papers presenting background on the use of environmental indicators are those of Li, Tian & Tang (2014) and of Tilină, Zapciu & Mohora (2015) who use different approaches to establish a diagnosis with the use of indicators. Later, the central section of this article will illustrate how indicators can be used through the functions of the Environmental Manager (EM). The manager itself will be further discussed in the following section.

THE ENVIRONMENTAL MANAGER OF THE MoLoBaC

Before making any comments on the Environmental Manager (EM), a couple of concepts will be presented that are indispensable in understanding in clear form the four quantitative - qualitative models presented in the introduction and created to explain logistics. These are the concepts of enterprise logistics and supply chain.

The enterprise logistics is centered in searching and obtaining the best present and future satisfaction of the final costumer. It includes the socio-environmental and ethic-legal aspects, and the planning, execution and control of all related activities with the procurement, flow, warehousing and maintenance of materials, products and even services –from the raw material source, including costumer through inverse logistics, to the

sale point of the finished product whether local or international, massive or enterprise –in the most effective and efficient manner, maximizing performance and the expected quality, while minimizing waste, time and cost using modern information technologies (Hernández, García & Hernández, 2013).

Supply chain is a wider concept than enterprise logistics, in the sense of its scope and is understood as all the logistic aspects that must be synchronized among the producers of raw material, finished products and both wholesale and retail distributors, so that the costumers' real needs are adequately satisfied. The logistic aspects in which Supply Chain Management (SCM) is usually centered around are: warehouse, inventories, localization and transportation, but in order to achieve a good SCM, a high integration of the information systems is required (Hernández, García & Hernández, 2013).

The presentation of these two concepts will make understanding the Environmental Manager of the Logistic Model Based on Positions (LoMoBaP [MoLoBaC]) easier. El MoLoBaC, as already indicated, is composed of forty-four positions. These positions are grouped into twelve areas, as well as into six stages (Barreto, 2012; García, Hernández & Hernández, 2013; 2014a; Hernández, García & Hernández, 2012; 2013; 2016). This work will focus on one of the positions of the stage General, partuclary working with the area Supporting Logistics, in which six positions are found: Manager of Costs (10), Manager of Finances (11), Manager of Marketing and Sales (20), Manager of Human Resources (26), Ethical & Juridical Consultant (40) and Environmental Manager (41). The numbers after each position uses the model to identify it.

Considering the relations that the position identified with the number 41, the Environmental Manager (EM), has with the whole organization, this paper focuses on how, through the functions of EM, enterprise diagnoses can be performed.

The EM is responsible for everything related to the environment in the organization, from being vigilant that all the existing laws are fulfilled to being the promoter of measurements that favor the environment. To look over this wide panorama of responsibilities, the EM must maintain constant contact with everyone in the organization, particularly with executives. However, their responsibilities are not limited to the internal sphere of the organization, but should represent all environmental subjects in everything that relates to the environment, even in the face of governmental entities at different levels. Additionally, it must maintain a completely proactive attitude with respect to progress relative to the environment –a social conscience as protection for the organization –because it allows for avoidance of any legal infringement.

For the Environemental Manager's extensive relationship with all positions in the organization and especially with all positions of the MoLoBaC, some of its functions are related to the remaining positions of this model. In particular, the environmental issues are usually related to recycling and at the same time with reverse logistics, for which some of the functions of EM, in one or another form, have certain relations with aspects relative to the inverse logistics (Hernández, García & Hernández, 2016).

For this high quantity of relations and the need of a permanent review of all the environmental aspects of the organization, there are many functions of the EM. Table 1 presents some of these functions, trying to emphasize those directly related to business logistics, hence some of them have been extracted and some taken or inspired by Demirel & Gökçen (2008); Fleischmann (2000); Garg, Luthra & Haleem (2014); Hernández, García & Hernández (2016); Sannö 2015; Sarkis, Meade & Talluri (2004). Some abbrevaitions will be used in this table: EF, for environmentally friendly; as has already been used by Environmental Manager; Env-Con, for environmental contamination; Envi, for environmental; HR for Human Resources; IL, for inverse logistics; IS&IR, for Industrial Safety and Internal Relations; Mgr, for Manager; M&SM, for Marketing and Sales Manager; PS, for plant shutdown and R&D, for Research and Development. Some of these abbreviations will continue to be used through this paper.

Table 1. Some functions of the Environmental Manager of the MoLoBaC

Intrinsic to the position.	
01	Establish all policies and rules relating to the environmental management of the organization.
02	Convert the organization to a reference regarding the care of Envi.
03	Constantly monitor all areas of the organization, to ensure full respect for the Envi.
04	Keeping up with all the new tendencies in the management of Envi.

05	To offer chats to the whole personnel of the organization, on the respect to the Envi.
06	To help to create the best conditions of work to facilitate the environmental management.
07	Keep the whole personnel of the organization informed of changes that affect their relation with the Envi.
08	To establish plans of growth with minimal contamination for the organization.
09	To guarantee that the whole organization works under a philosophy of zero environmental damages.
10	To give public recognition to the whole personnel that generates ideas or takes environmental measures
11	To collaborate with all initiative environmental ideas that comes from the employees.
12	Activate mechanisms that would enable it to measure the environmental responsibility of the personnel.
13	Analyze the needs of resources that facilitate a better environmental performance in the organization.
14	Promote the creation of interdisciplinary groups to work on improvements to the Envi.
15	Take advantage of all opportunities, to increase the interest of the staff in topics of the environmental.
16	Generate new ideas that allow environmental activities are increasingly challenging.
17	Be aware of all the environmental laws and regulations, which could affect the organization.
18	Promote services or products EF.
19	Know, with the greatest depth possible, the operation of the company, to establish appropriate policies for environmental protection.
20	Prepare contingency plans to prevent major environmental impacts in case of accidents.
21	Train personnel of the organization to minimize environmental impact, front any industrial accident.
22	Propose new projects to make the organization more EF.
23	Supervise a rational use of resources, especially energy, throughout the whole organization.
Related to other positions of MoLoBaC.	
24	To guarantee together with Layout Mgr that all the spaces facilitate the care of the environmental.
25	Take care with the Procurement Mgr and his subordinates that prdocuts acquired do not generate Env-Con.
26	Contribute with the Other inputs Mgr in the acquisition of equipment for environmental protection.
27	Help the Raw material Mgr, to ensure they are not generating products that cause health or environmental problems.
28	Support the Quality Mgr in all initiatives to be taken to improve the environmental quality.
29	Collaborate with the Quality Mgr, to maintain the quality from the start, so as to avoid waste and Env-Con.
30	Work with maintenance Mgr and subordinates to guarantee equipments are receiving proper maintenance to prevent Env-Con.
31	Work together with Reliability and substitution Mgr to disincorporate equipment that is no longer functioning properly to avoid waste and Env-Con.
32	Coordinate with the main Major maintenance Mgr for environmental improvements during PS.
33	Working with Cost Mgr to ensure environmental protection is made at minimum cost.
34	Support the Finance Mgr drawing up the budget for environmental protection.
35	Take care, together with Mgr of inventories and his subordinates, which warehouses ensure an EF treatment of all that is maintained in the warehouses.
36	Coordinate with the Mgr of Spare and equipment the availability of equipment for environmental protection.
37	To offer the opinion from point of view of the Envi to the Mgr of Expansion, when it is necessary.
38	To analyze all the information, with respect to the Envi that could be offered to the R&D Mgr and his subordinates.
39	To coordinate the support that it receives from the R&D Mgr and his subordinates to spread environmental information.
40	Ensure that the information technology equipment, incorporated by the R&D Mgr and his subordinates are EF.
41	Support to the Virtual channel Mgr, to minimize the consumption of paper, to be replaced by virtual resources.

42	Working with the M&SM, to promote products, whose production is more EF.
43	Collaborate with the M&SM, to educate the consumer on environmental aspects.
44	Generate ideas, together with Order processing Mgr and their subordinates, for the handling of customer orders to be filled with low consumption of paper and energy resources.
45	Caring, together with Material handling Mgr, that material movement causes the least environmental impact.
46	Collaborate with the Industrial design Mgr, for designs that are EF.
47	Working with Picking Mgr to achieve a process of picking EF.
48	Analyze with the HR Mgr, courses and workshops offered for training in environmental protection for all personnel.
49	Create together with HR Mgr, incentives for staff to improve their environmental awareness.
50	Contribute with the Physical distribution Mgr and his subordinates, so that their performance is EF.
51	Study together with the Dispatch Mgr, the ways more EF performing the same thinking, not only in the dispatch itself, but at the time of deliveries.
52	Support to the Channels Mgr, so the choice of the marketing channels is considered likely to be more EF.
53	Collaborate with the Localization Mgr, to ensure the location of any new installation of the company shall be deemed as EF and minimizes any possibility of Env-Con.
54	Working jointly with the Transport Mgr and their subordinates, so that they can perform their functions with an EF philosophy.
55	Contribute with the Mgr of Fleet in acquiring a fleet of vehicles that is at least possible Env-Con.
56	Support to the Routes Mgr to consider all environmental aspects that could be involved when establishing routes
57	To give special collaboration to the Packing Mgr, to realize packing EF and of minim Env-Con.
58	Create forecasts, jointly with Forecasting Mgr, which allow estimating the needs of environmental protection equipment for the organization.
59	Working in conjunction with the Inverse logistics Mgr and his subordinates, so that through the IL environmental are achieved will improve.
60	Assist Compilation and reception Mgr, to define the most appropriate policies for gathered.
61	Working with the Utilization Mgr, to guide the use of products that come through the IL.
62	To define political, with the Inverse logistics Mgr and his subordinates, a better use of the products that come for the IL, as well as internal by-products and those components that must be re-processed.
63	Exchange ideas with Ethical & Juridical consultant about any changes in environmental regulations.
64	Contribute with the IS&IR Mgr in the creation and implementation of standards and measures for the control of the Env-Con in the organization.
65	Participate with the Projects Mgr in projects for the protection and environmental improvements.
66	Study together the IS&IR Mgr, the reduction of internal contamination in the organization. In any case to guarantee the equipment of protection front the same one, for the whole personnel.
67	Help generate indicators measuring the environmental performance of personnel across the organization.
68	Establish strategies, together with Customer service Mgr and his subordinates, to make environmental policy into an instrument of customer satisfaction.
Related to MoLoBaICa, LAPDI, MoLETOI and the enterprise logistics in general.	
69	Studying the physical flows, especially effluent and ensure that they are not sources of pollution.
70	Ensure that the personnel perform the tasks tactical and operative of the organization with conscience EF.
71	Create awareness on staff to minimize waste and pollutants.
72	Prepare personnel, to handle environmentally consciously, all logistical aspects of the organization.
73	Collaborate to achieve the vision, mission and guiding principles of the organization, which must contain integrated environmentalists precepts.
74	To maintain a permanent flow of information on environmental measures.
75	Properly handle control flows, to ensure good environmental performance throughout the organization.

Related to SCM and the enterprise and its environment as a whole.	
76	Take advantage of the marketing channels and other members of the SCM, for further measures to protect the Envi.
77	Take advantage of changes in the environment to improve environmental conditions.
78	Integrate the communities around environmental improvement programs.
79	Trying to support environmental associations that present environmental improvement projects.
80	Help personnel of the organization favorably impact throughout society.
81	Help generate campaigns by the rational use of resources in the organization and its environment.
82	Promote the reduction of energy consumption in the organization and its environment.
83	Establish partnerships with universities and training institutes, to perform studies of improvement in the environment.

With this large amount of functions of the EM, presented in the Table 1, it is possible to see his big interrelation with the whole organization, which will be the starting point to computing enterprise diagnoses, making use of some of the above mentioned functions.

ENTERPRISE DIAGNOSTICS THROUGH THE FUNCTIONS OF THE ENVIRONMENTAL MANAGER

To reflect the diagnosis through the functions of a manager of MoLoBaC and the use of indicators, part of the analysis will have common points to the application of the MoLoBaICa (Guerrero, 2013; Guerrero et al., 2014; Hernández, García & Hernández, 2013). However there are fundamental differences departing from the objectives. Here, the MoLoBaCa intends to perform a diagnosis of the organization or a part of it, while the MoLoBaICa, intends to complete an evaluation of the staff. For the same reason, the MoLoBaICa is interested in the individual performance, although the estimate is measured with the performance of the entire organization, while the important measure in the MoLoBaC is how the organization performs against one aspect of interest. The purpose here is more than measuring performance; the aim is to know what situation is being faced and to detect aspects that represent opportunities or even occasions to solve abnormal situations. As will be seen in table 2, one aspect is the encounter of one coverage with one level.

In particular, with respect to the levels, the operational, tactical or strategic may be of interest. In general, with respect to coverage, diagnoses covering a specific area, group of areas, or the organization as a whole may be needed. Without more detail, the functions that could be used to complete this matrix of coverage front to the levels are enumerated in Table. Nine aspects are defined in this manner: 1 (an area, operational), 2 (an area, tactical), 3 (an area, strategic), 4 (multiple areas, operational), 5 (multiple areas, tactical), 6 (multiple areas, strategic), 7 (whole organization, operational), 8 (whole organization, tactical) and 9 (whole organization, strategic).

In this work the concept of areas refers to the areas that make up the stages of the MoLoBaC. These are: Procurement, Maintenance, Inventories, Order processing, Physical distribution, Transportation, Customer service, Inverse logistics, Intrinsic to logistics, Supported by logistics, Supporting logistics and Information.

Table 2. Functions of the Environmental Manager, for each aspect to diagnose

Coverage	Level of interest		
	Operational	Tactical	Strategic
An area	11, 25, 31, 33, 50, 56, 60, 70, 77.	11, 31, 33, 61, 70.	01, 27, 47, 68.
Multiple areas	14, 24, 30, 31, 32, 35, 44, 45, 50, 51, 54, 70, 77.	14, 30, 31, 32, 35, 36, 40, 44, 46, 52, 55, 57, 59, 62, 64, 69, 70.	01, 35, 41, 46, 64, 68.
Whole organization	03, 07, 09, 13, 17, 49, 70, 77.	05, 06, 07, 12, 13, 16, 18, 38, 53, 70.	01, 02, 08, 16, 18, 20, 21, 37, 42, 43, 68.

In the Table 2, notice that there are functions that do not appear in any of the aspects. There are two reasons for this. The functions 04, 10, 15, 19, 26, 34, 48, 63, 71 and 73, are functions of a punctual nature that generally do not adapt directly to perform diagnostics on them. On the other hand, the functions 22, 23, 28, 29, 58, 65, 66, 67, 72, 74, 75 and all the functions of 76 to 83 would perform diagnostics on all the coverage and for all levels, that is, for all the aspects.

From Table 2, the functions with which it is desireable to establish indicators in order to maintain a constinuous diagnostic could be chosen. It should not necessarily work with all the functions that appear in one of the boxes (aspects). In particular, for the first six aspects, the area or areas that will be subjected to diagnosis should be clarified.

In Table 3 and following (4a, 4b, 5a, 5b and 6), it is possible to see how the indicators can be generated and used following to a certain extent the work philosophy of MoLoBaICa (Guerrero, 2013; Guerrero et al., 2014; Hernández, García & Hernández, 2013). For this work, functions that can help perform diagnostics to an area with a strategic level (aspect 3) have been chosen. This aspect was chosen for simplicity, since it was where a minor number of functions coincided. In this case the illustration concerns the area of Procurement, by which it will work only with two functions: 01 and 27, obviating the functions that are useful to all aspects.

The weight of the function is expressed as a percentage and is relative to the importance that this function has in the diagnosis of the coverage and level in study. The number of indicators is not in direct relation with respect to this importance, but is chosen in accordance with the need. They will be the indispensable indicators to measure the respective function adequately.

Table 3. Weight and number of indicators for the selected functions of the Environmental Manager

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.		
Function	Function weight	Indicator Number
01.- Establish all policies and rules relating to the environmental management of the organization.	65%	Two (2)
27.- Help the Raw material Mgr, to ensure they are not generating products that cause health or environmental problems.	35%	Three (3)

As in MoLoBaICa (Guerrero et al., 2014; Hernández, García & Hernández, 2013), the next two tables give details of these indicators. In this case, these are Tables 4a and 4b; the first is for the indicators of function 01 and the second for the indicators of function 27.

Table 4a. Indicators of the function 01

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.							
Function: 01.- Establish all policies and rules relating to the environmental management of the organization.							
Weight of the function in the diagnosis (1 to 100): 65							
Indicator Name	Indicator Description	Mathematical Expression (Quotient)	Values			Revision conditions:	Indicator value for the function (1 to 100):
			Low	Medium	High		
Beware	Beware of the political to the area in study	(Political relative to the area) / Total policy	0,06	0,12	0,20	If it is below the minimum value	100

The indicator Beware is measured annually and is expressed in number of environmental policies related to the area on the number of total environmental policies.							
Consultations	Consultations with the area	(Number of consultations with the area) / (Total consultations)	0,05	0,12	0,25	If it is below the minimum value	90
The indicator Consultations is measured annually and is expressed in number of meetings or consultations, to discuss environmental policies, with the staff of the area on the total number of consultations throughout the whole organization.							

Table 4b. Indicators of the function 27

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.							
Function: 27.- Help the Raw material Mgr, to ensure they are not generating products that cause health							
Weight of the function in the diagnosis (1 a 100): 35							
Indicator Name	Indicator Description	Mathematical Expression (Quotient)	Values			Revision conditions:	Indicator value for the function (1 to 100):
			Low	Medium	High		
Studies	Analyzes on the raw materials	(Number of analysis) / Number of raw materials	1,00	1,50	3,00	Two times out of range	90
The indicator Studies is measured annually and is expressed in number of analyses performed on the raw material on the number of total raw materials.							
Meetings	Meetings to analyze the raw materials	(Number of meetings) / 12	1	2	3	Three times out of range	80
The indicator Meetings is measured annually and is expressed in number meetings held to discuss the raw materials that are being procured by the number of months of the year (12).							
Eliminate	Disincorporate raw materials	(Number of raw materials removed) / (Number of raw materials with some kind of doubt)	0,95	1,00	1,00	If it is below the minimum value	100
The indicator Eliminate is measured annually, and it is expressed in number of raw materials delisted on raw materials, which in high degree it can be assumed that have some type of problem.							

Although this is not evaluating the position, it is necessary to do an evaluation of the indicators when following the MoLoBaICa. In tables 5a and 5b, the evaluation will be incorporated into the measurement of the indicators of functions 01 and 27, respectively.

These evaluations are involved in steps 3 and 4 of the methodology for diagnostics presented in the first chapter. It is necessary to remember that step 3 focused on choosing the measuring devices and step 4 was the measurement in strict sense. At this time, these steps are not reflected explicitly. However, the EM must have chosen the appropriate instruments and have made the appropriate measurement in order to be able to have a value of correct performance for each indicator.

Table 5a. Measurements of the indicators of the function 01

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.			
Function: 01.- Establish all policies and rules relating to the environmental management of the organization.			
Indicator: Beware.			
Numerator value	Denominator value	Indicator value	Value (1 to 100)
8	50	0,1600	100,00 (0,15 = 100)
Indicator: Consultations.			
Numerator value	Denominator value	Indicator value	Value (1 to 100)
7	75	0,0933	57,73 (0,125 = 100)

Table 5b. Measurements of the indicators of the function 27

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.			
Function: 27.- Help the Raw material Mgr, to ensure they are not generating products that cause health or environmental problems.			
Indicator: Studies.			
Numerator value	Denominator value	Indicator value	Value (1 to 100)
159	142	1,1197	23,94 (1,5 = 100)
Indicator: Meetings.			
Numerator value	Denominator value	Indicator value	Value (1 to 100)
20	12	1,6667	66,67 (2 = 100)
Indicator: Eliminate.			
Numerator value	Denominator value	Indicator value	Value (1 to 100)
6	7	0,8571	85,71 (1,00 = 100)

Finally Table 6, similar to MoLoBaICa, presents consolidation of the results. The table does not present how good the performance of a position is, but how the indicators, each one individually in the functions and in the aspect, is evaluated. In this case, we want to have a diagnosis of an area, particularly Procurement, that is anaylzed on the strategic level.

Table 6. Evaluation of the studied functions and of the aspect to diagnose

Aspect: Coverage: An area. Level: Strategic. MoLoBaC Position: Environmental Manager.			
Function: 01 Establish all policies and rules relating to the environmental management of the organization.		Function Weight (Pf): 65	
Indicator	Obtained value in the indicator (Vi)	Indicator weight (Pi)	Vi * Pi
Beware	100,00	100	10000,00
Consultations	57,73	90	5195,70
Sum	157,73	190	15195,70
Function Value (Vf)	(Sum Vi * Pi / Sum Pi) * Pf (15195,70 / 190) * 65 = **5198,53 (79,98%)**		Sum of Pf = 65
Function: 27 Help the Raw material Mgr, to ensure they are not generating products that cause health or environmental problems.		Function Weight (Pf): 35	

Indicator	Obtained value in the indicator (Vi)	Indicator weight (Pi)	Vi * Pi
Studies	23,94	90	2154,60
Meetings	66,67	80	5333,60
Eliminate	85,71	100	8571,00
Sum	176,32	270	16059,20
Function Value (Vf)	(Sum Vi * Pi / Sum Pi) * Pf (16059,20 / 270) * 35 = **2081,75 (59,48%)**		Sum of Pf = 100
Aspect Value (Va)	Sum Vf / Sum Pf = 7280,28 / 100 = **72,80 %** (All the functions of the aspect)		
Value of all the aspects (Vt)	To be diagnosed more than one aspect would be the value here to implement Sum of all the Vf / Sum of all the Pf		

Step 5 of the methododolgy for diagnostic presented in the chapter on business diagnostics is achieved with the values in Table 6. This last table shows in summary form the real situation of the aspect that was diagnosed. This case applies to aspect 3 (An area, Strategic level). In particular, the area analyzed was Procurement.

However, also seen at the end of Table 6, is the ability to have the results of several aspects simultaneously be reflected in the overall results on a single table. Table 6 also shows that the indicator Studies is very low, only reaching 23.94%, and that function 27 has a low valuation, at 59.48%. However the aspect in study gets a value of 72.80 %, which can be considered a high value.

What is more important to emphasize than these particular values though, is the ability of Tables 3 through 6 to illustrate how a business diagnostic can be performed based on the functions of EM and expressed in quantitative terms, through management indicators.

The only absence is the implementation of pertinent corrections, which as noted previously, are generally not an intrinsic part of the diagnosis. However with the values obtained, it can be noted that the main effort must be made in function 27 and especially in the indicator Studies. This will not start a discussion of how to improve this indicator though, given that this particular case is not the important conclusion of the study, but having performed the diagnosis. Therefore, the results of Table 6 and in all the above tables allow some conclusions to be presented, while possible lines of future research to be discussed. The following section contains brief managerial implications procured from this work.

MANAGERIAL IMPLICATIONS

Although this article refers to three very important aspects of business life –new technologies, ethical aspects and legal aspects –the most important contribution is given by three different aspects: the business logistics, diagnosis management and environment. Therefore, the managerial implications will be discussed primarily through the last three aspects.

From the point of view of business logistics, this work can serve as a starting point to understand the close relations that exist between logistics and the rest of the business activity. This would help to better understand the organization as a whole and would enable studies to be performed on various aspects of it. Just a few examples of these aspects are management of flows; analysis of the functions performed by each of the staff members; dispersion and repetition of functions even functions not covered; study of management that is made from the strategic, tactical and operational stages; and the relationship with the environment.

In terms of diagnosis management, this work presents a methodology which is easy to implement, and which would facilitate the realization of any diagnosis that wants or needs to be done in an organization.

In addition to indicating the steps to be followed, this work can also uncover aspects that may be of special interest to diagnose. In this case it must be understood that one aspect is the intersection between a coverage (an area, multiple areas or the organization as a whole) and a level of interest (Strategic, Tactical or Operational).

With regard to the environment, this article presented many functions that can or should be performed by the Environmental Manager (EM), which will allow the managers of the different organizations to have a document that their respective groups are able to quickly review and monitor their level of compliance in the organization. In this way, it is possible to obtain a greater benefit of each of these functions. The documents also serve as an easy guide to measure the percentage of good performance within each group.

However, even more important than each of the managerial implications from the three aspects – logistics, diagnostics, and environment –is the advantage that can be obtained from the three together. This paper presents how to make a business diagnosis following the Environmental Manager of a logistic model and this diagnosis is expressed through management indicators. Following this work, companies and organizations in general could create management indicators that will allow them to measure their own performance.

CONCLUSIONS AND FUTURE RESEARCH

Centered not in the particular values but the results of Table 6, one can see that it is achievable to obtain a managerial diagnosis from the functions of Environmental Manager (EM), thus complying with the general objective proposed. In addition, a methodology for performing these diagnostics is produced, which generates results that present quantitative values of the situation in study through indicators. Also, a large amount of functions of the EM were presented before the indicator calualtions, complying with the specific objectives that had been established.

The achievement of these objectives suggests some future research. From the theoretical point of view, it is possible to keep on perfecting the methodology presented, in particular its quantitative aspects. It is possible to think of incorporating other types of mathematical models, specifically multicriteria models and in particular the Matrixes Of Weighing with Multiplicative factors (MOWwMf) or the Multiatributte Models with Multiplicative factors (MMwMf). These models could work individually or in conjunction with indicators. Furthermore, it is possible to perform similar works to the ones presented here, but with other positions of the Logistic Model Based on Positions (LoMoBaP [MoLoBaC]).

From a practical point of view, this can be extended to the world of small and medium enterprises. The methodology and tools presented here to perform diagnoses can help them see their situation more clearly and thus detect problems, which are perhaps not visual from simple sight. These diagnoses can pontentially uncover latent opportunities as well.

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