Theoretical Determinants for Assessing Sustainability in Printing Companies Operations

KAI, D. A. a,c*, PINHEIRO DE LIMA, E. a,b, GOUVEA DA COSTA, S. E.a,b

a. Industrial and Systems Engineering Graduate Program - Pontifical Catholic University of Parana, Curitiba, Paraná, Brazil

b. Federal University of Technology, Curitiba, Paraná, Brazil

c. Brazilian National Service for Industrial Apprenticeship, Curitiba, Paraná, Brazil

* dalton.kai@pr.senai.br

Abstract

The concern and search for the sustainable development has been forcing the organizations to modify your management systems and your operation models, aiming to attend these new environments. To have a business and sustainable operations, means to be economically viable, reduce or even not generate wastes, save energy and natural resources, be safe for the workers, community and consumers, to improve life quality, and share values. It can be noticed that the Brazilian graphic companies have been promoting changes in your strategy, business models and operation systems. The main objective of this work is to propose a conceptual structure to organize the practice of sustainable operations, which has as a goal to answer the research question, based on operation analysis: Has the graphic industry been doing your operations in a sustainable manner, focusing on the economy, environment and social aspects? It has been done a revision of the literature that contributed to characterize the context, structures and processes for the conception of a sustainable operation management. The proposed model has the intention to contain the best practices for the development of the sustainable operation and to be used for audit and regulatory. This will allow that the graphic companies adapt your models and operation systems, aiming the creation of a truly sustainable company.

Keywords: printing industry; operations management; sustainability; sustainable development; sustainable manufacturing

1. INTRODUCTION

In 1995, Lindle and Porter believed that the planet’s capacity was insufficient to sustain the consumption level of energy and resources of that time, but current World Wildlife Fund – WWF data show that, in order to support the human lifestyle nowadays, 25% more than what is available in nature is needed. This irrational form of resource exploration will result in a faster extinction than renovation capacity (INPE, 2012). Happening this way, it is necessary for a direction change looking forward for sustainability, and this must come from the companies.

Studies have discussed alternatives of sustainable productions, in a way that the operations, processes and systems, become: nonpolluting, natural resources and energy savers, economically viable, safe and non-prejudicial for the workers, community and consumers, socially and creatively rewarding for all employees (VELEVA and ELLENBECKER, 2001; JANSSON and PHAAL, 2002). The graphic industry...
has conditions to improve your production systems and adequate to a sustainability focused production, in more effective actions in socio-environment aspects, without losing economically (BIAGGIO, 2012).

Although there are proposals for a sustainable production, this is out of the Brazilian graphic industry reality, which of 78% of this sector is composed by micro companies, that couldn’t make as investment in an implementation of this level, without compromising their selves economically.

This work proposes a discussion about operations of the graphic industries in relation to the triple bottom line (3BL) aspects, with the objective to develop a model that guides these companies to sustainability. Aiming to reach this goal, the present work has been divided in two parts (FIGURE 1).

In the first part, it has been searched to comprehend the Brazilian graphic industry, your operations and projects. In this part, there was the need to develop a more specific study about many printing processes, beyond that, it has been searched also about sustainability, in the 3BL aspects and about operation management. The themes that have been covered, intends to contextualize and fundament the second part, about the analysis of the relation between all the ones involved in the operations of the graphic industry and for the development of a conceptual model for evaluation of sustainable practices in these operations.

2. PRINTING INDUSTRY

Brazilian printing industry counts on 20,007 printing enterprises approximately, 78% Microenterprises, 18,6% Small-sized enterprises, 2,9% Medium-sized enterprises, 0,4 Large-sized enterprises, granting 220,796 direct jobs and an industrial production of BRL 29.7 billion in 2012, according to Brazilian Printing Industry Association – ABIGRAF data.

The printing industry has a much-diversified production because it attends all economic sectors: government services; financial, advertising and editorial services; service providers and the manufacturing industry. Leaflets, posters, catalogues, magazines, newspapers, books, notebooks, diaries, handouts, labels, tags, packages, displays, bags, invoices, fanfolds, envelopes, are some examples of printing products.

This sector’s importance for the Brazilian economy is presented through some numbers, visualized in TABLE 1:
Table 1 – Brazilian Printing Industry Numbers

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Production (in BRL billion) (Brazilian Institute of Geography and Statistics - IBGE)</td>
<td>$28.6</td>
<td>$28.5</td>
<td>$29.7</td>
<td>$29.9</td>
</tr>
<tr>
<td>% variation in percentage</td>
<td>-</td>
<td>- 0.3%</td>
<td>4.5%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Industrial Production (in USD billion) (IBGE/Central Bank of Brazil - BC)</td>
<td>$15.5</td>
<td>$14.2</td>
<td>$16.9</td>
<td>$17.9</td>
</tr>
<tr>
<td>Share in Gross Domestic Product - GDP (in %)</td>
<td>0.45%</td>
<td>0.43%</td>
<td>0.39%</td>
<td>0.34%</td>
</tr>
<tr>
<td>Share in Transformation Industry GDP (in %)</td>
<td>2.30%</td>
<td>2.47%</td>
<td>2.34%</td>
<td>2.35%</td>
</tr>
<tr>
<td>Number of premises (Brazil’s Annual Report of Social Information - RAIS)</td>
<td>19,006</td>
<td>19,694</td>
<td>20,007</td>
<td>20,007</td>
</tr>
<tr>
<td>Number of employees (RAIS)</td>
<td>209,736</td>
<td>211,255</td>
<td>220,796</td>
<td>221,937</td>
</tr>
<tr>
<td>Employee / Enterprise Ratio</td>
<td>11.04</td>
<td>10.73</td>
<td>11.04</td>
<td>11.09</td>
</tr>
<tr>
<td>Industrial Production / Employee Ratio (in US$ thousand)</td>
<td>$74.13</td>
<td>$67.19</td>
<td>$76.54</td>
<td>$80.55</td>
</tr>
<tr>
<td>Balance of Trade (in USD thousand FOB) (Brazil’s Foreign Trade Secretariat - SECEX)</td>
<td>- $114.42</td>
<td>- $77.86</td>
<td>- $160.64</td>
<td>- $294.51</td>
</tr>
<tr>
<td>Exports (in USD thousand FOB)</td>
<td>$255.71</td>
<td>$220.34</td>
<td>$248.97</td>
<td>$269.32</td>
</tr>
<tr>
<td>Imports (in USD thousand FOB)</td>
<td>$370.13</td>
<td>$298.20</td>
<td>$409.61</td>
<td>$563.83</td>
</tr>
<tr>
<td>Realized Investments (in USD billion FOB) (SECEX)</td>
<td>$1.8</td>
<td>$1.0</td>
<td>$1.4</td>
<td>$1.4</td>
</tr>
<tr>
<td>Average Foreign Exchange Rates (sale) BRL/USD *</td>
<td>1.84</td>
<td>2.01</td>
<td>1.76</td>
<td>1.67</td>
</tr>
<tr>
<td>Gross Internal Product (in USD billion)</td>
<td>$1.650</td>
<td>$1.587</td>
<td>$2.090</td>
<td>$2.474</td>
</tr>
<tr>
<td>GDP variation in percentage</td>
<td>5.2%</td>
<td>5.1%</td>
<td>7.5%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Extended National Consumer Price Index (IPCA – IBGE)</td>
<td>5.9%</td>
<td>4.3%</td>
<td>5.9%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Industrial Production (%)^</td>
<td>- 3.1%</td>
<td>- 7.4%</td>
<td>10.5%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Data last updated: March, 2012

*For production estimates from 2009 to 2010, the variation in IBGE’s Monthly Survey of Industry - Physical Production (PIM-PF) indexes was considered.
^For 2008 production and income estimates, Annual Survey of Industry – Product (PIA/Produto), data, since the new Procedures for Electric Power Distribution in the National Electrical System – PRODIST (according to the Brazilian Classification of Economic Activities – CNAE, version 2.0) was considered. (Source: IBGE)
3 For the calculation of employees and premises numbers (2008 and 2009), the following CNAEs (version 2.0) were considered: 17311, 17320, 17419, 18113, 18121, 18130, 18121, 18229, 58212, 58239 and 58298.
4 Data obtained from Central Bank of Brazil’s market report and IBGE System of Automatic Recovery – SIDRA.

Source: ABIGRAF (2012) adapted by the author

According to Marta Vaz, entrepreneur, and José Pires de Araújo Jr., professor, in an article published in “Tecnologia Gráfica” magazine, issue 78: “the majority of the sector’s companies is of micro-and-small-sized ones, family-managed and little-professionalized.”

3. PRINTING PROCESSES AND PRODUCTS

Printing consists on the transfer of an image to a media (paper or other material) and occurs by means of one or more matrixes which, under pressure, transfer(s) the image. Sheet-fed offset, rotary offset, dry offset, letterpress, flexography, rotogravure, tampography and serigraphy are some examples of printing techniques. There is also the digital process, in which image is transferred to the media without the need of contact or pressure (KIPPHAN, 2001; PEACOCK, 2003; BAER, 2005; VILUKSELA, 2007).

Table 2 – Similarities among the various printing processes

<table>
<thead>
<tr>
<th>Printing processes</th>
<th>Sectors identified</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheetfed offset</td>
<td>Pre-press</td>
<td>operations that generate the printing form</td>
</tr>
<tr>
<td>Rotary offset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry offset</td>
<td>Press</td>
<td>process in which image engraved in the printing form is transferred to the printing media</td>
</tr>
<tr>
<td>Letterpress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotogravure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serigraphy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tampography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital printing</td>
<td>Post-press</td>
<td>operations for printing finishing</td>
</tr>
</tbody>
</table>

In industries in general, the production system that is observed has an input, a process and an output (PALADINI, 1995). It is also assumed that a single product is an operations output, but the printing industry presents different products as final outcomes: Leaflets, posters, catalogues, magazines, newspapers, books, notebooks, diaries, handouts, labels, tags, packages, displays, bags, invoices, fanfolds, envelopes, are some examples. Each of these printing products possess different features which had determined differentiated operations.

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The characteristics of a graphic product are defined by the client. From these definitions, the planning sector and production control sector can determine the best print process, cost / benefit, and other operations, looking forward to reach the expected result.

4. SUSTAINABILITY AND OPERATIONS MANAGEMENT

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This is the definition of sustainable development published in “Our Common Future”, prepared by the United Nation’s World Commission on Environment and Development, in 1987. With this initiative, it was created others contributions for the promotion of compromised countries with the sustainability and emergence of a variety of studies (BM&F BOVESPA, 2011).

Elkington, 1998, addresses a better economic, social and environmental balance in a business, but what would take the companies to search for something considered unreachable by many? By the explanation given by Labuschgne, Brent and Van Erck (2005), it would be the preservation conscience of the natural and human resources, that can be needed in the future, with the implementation of strategies and actions of continuous innovations that meet the needs of the companies and their different sectors of interest, in other words, use a sustainable management.

It can be observed in the graphic sector, by the initiatives of companies and other organizations, like syndicates and associations of the same category, the achievement of actions that aims the Cleaner Production (CP). That implies in the adoption of actions that look for an efficient operational rise, reducing the risks to the people and environment. (UNEP, 2009)

However, few companies have a management orientated for the sustainable development and that can be explained by the lack of knowledge, that doesn’t allow that the companies from these sectors to take advantage of the benefits provided by this action, as said by Fiksel, Mcdaniel, Mandenhall (1999).

The Brazilian graphic industries have little conscience of the importance and the responsibility with the sustainable development of your organizations and the value chain that involves them.

4.1. Triple Bottom Line (3BL)

The 3BL arises to companies that have follow a traditional business model, which used to consider, in their evaluations, only the economic factors, and are shifting for a new model, by adding environmental and social aspects. This is due to a greater exposure, of the industrial sector’s operations mainly, provoked by this new model, since it promotes a new direction for the stakeholders’ vision to social and environmental questions in manufacturing process, value chain, product life cycle, labor issues etc. This new consciousness has been causing some questionings from the society, which certainly disturb concern the organizations, for they require an altering in their current operational process.

4.2. Sustainability Frameworks

The international models of great success in sustainability have been observed. They include some management tools for the sustainable development, with a strategy of socio-environment responsibility to guarantee the evolution of human activity.

Despite the sustainability models and tools that allow the knowledge and concept application of economic, environment and social balance, that not always are applied in an ideal manner. Suppose that this indeed depends on the context that the organization is in, the type of management used and the stakeholders involved.
4.3. Operations Management

The companies in general have a concern with their management operations, always looking forward for higher operational efficiency, with the objective of maintaining or expanding their participation on the market (SKINNER, 1969).

From a traditional production system, acting in a globalized and highly competitive market, it is the manager’s responsibility to define an action strategy, which will create organizational impacts.

That way, from the definition of operation strategies and the goals to be reached, it can be worked a set of actions that comes from decision areas. These decision areas, in most companies, and localized in a higher hierarchical level, as told by Skinner (1969); Wheelwright (1978); Fine and Hax (1985); Hayes et al. (1988); Hill (1989); Schroeder and Lahr (1990); Platts and Gregory (1990).

A management model of the operation, based on decision areas of the company, becomes reference for studies and sustainability practices at the graphic industry operations, and for the relations with the 3BL aspects.

5. CONCEPTUAL FRAMEWORK

5.1. Identification of the Manufacturing Operations in the Various Existing Printing Systems

The theoretical development has its origins in conceptual discussions on the literature or in bibliographic reviews which generate the conceptual framework that results in new theories. The framework encompasses the description of a production system’s or of part of a production system’s operation (BERTO and NAKANO, 2000). It is up to the conceptual framework the investigation of casual and qualitative relations among the found or defined variables (BERTRAND and FRANSSO, 2000).

The main databases researched for this study were determined according to the works of Kanashiro (2010); Petersen, Aese and Heiser (2010); Correa, Paiva and Primo (2010). From them, a search for the following subjects: printing industry, sustainability and operations management was started.

From the collected content, an estimate of the printing industry importance in the Brazilian economic scenario, as well as of the features of a printing product which refer to the various printing processes existent in this industry sector, was allowed. After that, the need of verifying the printing processes existent in each one of this sector’s operations, observing their respective particularities and the similarities among them, had appeared.

Starting from a mapping of manufacturing operations, in which all the operations of all printing processes were unfolded, a synthesis of the operations, valid for any company in the printing sector despite of its printing system, was achieved, as presented in TABLE 2.

5.2. Influences

Government, society and companies have been confronting such a long time ago due to the idea that providing social and environmental benefits rise costs and, in consequence, reduce profits. Other concept related to this same conclusion is the notion of externalities, which appear when organizations create social and environmental costs which they cannot bear with, being some examples: penalties from labor prosecutions and environmental damages (PORTER and KRAMER, 2011).

It is up to the government to impose taxes, regulations and penalties so that companies start to consider socio-environmental aspects in their strategies. There is still some resistance, but it has been diminishing with the increased pressures from the society and the NGO’s. These pressures, in their turn, are reflected in an increase in the number of large-sized companies that are adapting themselves to the compliance of aspects, for they perceive that the required changes do not necessarily increase costs, because, through new technologies, operational processes and management approaches, these companies have, as a result, a productivity increase and the expansion of their markets.
In this way, when companies adapt themselves to this new perspective, they will promote benefits to all their stakeholders, HUTCHINS and SUTHERLAND (2008); PORTER and KRAMER (2011);

5.3. Conceptual framework

A framework is a way of developing a strategy of actions about a given phenomenon that allows the evaluation of relations among the variables resultant from those actions (MARTINS, 2009). Thus, the phenomenon to be researched can be defined as the sustainable practices in printing industry operations and their variables:

- Strategy adopted by printing industry;
- Stakeholders involved;
- Features of the printing product required by the customer;
- 3BL – economic, environmental and social equilibrium in operations.

The variables were identified through bibliographic research, in which the subjects related to the study were collected, thus providing a theoretical fundament for framework development.

The strategic question is essential for any aspiration inside an organization, be it focused on sustainable development or any other subject (PORTER, 1999; NEELY et al., 2005; BM&F BOVESPA, 2007). Much emphasis has been given to strategy alignment in relation to sustainable issues and operations, but mainly to the critical factors involved (GRAYSON and HODGES, 2004; PORTER, KRAMER and HART, 2006).

By promoting sustainable development in any company, there is the obligatoriness of strategy review and this has a direct impact on production process. The new strategy will generate new production objectives aimed at the equilibrium between economic and socio-environmental aspects. The stakeholders, due to their influence, are of great importance in the strategic change decision and also in the reflections from this modification (BOECHAT et al., 2006).

The conceptual framework for the evaluation of sustainable practices in printing industry operations can be defined as a system that implements and verifies sustainability performance in 3BL aspects, in order to promote a change of culture and processes. It can be considered a management system, since it includes functions such as: definition of objectives, feedback and reward (NEELY et al., 2005).

In a broader perspective, the conceptual framework proposed here starts with the involvement of the company’s decision making area for the promotion of any change. As a consequence of this change, there is the creation of the context necessary for the development of a short, medium and long-term action plan. FIGURE 2 shows this involvement in the definition of business and operations strategies, a top-down directive in which taken decisions interfere directly in the actions of the production sector. In that same figure, a longitudinal flow, involving suppliers, customers, and printing industry – more specifically, its production sector – can be seen, showing the value chain summarized.

Now, facing towards manufacturing in the first level, it is up to the production planning and control department (PPC) to optimize the production and to define the sustainable practices, integrating the 3BL aspects that will be proposed to each operation (FIGURE 2). Although PPC plans and controls production, the definition of the operations that will be performed is made considering printing product features required by customers.

In the second level, there is the monitoring of the sustainable practices proposed to each operation, which is up to the production supervision department. All operations constitute the third and last level, where sustainable practices that can involve the 3BL really occur.
The result of the verification of sustainable practices in operations provide indicate their level of sustainable development, point the sustainable and non-sustainable operations, the impact of the sustainable practices adopted in the end, the operational and strategic performance.

A positive result implies a company with sustainable practices in its operations, but this does not reflect the organization’s sustainable development as a whole. The relations between the company and its stakeholders are of much influence, and can determine that the organization is or is not sustainable developed even if the operations show the contrary.

A negative result only means that the company is not sustainable in its operations or sustainable only in some operations.

By the analysis of the conceptual framework, it cannot be said, in any way, that a company is not sustainable. The framework only demonstrates the inexistence of a strategy aimed at sustainable operations and sustainable development.

The possibility of its replication in various times shows that the framework is cyclic and allows continuous improvement. The feedback for the board of directors is important for a complete strategic operations alignment to the 3BL.

Table 3 – Principal elements of framework and referential review
CONCLUSION

Sustainable operations in the printing industry are the expected results, but it is important to highlight that, in order to achieve this objective, the variables addressed in this study have to be understood and a verification of their convergence to the sustainable development has to be done. Reviews and changes constantly occur in companies, be them due to marketing, economic, relationship or legal aspects or others. A change towards the sustainable development can mean the company’s survival, because, for many, the socio-environmental concern is a decisive business factor.

The conceptual framework contributes to the identification of the best sustainable practices for printing industry operations, helping companies to reflect on their current production mode and find new ways of improve themselves in the broadest sustainability aspects, in spite of the stage in which they are in the sustainability incorporation process. A more profound analysis allows the determination of the company’s sustainable development level. Thus, it is expected that the print industry will reach the sustainable development.

It can be concluded that the presented conceptual framework attends to the proposed objective, but its adherence still has to be verified by the means of a framework application in a real situation.

REFERENCES


