

SUPPLY CHAIN STRATEGY AND OUTSOURCING THE CASE OF THE GREEK PHARMACEUTICAL SECTOR

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Abstract

Scope – to support the introduction and effective implementation of modern supply chain strategy (SCS) in the Greek pharmaceutical sector.

Research methodology – A threefold analysis in combination: first, an integrated analysis aiming at contribution to the methodology issue by an interdisciplinary research framework; second, clearing-up the role of SCS in building-up a performing supply chain network; third, an empirical study of the Greek pharmaceutical sector using mixed research methodology, with special attention to logistics outsourcing (3PL).

Main findings – An attempt to contribute in the yet unsettled research methodology which has particular importance for the pharmaceutical sector dominated by SMEs; identification of possibilities of collective action to succeed; sustainable competitive advantage in a designed step-wise process.

Future study – Specific future research suggestions expected to support the sustainability of Greek pharmaceutical companies. JEL Classification: L65.

Keywords: Modern Research Methodology (MRM). Methodology Interdisciplinary Action Framework (MIAF). Supply Chain Strategy (SCS). Closed Loop Supply Chain Management (CLSCM). Reverse Logistics (RL). Enhanced Supply Chain Strategy (ESCS). Pharmaceutical Sector (PS). Outsourcing (3PL).

1. Introduction

The research attention to the sustainability of the pharmaceutical sector is attributed to its social function in public health, and the significant state intervention in connection with the overall distribution policy and development strategy. The pharmaceutical sector is an example of accommodation of state intervention in the framework of modern mixed economy. Actually, the use of pharmacies is today part of the culture, society and the way of life and has important implications in public health, employment, manufacturing production and distribution. More specifically, in the case of Greece, as a member of the European Union --extended to 27 member countries, few of which are in

infancy situation -- the 'historical challenge' of adjustment adverts in whether and how the new corporate and technology environment can be transformed from threats to opportunities. It is important to mention that the pharmaceutical sector's progress is chiefly based on knowledge and innovation with critical role to R&D which has to become performing and 'cost effective'.

It is helpful to overcome the misconceptions related with past practices and the constraints the creation strategic partnerships and collective action at supply chain level. Better understanding of the real situation will help the use of interdisciplinary research methodology for mobilization of all available knowledge infrastructure with effective use of modern Network Information Technology (NIT).

The reference to the special characteristics of the pharmaceutical sector gives emphasis to clearing-up the issue of split between core and non-core processes subject to outsourcing. It may potentially contribute to improving capabilities, with the goal of upgrading performance and succeeding sustainable competitive advantage.

2. Methodology Issue

With the rapid advance of logistics to supply chain management, there has been a move from firm to a network supply chain in which competition is carried out any more. Certain definitional and practical differences exist between logistics and supply chain management, although the terms are often used interchangeably (Cooper et al., 1997). Logistics can be defined as the planning and management of physical and information flows through an organization, whereas supply chain management extends this concept into the wider network of the organizations suppliers and customers. As such, supply chain managers not only need to be equipped with the skills and knowledge to manage logistics, but also they must be relationship managers.

Despite the rapid advance and extension of logistics and strategies formulation, there is yet little consensus on the conceptual and research methodological bases of SCM and SCS (Carter and Rogers, 2008; Kotzab et al., 2005; Kovacs and Spens, 2005; Näslund, 2002; Creswell, 2002). Mentzer and Kahn (1995) have reviewed that 'much of logistics literature and research lacks a rigorous orientation toward theory development, testing, and application' and presented 'a framework for understanding and undertaking logistics research': as guide to 'logistics researchers in how to adopt a rigorous research process that manifests theory development'. The process was identified as a series of logically ordered

and locally directional choices: from data collection to data analysis, plan formation and implementation and performance control. This set of choices is systematically circular: start running from formulation of the problem, through design, execution and assessment of results, gets back to the problem. Mentzer and Kahn had proposed a classification in three main research methodologies: the analytical, the systems and the actors approach. A question is whether the methodology issue has to precede or to follow established approaches for facilitating their testing. The latter case falls into the conventional hypothetico-deductive methodology. Alternatively, research methodology in line with hypothesis building-up precedes to theory formulation and is adopted in this article. The hypothesis building methodology requires discipline to the criteria of validity, reliability, and precision, according to the needs of empirical research. Modern research methodology (MRM) is helpful to smart use of all the existing knowledge infrastructure, on modern 'knowledge management'. In effect, Mentzler and Kahn maintained that dominant paradigms to logistics research are the economic approaches – that focus attention on cost minimization and profit maximization through cost analysis, mathematical modeling, simulation, and sensitivity analysis – and, to a lesser degree, the behavioral approaches that focus on psychological and sociological aspects of situations. Positivist paradigm that is dominating in logistics research, does not conveniently accommodate with the critical role on accumulation of knowledge and innovation, in which there is a dearth of research concerning the supply chain, both at conceptual and empirical level (Subroto et al., 2004). Logistics research is interdisciplinary by definition: it is reinforced from many different scientific traditions (Arlbjørn and Halldorsson, A., 2002), mainly through the business disciplines of marketing and management, but also borrowing from engineering, other disciplines and looking for use of new methods (Stock, 1997). Also there have been various attempts to fundamentally reappraise the rules defining what constitutes an acceptable approach to knowledge building in research literature (e.g. Mangan, 2004; Kotzab et al., 2005; Kovacs and Spens, 2005).

Although logistics has been criticized for not having a rich heritage of theory development (Stock, 1997), surprisingly little logistics research has focused on theory development to date (Listou, 1998; Kovacs and Spens, 2005), possibly as a consequence of the predominant positivist approach to logistics. At the same time, logistics theory development is very important in order to further validate the relatively young scientific discipline of logistics (Stock, 1997). According to Arlbjørn and Halldorsson (2002), the development of logistics theory calls for more inductive research. However, even induction may be trapped to traditional positivism, while in contrast the abduction has not yet been utilized in

logistics research, although it takes account of all available information and conforms to the choice of mixed methods, in combination with enriched goal grounded approach to methodology (Haigh, 2004; Kinach, 2004; Thomas and James, 2006).

In a recent literature review, Kovacs and Spens (2005) conducted an assessment of the current use of the three major research methodologies in logistics - i.e. deductive, inductive and abductive - through a 'content analysis' and carried out an analysis of logistics-related texts in academic journals to develop an understanding of the relative utilization of different research methods and approaches in logistics. The findings of this review are summarized in that only a small portion of articles in logistics refer to the methodology (32 out of 378, namely 8.47%) and that there is dominance of deductive research in logistics - suitable for testing existing theories - although logistics has not yet a theoretical background. No articles were found to conform to the requirements of abduction (table 1).

TABLE 1
Results from literature review

Journals Reviewed: period 1998-2002	Total of articles	No of Articles by Method		
		Deduct.	Induct.	Other
Total no of Articles	378	14	12	6
• IJLM	77			
• IJPDLM	206			
• JBL	95			

where: IJLM for International Journal of Logistics Management

IJPDLM for International Journal of Physical Distribution & Logistics Management

JBL for Journal of Business Logistics

Source: Kovacs and Spens (2005)

These results are comparable with those of Mentzer and Kahn (1995), of Samuel (1997), Burgess et al., (2006); Sachan and Datta (2005), with differences mainly associated with classification and categorization.

The literature review categorized by methods used is also illuminating. Many studies have been carried out at individual firm, survey and sector level, indiscriminately. A variety of techniques have been employed, depending on data availability and research capability, without enough always questioning the information and data collection, the accountability of the sources, corre-

spondence with definitions, sampling requirements in surveys research and in qualitative and statistical configurations. Not enough consideration of sample size, distributions central tendencies (such as mean, median, mode, skewness, etc.), of the stochastic character, variance and risk considerations. Statistical or logistics regression was often confused with models or theories testing and focus to the regression and correlation parameters in drawing conclusions, without reference to residual behaviour, reduced form and systems econometric analysis. It is not therefore surprising that case studies often involve data from many different sources in order to gather a rich picture of the case (Ellram, 1991), although case studies must have a theoretical dimension, otherwise they will be of little value for wider generalization (Yin, 2003; Kotzab et al., 2005). Neglecting, the distinction in theory testing, theory building or clinical case studies, implies that deductive approach had been used without any inductive elements (Stassen and Waller, 2002). Analysis techniques in survey research, depending on data and information collection can be interpreted quantitatively or qualitatively (Ho et al., 2002; Harkland et al., 2003). Some of the case studies deployed variant research methods and call for an inductive approach (Flint and Mentzer, 2000). Because case studies are versatile and with different paradigms, a review and taxonomy is required to clarify why logisticians deploy them (Dinwoodie and Xu, 2008). However, some articles referring that employed an inductive approach with use in part qualitative research, leave unclear whether it is about exploratory or inductive research (Golicic et al., 2002). In short, review articles published recently, converge to infer that relevant research only partially addresses conceptual issues and do not address adequately research methodology (Lumms et al., 2001; Mentzer et al., 2001; Ho et al., 2002; Hall-dorsson, 2002; Giannakis and Croom 2004; Chen and Paulraj, 2004; Christopher, 2004).

The empirical studies in logistics by classification into discipline categories (including marketing/services, logistics, purchasing, strategy, psychology/ sociology, finance/economic, information/ communication, operations management) have shown in table 2. The reviewed articles covered the period 1999-2003, were randomly reviewed by 48% from two journals, *Journal of Supply Chain Management* (21%) and *Supply Chain Management* (27%), and the remaining 52 percent of articles were 'thinly' spread over the rest of the 29 journals. It is worthy to note that first research attention category is the operations management discipline area (18,7 %), followed by the strategy (15,8 %) and purchasing (15,1 %), the information (12,9%) and logistics (11%). However, as it is known, all dicipline areas are complementary and encompassed in the concept of CLSCM., e.g. purchasing, marketing, strategy, information, etc.

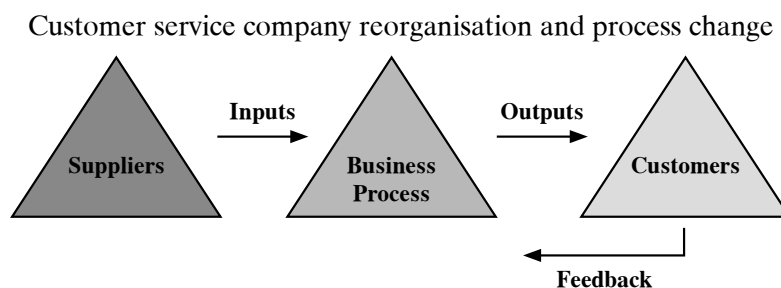
TABLE 2
Literature Review by Discipline: 1999-2003

Discipline	% of Articles
Operations Management	18,7
Strategy	15,8
Purchasing	15,1
Information/Communication	12,9
Logistics	11,0
Finance/Economics	7,9
Sociology/psychology	7,2
Marketing/services	5,0
Others	6,4
Total	100,0

Source: Burgess et al., 2006

The analysis based on a specified methodology framework in combination and intermix with an integrated interpretive approach to developments, may substantiate the notion of the Enhanced Supply Chain Strategy (ESCS). It will facilitate the requirements of managing 'value adding' logistics processes regarding flows of products and services including information flows across the supply network, by managers having to know the managerial variables (drivers) that must be addressed, since they determine how the business processes can be designed and successfully managed across the supply network; understand how the key SCM mechanisms (i.e. co-ordination and integration) interact with such managerial variables and, therefore, contribute to determining the concrete impact of drivers on logistics processes across the supply network (Romano, 2003). It also helps understanding that 'process change as strategic-driven and based on assessment of customer/supplier relationships and competitiveness factors' (Kettinger and Grover, 1995), shown in figure 1.

FIGURE 1



3. Study of the Pharmaceutical Supply Chain

3.1 Importance and Limitations

There has been a tendency to portray all supply chains as having similar characteristics. However, different industries and different products and services supply chains, notably in manufacturing, services and consultancy industries, can have quite different supply chains (Hughes et al., 1998; Waller, 1999).

Logistics have immense importance particularly in chemical and pharmaceutical supply chains. Companies in this industry, have gradually begun focusing on their supply chains, and research on pharmaceutical supply chain management and logistics has gained importance, although it has received little attention in the literature (NUS, 2008). The pharmaceutical industry is fast changing – increased cost pressures, mergers, acquisitions, an unpredictable global economy, etc. – requiring high degree of strategic and tactical flexibility to succeed. Pressures are leading many pharmaceutical companies to leverage all elements of their business, including increasingly complex supply chains, for making logistics a competitive advantage. Attention focuses in how to improve service quality while reducing operational costs and optimizing efficiency in inventory management and distribution. Meet evolving in synchronizing customer demands with use of logistics may contribute in keeping network optimized at all times and improve process efficiency, by reducing the time and labor required to order, track, deliver and stock of products. Moreover, integrated systems at network supply chain level of temperature-controlled shared warehouses and transportation management services, can increase capabilities and ensure the right product where and when needed, so that to reduce inventory and improve delivery status. Besides, the drugs bill of the national health system, funded by taxpayers, is under increasing pressure in recent years adding the need to afford some of the new and expensive drugs which are now being developed to tackle ‘modern diseases’ such as cancer (Boseley, 1999). As with any organizations, this area is looking for costs savings through better supply chain management.

The analysis of the pharmaceutical supply chain is conducted here by reference to a series of special characteristics of this sector, with focus of attention to Greek pharmaceutical sector. Adoption of SCS may assist establishing ‘best practices’, in terms of significant customers’ distribution costs and improving quality standards, which are critical within the highly regulated pharmaceutical / healthcare industry. Moreover, it may offer package outsourcing specialized services helping leverage others’ supply chain to improve customer satisfaction

in one of the world's most competitive industries. More specifically, its delegation is to provide with

- validated systems with full-lot traceability
- compliance assurance for State and EU Regulations
- a pan-European network of multi-client distribution centers, including strategically located, temperature-controlled campuses.

Turning the research attention to a particular sector, here the Greek pharmaceutical sector, is conducted in a discrete process, commencing with reordering of strategy priorities by specification of achieving long-term competitive advantage, as primary research goal. The engagement with the special characteristics of the pharmaceutical sector is followed by the structure of the distribution network of the Greek pharmaceutical sector. Then, the main results of a survey study are presented and assessed. In conducting this study, there are certain limitations (table 3).

In broad perspective, the pharmaceutical sector encompasses extensive use of drugs today within the western technology, culture and state intervention. The state intervention aims at protecting competition from possible distortion of the rules of equal chances, applying dumping etc by pharmaceutical multinational companies. In addition, the state intervention in public health belongs to the social policy mix that incorporates important issues such as health insurance and healthcare system, primary and hospital healthcare, income distribution and progress, demographic conditions, social cohesion, control system, etc. The interdisciplinary research approach will help understanding that state intervention and social policy are in principle compatible with the institution of markets, given the multimode targeting to equilibrate the various social and economic facets of the function and use of medicines today.

TABLE 3
Main Limitations of Research in Pharmaceutical Industry

- Limited resources to conducting research and pilot implementation
- Restriction to the suppliers of drugs (local and multinational pharmaceutical companies)
- Out of control the possible market fluctuations and disruption of the economic environment
- Requirements of awareness and behavioral and cultural change that take long-time and may include designed participatory action work
- Required stability of pharmaceutical policy for reducing risks associated with adjustment planning and implementation
- Need for protection of competition in view of that the pharmaceutical multinational companies may be distorting the rules of equal chances, applying dumping, etc.
- Only indirect consideration of the cost and cost effectiveness in the value adding by customers' quality satisfaction

The pharmaceutical industry over the last century has been rapidly expanding. However, within the dominating corporation environment pharmaceutical companies, as in other industries, have not applied specific rules. In the rapidly changing corporation environment over the last couple of decades, the pharmaceutical industry companies today have to become aware that it is imperative for them to contemplate and change the way of thinking, beyond that this industry can determine the health and lives of millions of people (although the issue of 'medical ethics' has been somewhat neglected).

3.2 Special Characteristics of the Pharmaceutical Sector

There is a number of special characteristics of the pharmaceutical sector, the understanding of which can have a series of important implications, to overcome past misconceptions and to help the structural analysis, strategy formulation and implementation (table 4).

TABLE 4
Special Characteristics of the Pharmaceutical Sector

- Combination of state intervention and social policy with the pharmaceutical market
- Usefulness of the supply network perception even though the pharmaceutical market works upon strict regulations, prices control and subsidization
- Critical role of innovation in developing new products and building-up distribution networks to store and move promptly and efficiently to final users (expensive R&D programs)
- Economic imperatives for lower costs without impairing quality: since drugs are for protection of social health and customership is in package form
- Continuing adjustment process: in view of changing business and technology environment and rising demand, living standards, life expectancy, modern illnesses, etc.
- Particular importance of the RL since the health of patients may be put at risk if drugs are not withdrawn expeditiously, with a timely and cost-effective manner
- Global marketplace changes: need for global SCS, strategic alliances, joint ventures, etc.
- Inter-European trend to integration: more complex 'strategy-structure-performance' circuit for value adding and creation of sustainable competitive advantage
- Prediction of rising role of logistics with harmonisation and a gradual shift towards pan-European distribution networks
- Need for excess stock, increased role of 3PL, wholesalers role, etc.
- Size scale effects: more structured frameworks, increase in marketing planning needs (McKee et al.,1990), need of alliances and outsourcing (Laios and Moschuris, 1999)
- Efficient technology use: rising role, available technology solutions, NIT, EDI, ERP, etc.
- Outdated Manufacturing: increasing competition, updated equipment in pharmacies, etc.
- Counterfeit products are coped with logistics through promoting innovation
- Parallel trading and black market: faced by RFID technology, product origin, etc.
- Law adequacy: helped by improving capabilities of control system, etc.

3.3 Outsourcing: 3PL Services

The historical 'question to make or buy' is frequently asked, in the main scope of promoting firms' adjustment to the new corporation and technology environment (Laios and Moschuris, 1999). It has long historical content, expressed as an issue of lean manufacturing for the purpose of reducing cost associated with the purchasing, operations and marketing. In addition, this relates with the 'medium and small size enterprises, which have limited competences and resources, compared to larger corporations'. This facilitates understanding how SMEs can proceed in developing collaborations for best use of all available resources and improve capabilities, with contribution of outsourcing or 'third party logistics' (3PL). It is a growing phenomenon, as a way to restructure the distribution networks and gain competitive advantage (Greaver, 2006; Manoliadis, 2007). The relations among the outsourcing firm, the 3PL service providers and customers are complex to integrate, and NIT are helpful to reduce the

risks of outsourcing (Xu et al., 2008). Since small and medium size enterprises (SMEs) --which are fundamental economic pillars of the European economy representing 99 per cent of enterprises -- as a rule lack competence, resources and capabilities, 3PL may enable them to improve relationships and become 'order makers' rather than 'order takers' with more leverage in their processes and succeed sustainable competitive advantage (Holter, et al., 2008). However, the 3PL providers may affirm declining efficiency, insofar as they focus on traditional service offerings such as transportation, and warehousing rather than playing the role as integrator or lead service provider (Zhou et al., 2008).

Besides the benefits of an outsourcing firm by assigning certain non-core processes to organized and experienced 3PL providers, there can be internal logistics benefits through structural adjustment of core process to quality services and customer satisfaction, possible extension to specialization in some high quality service of health, beauty, sporting, etc. Internal logistics include managing outsourced services and monitoring performance to target service levels. Optimal results can be assured by integrated strategic management which is not often the case (Willcocks et al., 1995; Bruce and Useem, 1998; Glassman, 2000). Otherwise stated, the rapid increase of the outsourcing and 3PL at international level, does not substitute the integrated supply chain strategy, insofar as it is confined in any single logistics outsourcing, in view of impressive immediate benefits, which likely burn in short-term. Fundamental subsistence and success criterion is the behavior of competitors, which is unknown, even more so in view that competition is conducted irreversibly anymore at supply network level. Without any preoccupation with outsourcing logistics companies whatsoever, the actual issue is a matter of awareness of the drugstores and of staff of the 'health funds' on the expected benefits in the framework of the state reform program: in terms of new inter-organizational structure at supply network level, to gain the synergy cost and scale effects for sustainable competitive advantage (Holter, et al., 2008).

There is a growing international logistics industry trend for expansion of capabilities for handling temperature-sensitive pharmaceuticals, by 3PL developers. It requires researchers, consultants and analysts access to briefs and as well as new items. Each brief contains in depth analysis of events and developments in the industry covering the logistics, express, forwarding and road sectors. It allows to

- track the acquisition strategies of competitors and suppliers
- gain an insight into the strategies of the main logistics operators

- respond to the latest industry trends
- identify threats or opportunities from industry developments.

The European pharmaceutical sector is included in the sectors experiencing even greater than anticipated growth. Parallel logistics spending in the sector is significantly rising to accommodate the rising throughput along with exploitation of new technology and a customer-focused attitude, by capitalizing on pharmaceutical expertise. More specifically, the growth to manufacturing and throughput creates a need for expanding warehousing to increase storage capacity. It is important therefore to dispose of all redundant unwanted stock and in parallel to prepare a number of other options to increase capacity. Pharmaceutical wholesalers are widening their service offerings and becoming health providers, supplying the pharmacy not merely with medicines, but with total solutions. Many wholesalers are also developing closer relationships with manufacturers, and offering them logistics services that have traditionally been the domain of 3PLs. With a trend towards greater harmonisation and unity in the EU, there is a gradual shift of European pharmaceutical logistics towards pan-European distribution networks.

TABLE 5

Effects of Outsourcing in the Pharmaceutical Sector (3PL)

- | |
|---|
| <ul style="list-style-type: none"> • Rise the interdependence of firms which in the past functioned independently. • Looking to outside sources for support in meeting IT demands - either for cost, skills, and strategy or a combination of the three. • Services may be performing than internal logistics and benchmarking. • Initiating major changes in organizational structure. • Facilitating automation of the operational or transactional/executional activity. • 3PL can offer huge support in the adjustment to new markets. • 3PL facilitates adding value when technology is changing fast. • Can help clumsy processes and some glitches by forming a process map. • May create a morale crisis, by increase in-house staff malaise, awakening and workforce backlash as people become anxious of layoffs. • Attaching to a long run strategic plan of structural transformation, to create hope for the future. |
|---|

The 3PL providers who remain stick to traditional service offerings may become victims of short-sightedness falling in declining efficiency, insofar as they focus on traditional service such as transportation, and warehousing rather than playing the role as integrator or lead service provider.

While outsourcing is a powerful tool to cut costs, improve performance, and refocus on the core business, outsourcing initiatives often fall short of manage-

ment's expectations. There are three principles for effective implementation of outsourcing: requirements, coordination and communication (Lynch, 2004). More specifically, it has been constructively criticised that outsourcing has to overcome a list of 'seven deadly sins' that underlie most of the failed outsourcing efforts: (1) outsourcing activities that should not be outsourced; (2) selecting the wrong vendor by overblown expectations; (3) writing a poor contract, by blindly banishing projects; (4) overlooking personnel issues; (5) losing control over the outsourced activity; (6) overlooking the hidden costs of outsourcing; and (7) failing to plan an exit strategy, by negligence and end-game myopia (Baitheimy, 2003; Artunian, 2006).

3.4 Survey Study of the Greek Pharmaceutical Sector: the Framework

Based on the discussed research methodology framework, it is conducted here a survey study for the purpose of identifying the extent of logistics penetration in the pharmaceutical companies suppliers of drugs in Greece. It is pointed out at the outset that there is relative lack of scientific economic research concerning the Greek pharmaceutical sector, although it faces important adjustment problems (Center for Health Services Management and Evaluation, 2001; Souliotis and Kyriopoulos, 2002; Kontozamanis et al., 2003) and it is considered to be the most crisis prone of all industries, calling for future studies and especially for generalization of the findings (Priporas and Vangelinos, 2008).

Within the specified methodology framework, attention is given to the design of study to avoid misapplication of this method (Benbasat et al., 1987; Pinsonneault and Kraemer, 1992). The purpose is clear to advance our knowledge concerning the behavior of the suppliers of drugs in Greece in relation to the SCM and SCS. All available information is used, on mixed method and triangulation analysis. Specially useful is the presented main characteristics of the pharmaceutical sector and the fragmentation of manufacturing companies and of independent small size pharmacies throughout the country. In addition, useful is the information about a rising trend in total expenditure on pharmaceuticals in Greece and the expectation that this trend is likely to continue due to factors determining demand (e.g., aged population). Besides these, public policy reflects defensive strategy (Kontozamanis et al., 2003), as confirmed by the recent contradictory recommendations of the ECJ concerning the GlaxoSmithKline (GSK) affair in Greece and in Spain, as threatening violation of the articles 81 and 82 of the EC Treaty with wide ranging implications to the competition rules in the pharmaceutical sector (Treacy and Hopson, 2007).

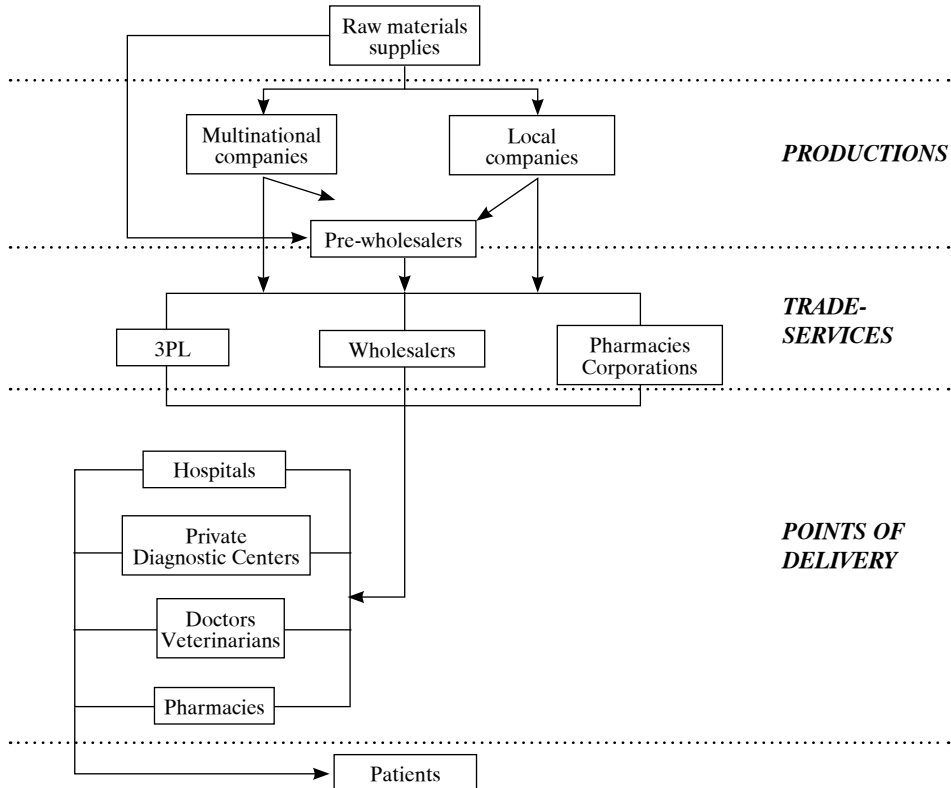
This study has certain advantages and limitations. Beyond the attention given in the study method in relation with the goal set-in, the sample size is relatively high, as the sample includes twenty five (25) pharmaceutical companies of a total of 102 pharmaceutical companies, representing over 90% of total sector revenues (IOBE, 2008). Seven of the companies included in this study are in the first twelve (12) places in the global market.

One more characteristic of this study is the attention given to the distribution structure of the channel network of drugs in Greece, representing the distribution process, as shown in figure 2.

The 55% of the market share belongs to private companies and the 45% to pharmacies cooperatives (2005). In addition, there are companies called as 'pre-wholesalers', which are local producers that provide logistics services as well for other pharmaceutical companies.

The study was conducted through a questionnaire of 18 questions regarding the following issues: infrastructure and use of outsourcing logistics in relation to strategy and performance, automation and procurement. The information was collected in mid 2006-mid 2007 from twenty five (25) pharmaceutical companies.

FIGURE 2
Pharmaceutical Distribution Process in Greece



3.5 Survey Study Results

The analysis of the collected data in terms of descriptive statistics is summarized as follows

1. The Importance of Logistics: In the interviewed companies the processes of warehousing and distribution were under responsibility of the General Management in the 50% with separate logistics department, 25% under the economic department, 19% under a distribution department and 6% in other departments.

2. The Logistics Organization: 94% of the staff members have expressed in principle the view that an organized Logistics department has to be included in strategic priorities and only 6% of them perceive Logistics solely as a routine function.

3. Logistics Outsourcing (3PL): The outsourcing in the pharmaceutical and cosmetics has third place in Greece (11%) following the foods and drink and the automobile sector (2006). This position of the pharmaceutical sector expresses a rapidly increasing trend, as compared with a corresponding 6% in 2003 (ICAP data). Larger proportion (56%) of the interviewed companies have declared that they conduct the warehousing and distribution 'in house', in own (31%) or rented installations (25%). The 44% has subcontracted outsourcing servicing (3PL). However, a number of smaller size companies have adopted 'in house' logistics, while one company of the sample operates as a 'pre-wholesaler', providing logistics services beyond production. It is anyhow noted that most companies that have installed own or rent installations preclude proceeding to 3PL in the foreseeable future.

4. Main Advantage of 3PL Warehousing: The benefits from assignment of the warehousing in third parties are similarly distributed, mainly cheaper warehousing services (38%), capital saving and possibilities of investing in other outlets (31%), focus in 'core processes', etc. This result is in line with a study at worldwide level (ElAmin A., 2005), which has shown that the cost of services has been considered main criterion of decisions of outsourcing for first time in the last decade.

5. Cost of Assigning 3PL Warehousing Services: The cost of 3PL warehousing is perceived to include the lack of control of the warehousing conditions (38%), which is important in view of the sensitivity of pharmaceutical products, the lack of specialized in pharmaceuticals 3PL companies (25%), the delays in customer service (25%) and the insufficient store management, while 6% had not declared any reservation in outsourcing choice. In effect, none pharmaceutical company considers the 3PL services as high cost (answer to alternative question), but almost all companies perceived defective the quality of services supplied, e.g. delays, bad management, lack of experienced staff, impossibility of any control, etc.

6. Use of 3PL in Distribution: A noteworthy observation is that the pharmaceutical companies put under consideration the issue of distribution assignment to outsourcing following their decision of warehousing management, assessing it as secondary strategic importance. Any how, the big majority of Greek pharmaceutical companies do not use own fleet in the distribution of their products (71% in the greater Attica area), while all companies make use of agents for the distribution in the provincial country.

7. Assessment of the Distribution Outsourcing: The assessed main advantages of outsourcing were the release of capital in transportation means (62%), the

possibilities of focusing in 'core processes' (25%) and the cheaper cost of transport services (13%). These advantages overbalance the 'cost' of distribution outsourcing, which is assessed to include the impairment of quality and the impersonal service (57%), the lack of modern transport means for pharmaceutical products (19%), the impossibility of immediate control of the process and the channels of distribution (6%), the damages and returns (6%), and the information leakages (6%), while only the 6% of pharmaceutical companies consider defective the distribution process.

8. Follow –up of Company's Logistics: As it is known, the decisions of warehousing and distribution are not random but have to be based on penetrating marketing research, the rules, regulations and processes according to law, the company's capabilities and the priorities ordering put by the management. Although all companies of the sample follow and record the cost of warehousing and distribution annually, the majority of them does not put targets regarding the %age of the annual turnover which was 38% on average, while one company considered confidential this data. It is implied that the importance attributed to logistics is based upon relation with the service quality rather than with the effects on the operational company's cost.

9. Cost and Computerization of Logistics: The cost of orders and of warehousing is significant in the pharmaceutical sector (Pantazis, 2004). This suggests electronic data processing, with computerized company's system in Warehousing. More often use is made of Warehouse Management System (WMS), Enterprise Resource Planning (ERP) or combination of them, use of Barcode system, etc. The problem is a matter of choice concerning the question how the inventory management and the warehousing processes are properly systemic computer supported (receipt, placement, orders collection, processing and dispatch forwarding/invoicing, delivering to customer, etc.). The big majority of interviewed companies use ERP program (68%), a small proportion of them uses WMS (13%) and some use combined ERP + WMS (19%). It is inferred that no extensive use has been yet of specialized computer programs for the warehousing management, such as the WMS. Mostly, ERP systems support the movements to and from the store, but do not offer detailed design and following-up as WMSs concerning internal handling process and positions and systems. The computerized support of warehouses, according to staff of the interviewed pharmaceutical companies, contributes chiefly for reduction of faults and for the speed of the warehousing processes (88%).

10. Procurement and Orders' Processing: The procurement includes everything concerning the interrelationships with the suppliers, based on trust, on

technological processes, etc. Securing the necessary input inventory and flow presumes possibly prior contracting and timely orderings and right warehousing management and normal operation. Almost all pharmaceutical companies of the sample (94%) evaluate their suppliers from the time of response to orders and the conformance in quantity and quality. However, just the 6% has developed close and trusting connection with their suppliers, considering unnecessary the evaluation in this area. The communication of the sector's companies and the putting of orders is conducted through Fax (53,8%), via e-mail the 11,8%, via ERP the 11,7% and by telephone the 10,3%, while the 12,4% had not revealed this information. It is shown therefore that the new technologies have not yet reached the Greek pharmaceutical companies, in part possibly as considering past practices as more personal and friendly. Thus, the majority of these companies (62%) make rare use of the internet tools and facilities for searching new suppliers, while 19% do not use it at all and the rest 19% makes exclusive use of internet for this purpose.

11. Logistics Training: All the companies (100%) consider necessary the participation of the employees with their warehouses in training programs in regular times. However, the data have shown that only 56% of the warehouses personnel had participated in training programs during the previous two years.

A model of the following form of using 3PL services was build-up and tested:

$$3PL = a_0 + a_1 \text{WSD} + a_2 \text{DSD} + a_3 \text{DSP} + a_4 \text{IPS} + e_i$$

where

3PL, for use of 3PL services

WSD, for main feature of use of warehousing 3PL services

DSD, for main negative feature of use of distribution 3PL services

DSP, for main positive feature of use of distribution 3PL services

IPS, for using internet facilities in search of suppliers

For the estimation of the depended variable 3PL for a pharmaceutical company the Logistic Regression method was applied with the above independent variables concerning the use of 3PL services. The Lickert scale was used with '1' for the main characteristic of each variable and '0' for its refusal or not answering. The dependent variable also takes the value '1' for use of 3PL services and '0' for not use of 3PL services by a pharmaceutical company. The main regression results are outlined in the following table:

TABLE 6
Estimated Regression Results

Variables' Parameters	Estimated Parameter
a_1 for WSD	3,5* (2,759)
a_2 for DSD	-7,254** (4,333)
a_3 for DSP	2,288*** (1,303)
a_4 for IPS	-3,109** (4,055)

symbols ***, **, * for statistical significance at 1%, 5% και 10% respectively

The main quantitative results of this survey research are summarized as follows:

The parameter of the WSD is positive and statistically significant at 10% level, which means that warehousing 3PL services have positive influence in using such services. Moreover, the coefficient of DSD, for main negative feature of use of distribution 3PL services, is negative and statistically significant at 5% level, implying that the pharmaceutical company which considers negative the 3PL services because of impossible exercising of direct control, avoids using them. The positive coefficient of DSP, of use of distribution 3PL services, at 10% level considers positive the 3PL services chiefly because of 'freeing capital'. In addition, the use internet services for procurement by a pharmaceutical company, reduces the probability of using 3PL services.

In brief, these results indicate that the Greek pharmaceutical companies have as main criteria of using 3PL services the warehousing services and the freeing capital, which however reduces exercising direct control and the alternative use of internet services for the procurement. It means dominance of lack of understanding and awareness of the role of 3PL and more broadly the perception of the supply chain strategy, for achieving sustainable competitive advantage. The research of the logistics infrastructure and the education in logistics have substantiated such a situation. Although the supply chain of the pharmaceutical products is critical for the social health, in the majority of the pharmaceutical companies the responsibility of the warehousing and distribution processes remain in the responsibility of the general management. Of course, in consideration of the 'economies of scale' in production and distribution, have pushed a number of pharmaceutical companies and a number

of services companies in mergers and collaborations, with main aims the cost reduction and the capital saving.

Comparison of advantages and disadvantages of the 3PL in warehousing and distribution, in the framework of the results of this study, main disadvantage has been considered the loss of direct control (44%) and main advantage the freeing of capital (40% on average) in combination with the basic production functions (average 24%).

4. Main Concluding Remarks and Future Research

This paper has been engaged with the yet unsettled methodology framework and theoretical background issues concerning the SCM and SCS by a mixed analysis: a modern methodology framework based on combination with interdisciplinary modern Knowledge Management. It may contribute to the critical contemporary issue of sustainability through transforming the 'challenges' to 'chances' in the course of adjustment to the new transactions and technology environment. This research structure may become particularly useful for SMEs and is essential especially in the case of the pharmaceutical sector, in view of hard global wide competition and the critical social and economic importance of this sector. It can contribute to awareness for use of all available infrastructure, raise collective capabilities, inducing innovation and promoting creation of sustainable competitive advantage, within the single market of the 27 EU member countries.

It has also been attempted to erase a series of misconceptions concerning the quality of outsourcing (3PL) through ascending qualitative technical support to induce initiatives for strategy forming at network supply chain level, and mobilization of all available resources. Participative action research based on the triangular integration approach for strategy formulation (at technocratic, corporation and state policy level) can be useful in the case of the Greek pharmaceutical sector. Firstly, it may help to reveal a series of hindering factors to strategy formulation for acquiring sustainable competitive advantage, such as the relatively high returns and rising drugs demand due to rise in income and aged population. Helpful to this goal is the identification of a series of special characteristics of the pharmaceutical sector to facilitate the supply chain analysis of this sector. Moreover, useful are assessed the presentation of the distribution network structure and a survey study of the logistics outsourcing conducted in the Greek pharmaceutical sector. Actually, the results of this research have shown a number of developments in the correct direction, but self-complacency deprives the sector from the potential benefits of SCS for attaining sustainable

competitive advantage, due to lack of knowledge, understanding and mistrust. Thus, although the pharmaceutical companies which use 3PL in warehousing and distribution have higher market shares, the main criterion has been the capital saving. This, along with the restricted action in the area of pharmacies' cooperatives, is indicative of big possibilities of use of integrated logistics strategy to succeed sustainability of the Greek pharmaceutical sector.

Finally, future research is suggested in the following particular areas

1. A study of supporting an initiative of establishing a local pharmaceutical SCM network, based on constructive mixed participatory action methodology. It may contribute to improving outsourcing of other pharmaceutical companies by offering a package of specialized services helping leverage others' supply chain to improve customer satisfaction in one of the world's most competitive industries.

2. A study concerning the introduction of RL (reverse logistics) within the Greek National Health Service (NHS).

3. A study to promote information and education in health care decision making by unskilled medicare beneficiaries, following foreign experience 'national medicare education programs' for saving in use of drugs.

4. A research project based on CLSCM regarding the dilemma that the pharmaceutical industry aggravates the problem of physical sustainability, along with its social mission in protection of public health.

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