

MODEL TO ASSESS SUPPLY CHAIN RESILIENCE

J. VARGAS & D. GONZÁLEZ

Department of Engineering, Pontificia Universidad Católica del Perú, Peru.

ABSTRACT

The uncertainty in the current business environment is driven by events such as economic crises, climate change, global terrorism, shortage of resources and so on. This causes traditional supply chain operations models to become obsolete and not able to ensure the sustainability and competitiveness of the organizations. In this context, resilience is defined as the ability of a company/ community/ environment/ people to recover after it has been exposed to an important disturbing event, for instance, a natural disaster as a hurricane hitting the main suppliers, thus creating lack of raw materials in production lines. This article tackles how the assessment of the supply chain resilience, considering this capacity, enables one to be better prepared for an unstable risky environment and the post disaster consequences. We propose a model based on three categories of indicators; the first one is related to achieving an organizational resilience (to assess by results of responsiveness, flexibility and effectiveness), the second one is related to attaining business resilience (to assess by cash-to-cash, days of inventory, days of receivables and days of payables), and the third one is related to having a labour resilience (to assess by labour capabilities to overcome vulnerable living conditions). Two Peruvian supply chain companies (which belong to the food and pharmaceutical sectors) have been studied by using the model; the main results allow concluding that they have a low resilience level, because of their current three-category indicator results.

Keywords: agility, business continuity, resilience, supply chain.

1 INTRODUCTION

Currently, business is exposed to a variety of risks which generate disorientation in decision making – it is called “The New World Disorder” [1]. This environment had undergone successive economic crises such as; Argentina (1991), Brazil (1994), Thailand and Korea (1997), Russia (1998) and recently, the United States of America (2010) and Europe (2011). Today, supply chains are more exposed to disruptions than before. Resilience is a determining factor for business management, ensuring agility, strength, flexibility, adaptability, responsiveness, visibility and reliability in companies, as Peter Drucker predicted, “... change is the norm” [2]. The references [3, 4] shown that people, environment and society (local or global) currently influence each other in a way that is unknown in magnitude, testing their ability to adapt to traditional structures and organizations. That is why resilience is necessary in the actual supply chains – more adaptable operations are required. This article proposes a model to assess the supply chain resilience, being in this way consistent, through its measurement, with the growth of contemporary supply chain challenges [5].

The article is arranged as follows: first, it explains the background and frame of resilience and the supply chain, the chapter four introduces the assessment model to measure the resilience capacity in the supply chain, the next chapter presents the methodology used in the

paper, the chapter six sets forth two application cases. Finally, the main conclusions and future works are remarked.

2 BACKGROUND

Resilient research into operation studies has caught the attention of researchers. In Scopus, 27 articles are recorded in 2,000 with the words “resilient management”, while in 2014, the record shows 365 articles (analysis made on February 11, 2015).

Nowadays, the number of disruptions which business is exposed is high, and it is through resilience that it attains a state of permanent readiness, allowing to have time for addressing those extreme situations, disruptions or impacts [6]. A resilient company is well organized to cope better with conditions of uncertainty, risk, vulnerability and exposure coming from hostile market conditions and failures in market conditions, lack of critical raw materials, new pandemics, global financial crises, attacks to information systems, etc. A multitude of events from which its speed, novelty, magnitude or complexity are current out of range protocols, management techniques and traditional organizations’ response systems.

References [7–12] studied the supply chain performance into disruptive events (natural or man-made origin; fires, earthquakes, floods, intentional attacks, etc.); the authors found that their operations design which face them were not performed. Chopra [11] proposes an extensive risky driver list which threatens the supply chain. On the other hand, Grossi and Kunreuther [13] and Banks [14] studied the impact of catastrophic events where geographically supply chains are dispersed, causing that their supply chains cannot be restored swiftly and reactively: For instance, the strongest earthquake recorded in Japan 9.0 M, on 11 March 2011, not only had a major impact on the global automotive industry, but also many electronic components made in Japan which are used by different companies around the world, had shortages and stoppages in assembly lines, such as mobile phones, refrigeration equipment, control devices (steel and chemical industries) and so forth [15–17].

3 SUPPLY CHAIN RESILIENCE

The origin of the term resilience comes from materials science, and describes the ability of a material to recover its initial state. In psychoanalysis, it is defined as “the ability to withstand a trauma and rebuild after it”. This meaning has spread to various domains and sciences such as geography, management, economy and others [18]. Zsidisin defines resilience as the ability of a system to keep functioning despite a large disturbance or the ability to recover its operating status after a state of greater disorder [19].

Bennasar says that in resilience two notions coexist, the first one is about the resistance (namely, withstanding the shock) and the second one is about persistence (continuing on a slightly altered state), both must take into account to analyze companies with resilient performance [6]. Although the notion of resilience is identified by a state after the disturbance, the mechanisms and elements that gave origin and piloted the performance level of this capacity, are present long before the presence of the disturbing event. Inspired by Helfferich [9], these elements are classified in: (i) resilience in input logistics, (ii) resilience in processes logistics, and (iii) resilience in output logistics.

3.1 Resilience in input logistics: resistance

Knowing disruptive events may affect input logistics, resilience capacity shall express actions such as: (i) increasing anticipation capacity, (ii) improving and making more reliable

monitoring, (iii) reducing the exposure, (iv) fortifying against strikes, (v) planning the means of protection and preservation and (iv) improving the system capacity against disruptions.

3.2 Resilience in processes logistics: continuity

In the field of manufacturing processes, resilience is often expressed by the flexibility, redundancy, control and response differential fill-rates and multi-sourcing, everything here is implicit to business continuity [20].

3.3 Resilience in output logistics: persistence

For outbound logistics, among other issues, the supply chain should take action to be capable of: (i) increasing the capacity to detect, adapt and react efficiently against disruption, (ii) increasing the capacity to organize and optimize the response and quickly resume nominal operation status, etc.).

In conclusion, as reference CLSCM [21] remarks, "...dealing with supply chain vulnerability requires a change management approach. Such an approach recognizes that the *right* philosophy for tackling supply chain vulnerability depends on culture, structure and business drivers dominant in an industry sector."

4 PROPOSITION

In order to assess resilience capacity in the supply chain, here is proposed a measurement model which is shown in Figure 1. It is based on three categories of indicators; (i) the first one is related to having a Labour Resilience (to assess by labour capabilities to overcome vulnerable living conditions), (ii) the second one aims to achieve an Organizational Resilience (to assess by the results of responsiveness, flexibility and effectiveness), and (ii) the third one, seeks to attain a Business Resilience (cash-to-cash, days of inventory, days of receivables and days of payables).

In reference Kirby [22] - it is mentioned that an unstable and uncertain business environment, generated *post disturbing events*, requires an operational management based on attaining

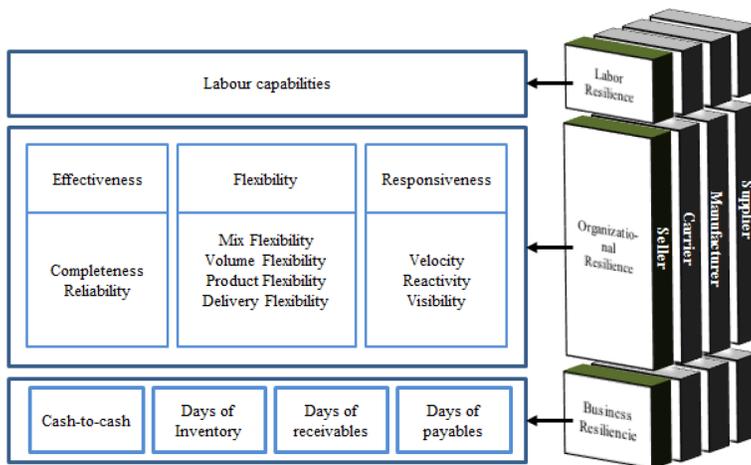


Figure 1: Resilience measurement model.

a resilient organization. In possible future scenarios, post disruptive events are better managed, considering an early configuration, flexible and adapted to new estimated conditions [23, 24].

4.1 Labour resilience

A study about risk and exposition to natural disasters [20, 23] allows to deduce that an important level of resilience is achieved having a mature well-being labour. References UNDP [25]; D’Ercole [26]; D’Ercole [27]; Alinovi [28], allow to identify generic factors which characterize population resilience to disasters (see Table 1). Reference Kang-Yao [29] mentions resilience development mainly needs an intra- and inter-organizational capitalization that may feed all actions and improvement of the system to anticipate future hazards.

Table 1: Indicators to assess resilience labour.

Board	Group	Measurements
Labour	Income and feeding	Average per-capita income (\$)
		Average per-capita expenditure (\$)
		Score on family food security
		Score on the diversity and feeding frequency.
		Caloric diet intake (Kcal/person/day)
	Access to basic services	Physical access to health services
		Score on health services quality.
		Education system quality.
		Security perception
		Restrictions on mobility and transport. Water, electricity and phone networks.
Social rewards	Amount of cash for day care per-capita	
	Evaluating quality of assistance	
	Assistance work Frequency of assistance General opinion on assistance objectives.	
Assets	Number of rooms per house	
	Family equipment index (TV, car, etc...)	
	Tropical Livestock Unit (TLU) equivalent to 250 KG	
	Land property (in hectares)	
Adaptation capacity	Resources diversity for obtaining income.	
	Education level (family average).	
	Employment ratio	
	Different strategies for social involvement.	
	Food consumption ratio	
Stability	Number of unemployed members in the family.	
	% Change in income	
	% Change in expenditure	
	% Change in savings	
	Financial dependence. Education system stability.	

4.2 Organizational resilience

Academic literature about supply chain under disruptive events considers agility as a previous state in the process for developing a supply chain resilience capacity in organizations. Charles says that while agility is being able to deal with and take advantage of uncertainty, volatility and adaptability (short and medium term), resilience aims to mitigate identifiable risks and ensure continuity in the firm's business (long term) [30]. Furthermore, authors propose that can assess organizational supply chain resilience, using a supply chain agility assessment model widely developed in [30, 31], summary indicators are shown in Table 2. Below are presented the indicators proposed by previous authors mentioned in a model adapted to assess the supply chain resilience.

4.3 Business resilience

Farris II says "supply chain management is being heralded as a value driver because it has such a wide-ranging effect on business success or failure...being the cash-to-cash metric a useful measure from both an accounting and the supply chain management perspective" [37]. Citing Aberdeen-Group (2006) and Tibben-Lembke & Rogers (2006), are agree in Randall [38], that adopting a supply chain financial management perspective has the potential to increase profit, reduce risk and improve competitiveness. Stevens mentions the nature and configuration of the (supply chain) asset base, the balance of fixed assets to current assets, the profile of inventory and the cash, all influence the resilience of the supply chain and influence a firm's ability to mitigate risk [39].

Table 2: Indicators to assess organization resilience model [31].

Group	Measurement	Definitions	Reference
Flexibility	Volume	"Ability to change the level of aggregated output."	De Toni [32]; Slack [33]
	Delivery	"Ability to change planned or assumed delivery dates."	
	Mix products	"Ability to change the range of products made or delivered within a given time period."	
	Products	"Ability to introduce novel products, or to modify existing ones."	
Responsiveness	Reactivity	"Ability to evaluate and take needs into account quickly."	Golden [34] Golden [34]; Vernon [35]
	Speed	"Ability to cover needs quickly."	
	Visibility	"Ability to know the identity, location and status of entities transiting the supply chain,..."	
Effectiveness	Reliability	"Ability to deliver the correct product, to the correct place, at the correct time, ..."	SCC [36]
	Exhaustivity	"Ability to realize the goals."	

Table 3: Indicators to assess business resilience.

Measurements	Definitions	Reference
Cash-to-cash	The average days required to turn a dollar invested in raw materials into a dollar collected from a customer	Randall [38]; Stewart [40]
Days of Inventory	Inventories held at the firm	Randall [38]
Days of receivables	Accounts receivable by having customers' payments	
Days of payables	Accounts payables to suppliers	

On the other hand, a resilience company is a function of its competitive position and the responsiveness of its supply chain [12]. In conclusion, all the following indicators are proposed to achieve a board control to attain business resilience.

5 METHODOLOGY

The research methodology is qualitative and exploratory through case studies. According to reference Yin [41] – the case study allows, among other purposes, to answer questions about the features and functionality of the phenomenon under study. Thus, this particular research addresses the issue of measuring the three categories of the resilience of the supply chain presented above.

The main proposition of the research is that the categories listed in the model provide relevant information to understand the degree of resilience of a company in a supply chain. Therefore, it is proposed that the company is the basic unit for measuring resilience throughout the supply chain. In this respect, there have been studied two companies located in Lima from different sectors that are important in their supply chains. The aim is to gather evidence of the barriers and facilitators presented for the measurement of these categories, according to the research model. Like a photograph, these evaluations represent the companies' current resilience status. To know their capacity in progress along the supply chain they belong to, they must be tracked over time under sustainable supply chain risk management strategies on how the resilience develops. This allows determining the complete profile of performance in terms of their supply chain resilience.

6 APPLICATION CASE

In this section, we present two application cases to illustrate the benefits of our contribution. In the first case, it is performed in a Peruvian manufacturing and sales company, with three divisions: pharmaceutical, care and health products (PC). It also trades laboratory equipment. The second one is the largest food processing company in Peru (FP), with distribution in more than 23 countries, and manufacturing in several Latin American countries such as Argentina, Brazil, Chile, Colombia, Ecuador and Peru. It runs over 125 leading consumer good brands; biscuits, noodles, oil, animal food, etc.

6.1 Labour resilience

Interviews were conducted to PC's Supply Chain and Quality Assurance Management staff. Results show PC's poor working conditions compared to the open Peruvian national governmental database in sites that have been used to get indicators [42-50], see Table 4.

Table 4: Pharmaceutical labour resilience case results.

Group	Measurements	Company	Peru
Income and feeding	Average per-capita income (\$)	2,145	6,551
	Average per-capita expenditure (\$)	1,054	6,712
Access to basic services	Water (% population)	100	86
	Electricity (% population)	97	91
Social rewards	Amount of cash for day to care	180	354
Assets	Number of people per car	4	14
Adaptation capacity	Education level (family average)	7.45	9.80
Stability	Number of unemployed per family.	8.5	3.9
	% Change in income	2.0	4.0
	% Change in expenditure	6.5	8.0
	% Change in savings	1.4	5.0

Table 5: Pharmaceutical organizational resilience case results.

Indicators	Scores	Total	Resilience level
Effectiveness			
Completeness	3	3	Level 1
Reliability	0		
Flexibility			
Volume flexibility	2	7	Level 1
Delivery flexibility	2		
Mix flexibility	3		
Product flexibility	0		
Responsiveness			
Speed	1	7	Level 1
Reactivity	3		Level 1
Visibility	3		Level 3
Resilience level			Level 2

6.2 Organizational resilience

The resilience level reached by PC was type 2 (maximum resilience level is 5). The calculation of the indicators is widely explained by Charles [30], see Table 5.

6.3 Business resilience

This part was carried out in FP through interviews and reviewing company's secondary source materials such as The Statement of Financial Position and The Income Statement Reports from 2013 and 2014, published by the Lima Stock Exchange [51, 52]. The results show that

Table 6: Food business resilience case result.

Measurements	2014	2013	Food manufacturer competitor
Cash-to-cash	64.21	74.06	103.56
Days of inventory	78.85	68.07	99.00
Days of receivables	56.80	59.48	76.00
Days of payables	71.44	53.49	62.47

company's performance on business uncertainties and disturbances will be better managed, even if compared with its competition, which coincides with the general opinion of those interviewed (see Table 6). The calculations of indicators are widely explained in reference Randall [38].

7 CONCLUSIONS AND FUTURE WORKS

The assessment models proposed to measure the supply chain resilience are based on an extensive literature review on case study research, expert opinion and field study on organizations and communities exposed to crisis. The proposal has been broken down into three main categories of factors on assessment, organizational, business and labour resilience performance. They are applied to each company that belongs to a supply chain; the results shall give a good idea about the resilience capacity, which will finally allow deducing its capacity to manage disruptive crises in a current uncertain business environment. In the analyses of both cases, the sole supply chain leader has been examined; the integral results on indicator categories showed poor resilience performance.

Regarding this work, the next steps will consist in designing a sectorial model that can use such approach to determine the proper resilience measures which frame are adequate to some industrial or commercial sectors. A new model version will also try to reach a specific goal in terms of a sensibility analysis on indicators by categories.

REFERENCES

- [1] Checa, N., Maguire, J. & Barney, J., The new world disorder. *Harvard Business Review*, **81**, pp. 70–79, 2003.
- [2] Drucker, P.F., *Management Challenges for the 21st Century*, Harper Collins Publisher: New York, 1999.
- [3] Holling, C.S., An ecologist's view of the malthusian conflict. In *Population, Economic Development and the Environment*, ed. K. Lindahl-Kiessling & H. Landdberg, New York: Oxford University Press, pp. 79–103, 1994.
- [4] Oliver-Smith, A., What is a disaster? In *The Angry Earth: Disasters in Anthropological Perspective*, ed. A. Oliver-Smith & S. Hoffman, New York: Routledge, pp. 18–34, 1999.
- [5] Chen, I.J. & Paulraj, A., Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management*, **22**(1), pp. 119–150, 2004. <http://dx.doi.org/10.1016/j.jom.2003.12.007>
- [6] Bannasar, M. & Vuitton, R., Livre Blanc, *Résilience des organisations: pourquoi certains survivent et d'autres pas*, LexsiPress, https://www.lexsi.com/sites/default/files/publications/livre_blanc_-_resilience.pdf, 2011.

- [7] Martha, J. & Vratimos, E., Creating a just-in-case supply chain for the inevitable next disaster. *Mercer Management Journal*, **14**(1), pp. 70–77, 2002.
- [8] Semchi-Levi, D., Snyder, L.V. & Watson, M., Strategies for uncertain times. *Supply Chain Management Review*, **6**(1), pp. 11–12, 2002.
- [9] Helferich, O.K. & Cook, R.L., *Securing the Supply Chain: Management Report*, CLM Publications: Oak Brook, 2002.
- [10] Christopher, M. & Lee, H., Mitigating supply chain risk through improved confidence. *International Journal of Physical Distribution & Logistics Management*, **34**(5), pp. 388–396, 2004.
<http://dx.doi.org/10.1108/09600030410545436>
- [11] Chopra, S. & Sodhi, M.S., Managing risk to avoid supply-chain breakdown. *MIT Sloan Management Review*, **46**(1), pp. 52–61, 2004.
- [12] Sheffi, Y. & Rice Jr. J.B., A Supply chain view of the resilient enterprise. *MIT Sloan Management Review*, **47**(1), pp. 14–48, 2005.
- [13] Grossi, P. & Kunreuther, H., *Catastrophe Modeling: a New Approach to Managing Risk*, Springer-Verlag: New York, 2005.
- [14] Banks, E., *Catastrophic Risk: Analysis and Management*, Wiley Finance, 2006.
- [15] Reed, J. & Simon, B., Car components hit by Japan aftershock. *Financial Times*, published on 28-03-2011.
- [16] Reed, J. & Simon, B., Japan carmakers' supply woes hit EU and US. *Financial Times*, 2011.
- [17] Fujita, M. & Nobuaki, H., Japan and economic integration in east asia: post-disaster scenario. *The Annals of Regional Science*, **48**(2), pp. 485–500, 2012.
<http://dx.doi.org/10.1007/s00168-011-0484-y>
- [18] Cyrulnik, B., *Resilience: How Your Inner Strength Can Set You Free from the Past Paperback*, Tarcher: New York, 2011.
- [19] Zsidisin, G.A. & Bob, R., Supply chain risk. *International Series in Operations Research & Management Science*, **124**(1), New York: Springer, 2008.
- [20] A&T, Best Practices : Achieving Resilience – Best Practices in Business Continuity, published on 04-05-2004, available at <http://www.bankofengland.co.uk/financialstability/fsc/Documents/ATBestPractice.pdf>
- [21] CLSCM, *Report: creating resilient supply chains: a practical guide*, cranfield school of management, centre for logistics and supply chain management, CLSCM, 2003.
- [22] Kirby, J., Supply chain challenges: building relationships. *Harvard Business Review*, 2003.
- [23] Vargas, J., Luras, M., Dupont, L. & Charles, A., Towards a demand forecast methodology for recurrent disaster. In *Disaster Management and Human Health; Reducing Risk, Improving Outcomes, WIT Transactions on the Built Environment*, ed. C.A. Brebbia, 133(1), Wessex Institute of Technology Press: UK, 2013.
- [24] Vargas, J., Charles, A., Luras, M. & Dupont, L., Designing realistic scenarios for disaster management quantitative models. *Proceeding of the 11th International Conference on Information Systems for Crisis Response and Management*, ISCRAM, Pennsylvania: USA, 2014.
- [25] UNDP, *United Nations Development Programme. Reducing disaster risk: a challenge for development. A global Report*, UN Press: New York, 2004.

- [26] D'Ercole, R. & Metzger, P., La vulnérabilité territoriale : une nouvelle approche des risques en milieu urbain. *European Journal of Geography*, **447**(1), 2009.
<http://dx.doi.org/10.4000/cybergeo.22022>
- [27] D'Ercole, R., Hardy, S., Metzger, P., Robert, J. & Gluski, P., Les dimensions spatiales et territoriales de la gestion de crise à Lima. *Vertigo - La Revue Electronique en Sciences de l'Environnement*, **12**(1), 2012.
- [28] Alinovi, L., Mane, E. & Romano, D., *Measuring Household Resilience to Food Insecurity: Application to Palestian Houselhold*, FAO Press, pp. 3–10, 2009.
- [29] Kang-Yao, Y., Comment développer des supply chain resilientes? *Supply Chain Magazine*, 2005.
- [30] Charles, A., Thesis doctoral. *Improving the Design and Management of Agile Supply Chain: Feedback and Application in the Context of Humanitarian Aid*, Ecole des Mines d'Albi, Université de Toulouse, 2010.
- [31] Charles, A., Lauras, M. & Wassenhove, L.V., A model to define and assess the agility of supply chains: building on humanitarian experience. *International Journal of Physical Distribution & Logistics Management*, **40**(8/9), pp. 722–741, 2010.
<http://dx.doi.org/10.1108/09600031011079355>
- [32] De Toni, A. & Tonchia, S., Definitions and linkages between operational and strategic flexibilities. *Omega*, **33**(6), pp. 525–540, 2005.
<http://dx.doi.org/10.1016/j.omega.2004.07.014>
- [33] Slack N., The flexibility of manufacturing systems. *International Journal of Operations & Production Management*, **25**(12), pp. 1190–1200, 2005.
<http://dx.doi.org/10.1108/01443570510633594>
- [34] Golden, W. & Powell, P., Towards a definition of flexibility: in search of the Holy Grail? *Omega*, **28**(4), pp. 373–384, 2000.
[http://dx.doi.org/10.1016/S0305-0483\(99\)00057-2](http://dx.doi.org/10.1016/S0305-0483(99)00057-2)
- [35] Vernon, F., Supply chain visibility: lost in translation? *Supply Chain Management: An International Journal*, **13**(3), pp. 180–184, 2008.
<http://dx.doi.org/10.1108/13598540810871226>
- [36] SCC, *Supply Chain Operations Reference Model 8.0*, Technical report, 2006.
- [37] Farris II, M.T. & Hutchison, P.D., Cash-to-cash: the new supply chain management metric. *International Journal of Physical Distribution & Logistics Management*, **32**(4), pp. 288–298, 2002.
<http://dx.doi.org/10.1108/09600030210430651>
- [38] Randall, W.S. & Farris II, M.T., Supply chain financing: using cash-to-cash variables to strengthen the supply chain. *International Journal of Physical Distribution & Logistics Management*, **39**(8), pp. 669–689, 2009.
<http://dx.doi.org/10.1108/09600030910996314>
- [39] Stevens, G.C. & Johnson, M., Integrating the supply chain...25 years on. *International Journal of Physical Distribution & Logistics Management*, **46**(1), pp. 19–42, 2016.
<http://dx.doi.org/10.1108/IJPDLM-07-2015-0175>
- [40] Stewart, G., Supply chain performance benchmarking study reveals keys to supply chain excellence. *Logistics Information Management*, **8**(2), pp. 38–45, 1995.
<http://dx.doi.org/10.1108/09576059510085000>
- [41] Yin, R., *Case Study Research Design and Methods*, Sage Press: California, 2009.
- [42] WB, World Bank, [23-11-2015], available at <http://data.worldbank.org/indicator>, 2014.

- [43] MIDIS, Ministry of Development and Social Inclusion of Peru, [23-11-2015], available at <http://www.midis.gob.pe/mapas/infomidis/>, 2015.
- [44] CEPLAN, Center of Strategic Planning of Peru, [23-11-2015], available at http://www.ceplan.gob.pe/documentos/peru-indicadores_mundiales, 2015.
- [45] MINCETUR, Ministry of Foreign Trade and Tourism of Peru, [23-11-2015], available at <http://www.mincetur.gob.pe/newweb/Default.aspx?tabid=3250>, 2015.
- [46] DG, Gestión, *El 85% de la población peruana tiene acceso al servicio de agua potable*, [23-11-2015], available at <http://gestion.pe/economia/mvcs-857-poblacion-peruana-tieneacceso-al-servicio-agua-potable-2130028>, 2015.
- [47] DR, La República, *El Perú baja dos puestos en educación: del 63 al 65*, [23-11-2015], available at <http://larepublica.pe/04-12-2013/el-peru-baja-dos-puestos-en-educacion-del-63-al-65>, 2015.
- [48] P21, Perú 21, *El 40% de la red vial nacional aún no está pavimentada*, [23-11-2015], available at <http://peru21.pe/opinion/40-red-vial-nacional-aun-no-esta-pavimentada-2164527>, 2015.
- [49] LPP, La Prensa Perú, *En el Perú hay un automóvil por cada 14 personas*, [23-11-2015], available at <http://laprensa.peru.com/economia/noticia-peru-hay-automovil-cada-14-personas-4711>, 2015.
- [50] GfK, *Reporte sobre la Seguridad ciudadana en el Perú*, [23-11-2015], available at <http://es.slideshare.net/GfKPeru/gf-k-enc-opmayo2014seguridadciudadana-4>, 2015.
- [51] SFP, *The Statement of Financial Position 2014*, Bolsa de Valores de Lima, available at http://www.bvl.com.pe/jsp/ShowEEFF_new.jsp?Ano=2014&Trimestre=A&Rpj=B30006&RazoSoci=&TipoEEFF=BAL&Tipo1=A&Tipo2=C&Dsc_Correlativo=0000&Secuencia=0, 2014.
- [52] ISCR, *The Income Statement*, Bolsa de Valores de Lima, available at http://www.bvl.com.pe/jsp/ShowEEFF_new.jsp?Ano=2014&Trimestre=A&Rpj=B30006&RazoSoci=&TipoEEFF=GYP&Tipo1=A&Tipo2=C&Dsc_Correlativo=0000&Secuencia=0, 2014.