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DEMAND CHAIN MANAGEMENT: The Main Techniques Used  
by Production Engineering in the Demand Management Process

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# DEMAND CHAIN MANAGEMENT: The Main Techniques Used by Production Engineering in the Demand Management Process

***Abstract.** This paper aims to show the main demand chain management techniques used by production engineering in the forecasting process. The demand management is a strategic process to direct the present decisions toward a competitive position in the future. The success of manufacturing engineering depends directly on the alignment of demand chain. Initially, carried out a literature review on the topic of demand management and forecasting, then, defines the methodology and methods used. Regarding the classification of this work is a survey research approach with qualitative and quantitative level of applied research and exploratory focus. Data were collected exclusively by internet and the survey address was available online between the 23 January 2012 and 2 April 2012, this range 50 people responded to the questionnaire. The study showed that companies maintain high priority on statistical forecast and low priority on techniques like automatic outlier detection and cannibalization analysis.*

**Keywords:** Demand management, Forecasting, Production engineering.

## 1. INTRODUCTION

Despite the global market uncertainties, executives around the world try to get the best predictions of future demand to support critical business process in the best way possible, because they need to buy raw materials, purchase equipment, make investments, hire, train or dismiss people [1]. The ability to handle the demand characteristics and their variations provides benefits to the entire company production system, assisting in the management process, and improve forecast accuracy.

The new machinery purchase, materials replacement, creating of a new distribution centre, a new plant installation, increase in the employees number, increased productivity or process improvement are examples of decisions that can be planned and performed with enough time to avoid losses, wastage or lack of capacity to meet future demand, in this sense, demand management is a strategic process to direct the decisions of the present toward a competitive position in future [2].

The demand management has a fundamental importance in the productive system competitiveness, leads solutions to questions such as "how", "when" and "what" make or buy, directs professionals from various sectors to improve their demand forecasting techniques and leads

organizations to an anticipatory positioning to guard against uncertainties in future planning horizon [2][3].

According to [4][5], it is confirmed that since suppliers payment until customer receiving, an effective demand management facilitates financial planning and operational supply chain, enabling business risks mitigation, operation improvement, backorders reduction and service level increased.

Studies had confirmed the relevance of this topic, identifying that the demand chain management can reduce unemployment and consequently increase the wealth of the nation [6].

There are several factors that contribute to the justification of this research, among them; the Aberdeen Group [7] had conducted a worldwide survey involving 260 companies in order to examine the use, experience and intentions of companies in relation to demand management technology.

Seventh percent of companies surveyed indicated that they focus on demand management programs and 31 % showed that were with the demand management program implemented over four years. To address the demand management process, rather than simply focus on demand planning (statistical forecasting), companies need to refocus their attention and go beyond excellence in order-to-delivery, which includes activity from receipt of requests to delivery of products to customers. Some aspects of these companies should focus on include external collaboration, consumer-level forecasting and integration with order management [7].

In last decades the concept of demand management is gaining popularity increasingly being discussed by several authors, such as [8]-[25].

This study has the objective to show the main demand management techniques used by production engineering in the process of forecasting, identifying which companies use these techniques, which techniques most commonly used, and what techniques the companies intend to improve in the coming years.

The study also reviews the concept of demand management and its fundamentals, strategic function and competitive differentiator for companies that seek to achieve a higher level of efficiency and effectiveness in production engineering and strategic objectives to deliver the right product, in the amount requested, in the right place at the right time, in the best possible quality and the lowest possible cost to the customer.

## **2. METHODOLOGY**

According to [26], the methodology is the detailed, precise and accurate explanation of the method developed in every action of the research. It describes the type of survey, the instrument used (questionnaire, interview etc.), the predicted time, the research team and the division of labor, forms of tabulation and processing of data, in short, everything that is used in research.

Regarding the type of this work, it is a survey research. The survey research contributes to the enrichment of knowledge by collecting information from subjects (through questionnaires, telephone calls, personal interviews etc.) and gathering information about the units of analysis (environments) of these subjects [27].

The research uses a qualitative and quantitative approach. The difference between them lies in the fact where qualitative research, unlike quantitative, seeks to emphasize the perspective of the entity being searched, while this emphasis on quantitative research is less [28]. The data collection was performed through the use of questionnaires, since the advantages of using the questionnaire method regarding interviews are due to the fact people use less to run, provide cost savings, time and travel with obtaining a larger sample, and not be influenced by the interviewer [29].

The research level is applied, with the goal of producing knowledge that necessarily presents itself as a solution or answer to practical problems that exist in the realities surveyed [30].

This work was exploratory, considering the definition of some authors [31], where the exploratory research occurs during the early stages of investigating a phenomenon when the goal is to have a preliminary view on a topic, and provides the basis for a research more depth in the subject. Being exploratory research is due to seek to clarify the concepts on the topic researched, its goal is not consisted of a thorough exploration of the fact, but to provide an overview on the topic.

Other authors report that even the category of exploratory research has as main objective the improvement of ideas or discovering insights that allow the consideration of various aspects of the studied fact, in most cases these involve literature searches, interviews with people who had practical experience with problem analysis and researched examples that encourage the understanding [32].

Data from this study were collected exclusively via the internet and the survey address was available on the web between the 23 January 2012 and 2 April 2012, during the intervening 50 companies answered to the questionnaire. The Google Docs [33] was used as a tool to develop the survey and collect responses.

### **3. RESULTS AND DISCUSSION**

The initial questions ranked the companies in relation to the business sector, the manufacturing environment, the production system, the products shelf life, the functional responsibility of respondents and the amount of the company's employees.

As for the business line of the companies surveyed, 72 % are from the industrial sector, 8 % are from the service sector and technical assistance, 6 % are logistics service providers and 6 % work in retail. The “other” class was for the financial sector and business association. Figure 1 shows these percentages.

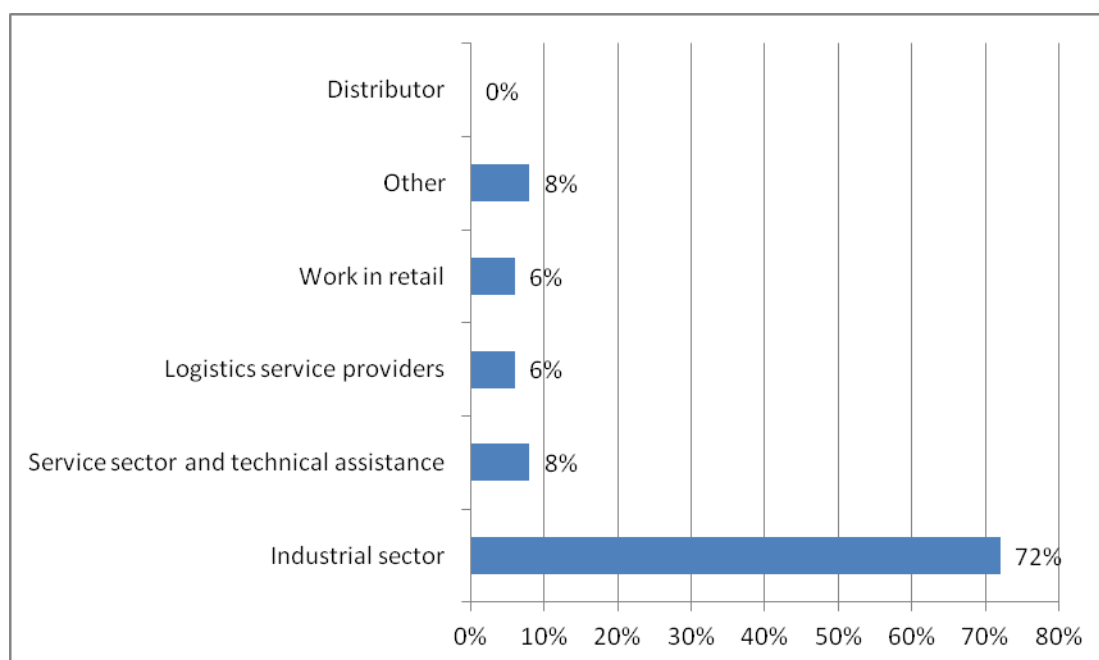


Figure 1 – Which option best describes the performance of your company?

As for the production environment, 40 % of companies surveyed operate with MTS (make-to-stock), 26 % work with MTO (make-to-order) or ATO (assemble-to-order), 18 % work in industry services and 8 % with ETO (engineering-to-order). In this study the surroundings MTO and ETO were considered in the same class because of the proximity between manufacture and assemble custom per order (Figure 2).

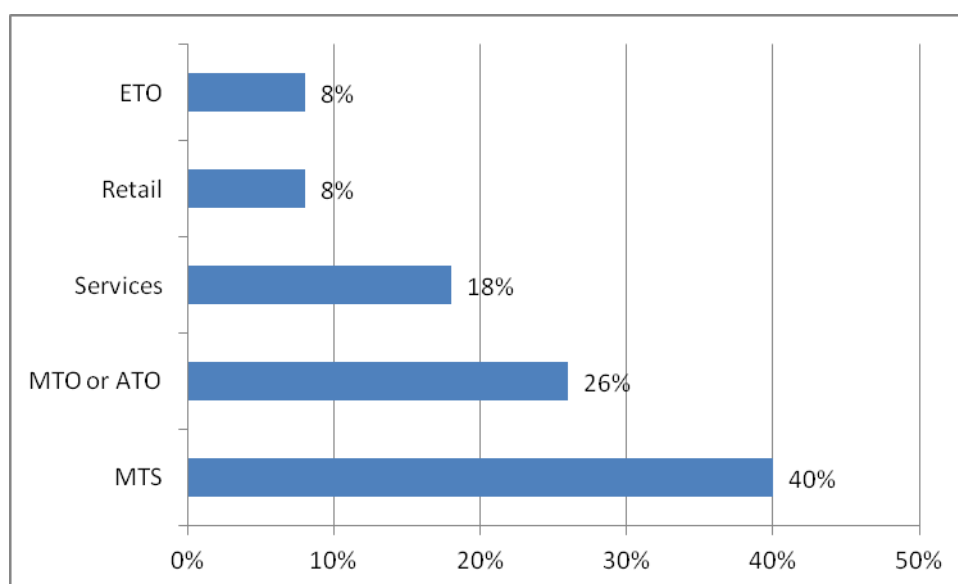


Figure 2 – Which option best describes the production environment used in your company?

As for the productive system, 30 % of companies work with repetitive batch, 28 % use the

system repetitive mass, 24 % work for project, with 12 % continuous system, and 6 % work with intermittent system – job shop (Figure 3).

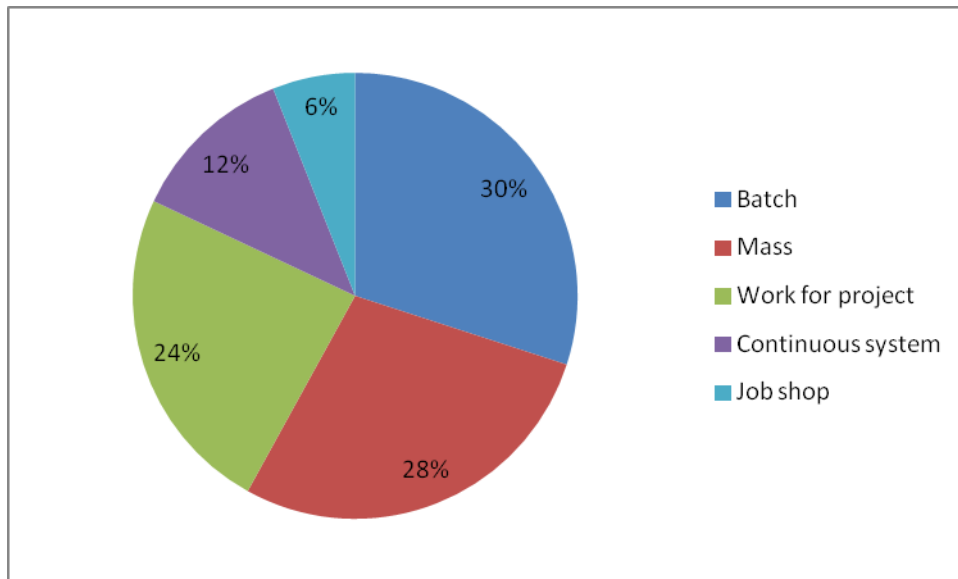


Figure 3 – Which option best describes the productive system performance of your company?

As for shelf life products, 58 % of companies surveyed had long shelf life and only 4 % of companies with products whose work showed shelf life were extreme. For this study, the shelf life was divided into six tracks: extreme (1 to 30 days); very short (1 to 3 months), short term (4 to 6 months), medium (7 to 12 months), medium-long (13 to 24 months) and longer (greater than 2 years). The classification of shelf life is shown in Figure 4.

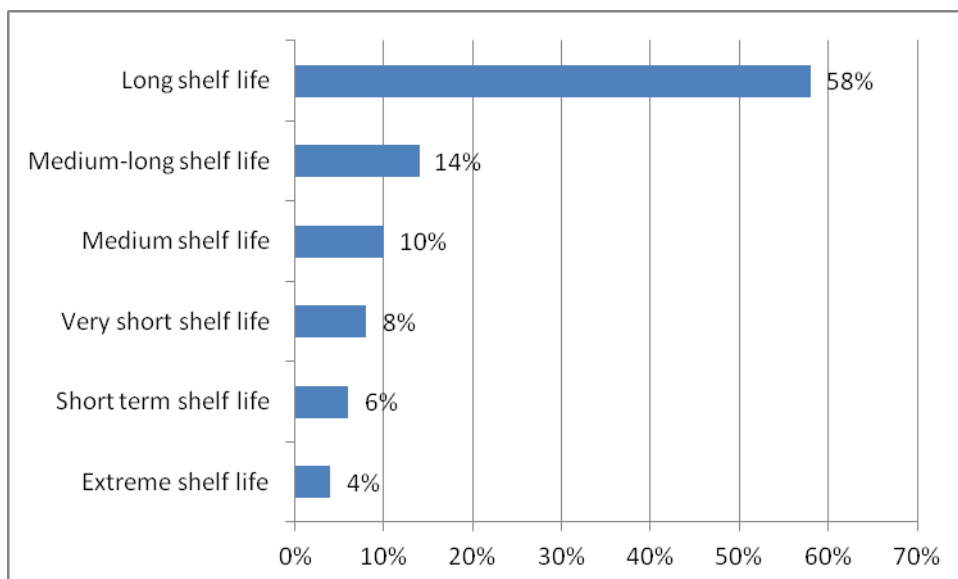


Figure 4 – Which option best describes the shelf life products performance of your company?

As for the employees number, the companies surveyed are defined as shown in Figure 5.

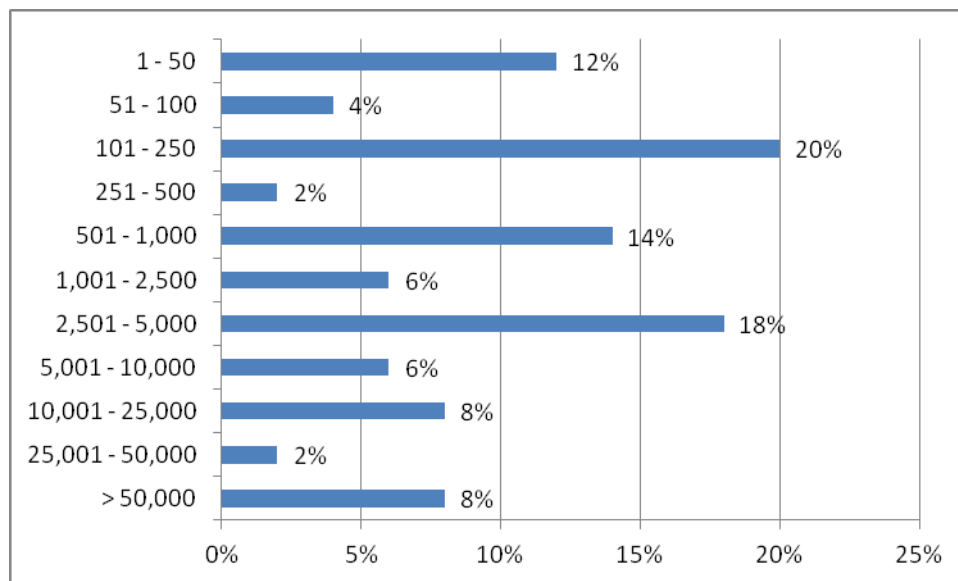


Figure 5 – Which option best describes the employees number in your company?

The three main questions used in the preparation of this article were:

- (Q1) – What demand management techniques are used in your company? (tick whichever is applicable);
- (Q2) – What demand management technique is the most used in your operation? (check one);
- (Q3) – What demand management techniques your company wants to improve in the coming years? (tick whichever is applicable).

The three questions were the same as alternative response option, as shown below:

- ( ) Statistical forecast demand (forecasting);
- ( ) Collaboration between areas;
- ( ) Predictive analysis and simulation;
- ( ) Cannibalization analysis;
- ( ) Promotions management and demand development (shaping);
- ( ) Alerts management;
- ( ) Price optimization;
- ( ) Replacement signals;
- ( ) Automatic outlier detection;
- ( ) Life cycle planning;
- ( ) Does not perform demand planning.

The techniques shown above are not exclusive and the greater the company's ability to



combine the use of these techniques more likely to achieve good results in the process of demand management, hence the emergence of question Q1. Independent of a certain company to use two or more of the techniques listed in the alternatives of the three questions, there will always be a technique that the company uses with more intensity (question Q2) and a technique that aims to improve the company (question Q3).

Regarding the techniques that companies use (Q1), the statistical prediction of the demand (forecasting) is the most used (Figure 6), followed by collaboration between areas and replacement signals. The life cycle planning, price optimization, promotion administration and demand development (shaping) and alerts management is still under development by most companies, consisting in the home of 20 % to 30 %. It is noteworthy that 2 % of the companies surveyed do not perform demand planning.

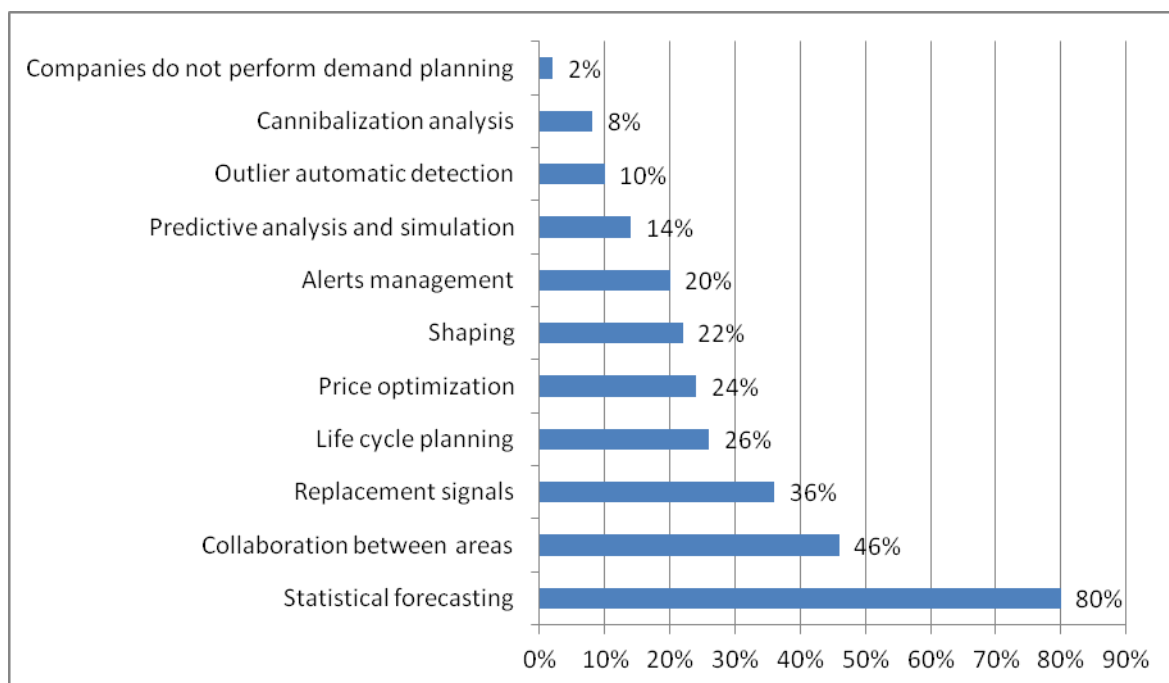


Figure 6 – (Q1) – What demand management techniques are used in your company? (tick whichever is applicable)

Regarding the technique most used in the operation, no company cited the cannibalization analysis and promotion administration/demand development (Figure 7). The most used technique is the statistical prediction, then collaboration between areas and replacement demand.

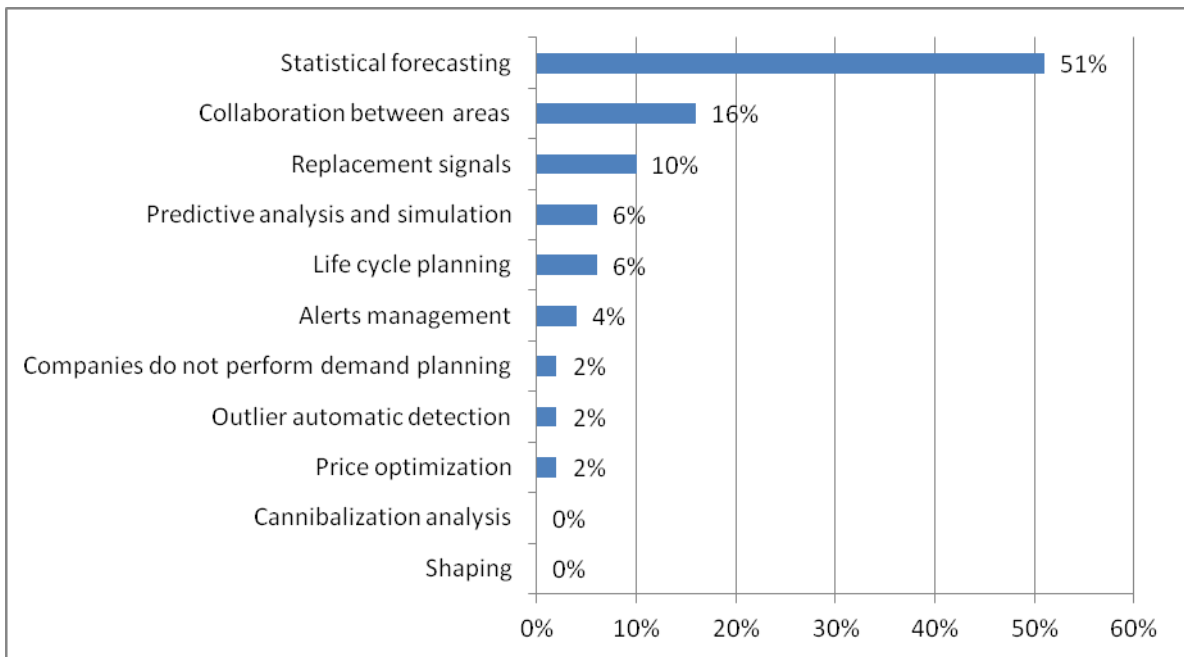


Figure 7 – (Q2) – What demand management technique is the most used in your operation? (check one)

Regarding the techniques that companies want to improve in the coming years, again the statistical prediction of the demand is shown first, followed by the collaboration between areas and replacement signals (Figure 8).

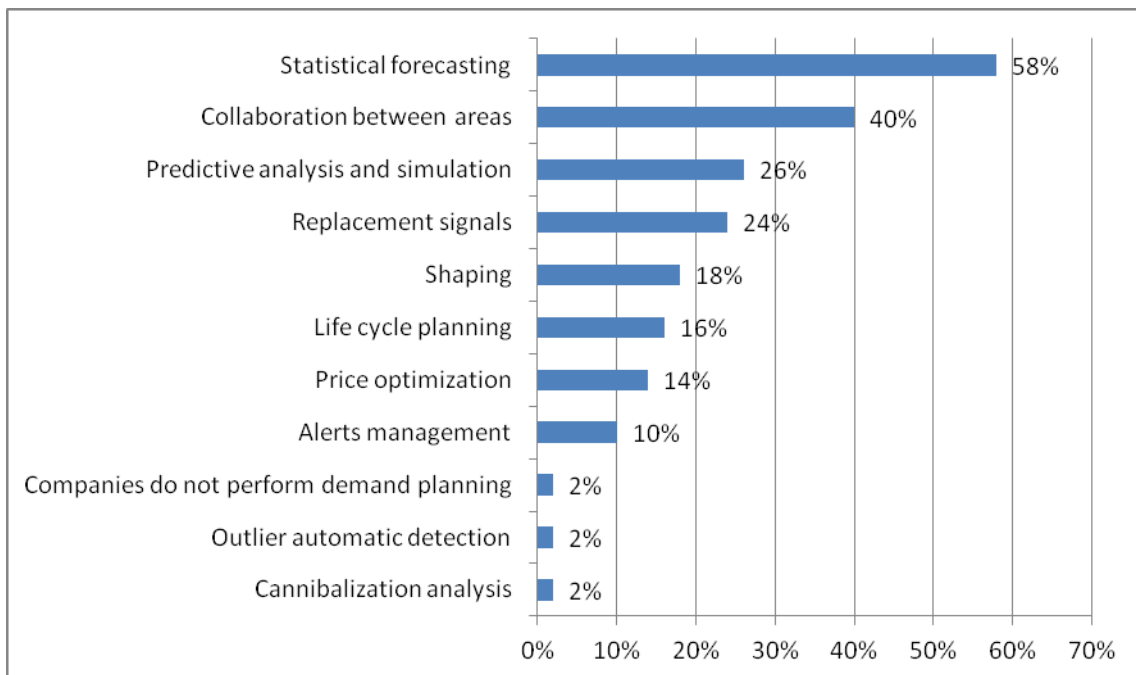


Figure 8 – (Q3) – What demand management techniques your company wants to improve in the coming years? (tick whichever is applicable).

By applying the data average from three previous questions (techniques used, most used technique, and techniques that companies want to improve), it was calculated the importance index of demand management techniques use, as shown in Figure 8.

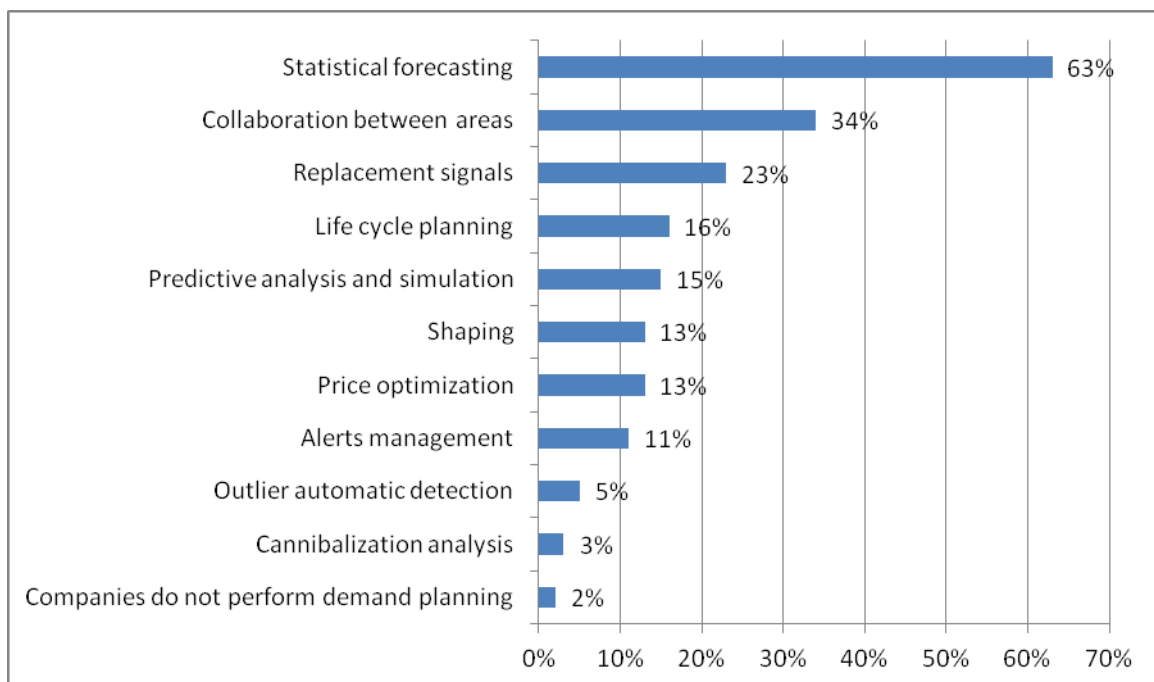


Figure 8 – Index of demand management techniques use

Companies struggle more with the statistical prediction of the demand (63 %), collaboration between areas (34 %) and replacement signals (23 %). Issues such as life cycle planning, predictive analysis/simulation, promotion administration/demand development, price optimization and alerts management, corresponding to an average of a quarter of the importance of statistical forecast, since automatic outlier detection and analysis cannibalization account for only 4 % of the importance given to the statistical forecast.

While most efforts are concentrated on statistical forecasting, demand management has a lot to improve and develop other techniques mentioned in this alternative the three research questions (Q1, Q2, Q3). The statistical prediction is important, however, is necessary to combine other techniques listed in this research.

#### 4. CONCLUSIONS

The demand management is not an end, but the beginning of a new cycle and allows direct and continuous improvement efforts for the processes improvement. It is a tool for learning and reduces risks in dynamic, changeable and uncertain environments. It is a proactive process where a company fails to respond to demand signals and passes to form, shape and manage its demand, with

the ability to predict future events in time for the necessary alignment in the present. It is a tool for decision making and change management.

The statistical prediction is important to improve the system and demand forecasting firms must increase participation in the other techniques mentioned in this paper. The success of supply chain management depends directly on the demand chain operations. Having a process and a system for forecasting demand planning is not enough, the company needs to manage demand, this implies going beyond the borders of the company and integrate collaborative processes between suppliers, customers in the demand management process.

Tools, methodologies and technologies for demand management improved the ability of companies to obtain quick and updated information, correlate with causal factors, events and use intelligence to predict demand scenarios in different contexts and at any level of aggregation or channel condition primary to serve customers who are increasingly demanding to efficiently and effectively manage the supply chain, optimize prices and contribution margins, minimize costs, reduce inventory levels, provide rapid response to consumer, improved productivity and asset utilization, greater availability of products and increase the level of stakeholders satisfaction.

## REFERENCES

- [1] Sharma RK. Demand management: supply constraints and inflation. New Delhi: Global India Publications Pvt Ltd., 2009.
- [2] Crum C, Palmatier GE. Demand management best practices: process, principles, and collaboration. Plantation, FL: J. Ross Publishing, 2003.
- [3] Arnold, Jr. T, Chapman SN, Clive LM. Introduction to materials management. Volume 10. New York, NY: Prentice Hall, 2007.
- [4] Li L. Supply chain management: concepts, techniques and practices – enhancing value through collaboration. Danvers, MA: World Scientific Publishing Co. Pte. Ltda., 2007.
- [5] Coyle JJ, Langley CJ, Gibson B, Novack RA, Bardi EJ. Supply chain management: a logistics perspective. 8 ed. Mason, OH: Cengage Learning, 2008.
- [6] Bean CR. The role of demand-management policies in reducing unemployment. London, UK: Cambridge University Press, 1997.
- [7] The Wise Marketer. Can demand chain management improve on CRM's returns? (27 Sept 2002) <http://www.thewisemarketer.com/news/read.asp?lc=k31250sx425zy>
- [8] Filippini R. Operations management research: some reflections on evolution, models and empirical studies in OM. International Journal of Operations & Production Management 1997; 17(7):655-670.
- [9] Heizer JH, Render B. Operations management. 10 ed. New York, NY: Prentice Hall, 2010.

- [10] Frohlich MT, Westbrook R. Demand chain management in manufacturing and services: web-based integration, drivers and performance. *Journal of Operations Management* 2002; 20(6):729-745.
- [11] Selen W, Soliman F. Operations in today's demand chain management framework. *Journal of Operations Management* 2002; 20(6):667-673.
- [12] Williams T, Maull R, Ellis B. Demand chain management theory: constraints and development from global aerospace supply webs. *Journal of Operations Management* 2002; 20(6):691-706.
- [13] de Treville S, Shapiro RD, Hameri A-P. From supply chain to demand chain: the role of lead time reduction in improving demand chain performance. *Journal of Operations Management* 2004; 21(6):613-627.
- [14] Mentzer JT, Moon MA. *Sales forecasting management: a demand management approach*. 2 ed. Thousand Oaks, CA: Sage Publications, Inc., 2005.
- [15] Anbuvelan K. *Principles of management*. New Delhi: Laxmi Publications (P) LTD, 2007.
- [16] Juttner U, Christopher M, Baker S. Demand chain management-integrating marketing and supply chain management. *Industrial Marketing Management* 2007; 36(3):377-392.
- [17] Tubino DF. *Planning and production control: Theory and Practice*. Sao Paulo, SP: Atlas, 2007. [in Portuguese]
- [18] Lambert DM. *Supply chain management: processes, partnerships, performance*. Sarasota, FL: Supply Chain Management Institute, 2008.
- [19] Boyer KK, Verma R. *Operations and supply chain management for the 21st century*. Mason, OH: Cengage Learning, 2009.
- [20] Chase Jr. C. *Demand-driven forecasting: a structured approach to forecasting*. New York, NY: John Wiley and Sons, 2009.
- [21] Gunasekaran A, Lenny Koh SC. Interlocking of information systems for international supply and demand chains management. *International Journal of Production Economics*, Volume 122, Issue 1, November 2009, Pages 127-132.
- [22] Jacobs RF, Chase RB. *Production and operations management: the essential*. Porto Alegre, RS: Bookman, 2009. [in Portuguese]
- [23] Mahapatra PB. *Operations management, a quantitative approach*. New Delhi: PHI Learning Pvt. Ltd., 2010.
- [24] Rexhausen D, Pibernik R, Kaiser G. Customer-facing supply chain practices – The impact of demand and distribution management on supply chain success. *Journal of Operations Management* 2012; 30(4):269-281.
- [25] Venus Lun YH, Lai K-h, Wong CWY, Cheng TCE. Demand chain management in the

- container shipping service industry. *International Journal of Production Economics* 2013; 141(2):485-492.
- [26] Cartoni DM. General monograph manual. Valinhos, SP: FAV – Faculdade de Valinhos, 2007. Not published. [in Portuguese]
- [27] Forza C. Survey research in operations management: a process-based perspective. *International Journal of Operations & Production Management* 2002; 22(2):152-194.
- [28] Oliveira SL. Treaty of scientific methodology. Sao Paulo, SP: Ed Pioneira, 1999. [in Portuguese]
- [29] Marconi MDA, Lakatos EM. Research techniques: planning and execution of research, sampling and research techniques, preparation, analysis and data interpretation. 7 ed. Sao Paulo, SP: Atlas, 2011. [in Portuguese]
- [30] Barbosa AM. Basic guidelines for preparation of research project and monograph. Belem, PA: Centro Universitario do Para, 2004. [in Portuguese]
- [31] Pinsonneault A, Kraemer KL. Survey research methodology in management information systems: an assessment. *Journal of Management Information Systems* 1993; 10(2):75-106.
- [32] Gil A. Designing research projects. 5 ed. Sao Paulo, SP: Atlas, 2010. [in Portuguese]
- [33] Google Docs Forms. (8 September 2012) <http://www.google.com/google-d-s/intl/pt-BR/forms>. [in Portuguese]