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**INTERDISCIPLINARITY AND TRANSDISCIPLINARITY
IN MATERIAL RESOURCES APPROACH.
LOGISTICS BETWEEN
MANAGEMENT AND INDUSTRIAL ENGINEERING**

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Abstract:

The need for interdependencies between different disciplines to address (theoretically and practically) the optimal solution to certain problems in various areas, based on these realities, has resulted, ever since the mid twentieth century, today being already advanced, at a macro level, the concept of "Hybrid Age" an equivalent to the fourth wave (in Toffler's language) in which human evolution turns into a man-technology co evolution. So, "disciplinarity"-based concepts (trans, multi, inter) acquire complex meanings, completing initial area meanings, all these with the purpose of searching for new sources of organizational performance. The article investigates the issue of organizations' material resources approach (role and importance) in terms of principles and methodologies that are specific to a relatively young science, Logistics, with a specific management claimed to be solved by both economists and engineers. In the same note, in agreement with the theme of this conference, we also lay emphasis on the fact that there are discussions in Logistics literature regarding the civil-military interconditioning type, with significant results in the improvement of best practices in the field of logistics activities' outsourcing.

Key words: Logistics, material resources, industrial engineering, management, interdependences

1.Introduction

The starting concepts in grounding this article (inter-and transdisciplinarity) do not lay in scientific research, nor should they be construed as antagonistic, but complementary, keeping in mind their common goal of better understanding reality.

The main difference between multi and interdisciplinarity consists of the type of relationship that is established between the combined disciplines: multidisciplinary simply brings together a series of independent disciplines, which together contribute to the achievement of the scientific endeavor, while interdisciplinarity blends and transforms methods, creating new and improved tools better adapted to the subject of the research. Transdisciplinarity goes even further, seeking a unity of knowledge beyond isolated disciplines, while multi and interdisciplinary research always remains within the boundaries of traditional disciplines [1]. Interdisciplinarity supports the horizontal transfer

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of knowledge from one discipline to the other. In „Expose de quelques concepts fondamentaux”, UNESCO, 1985, G. Vaideanu emphasized that interdisciplinarity involves a certain degree of integration between the various fields of knowledge and different approaches, much like using a common language, enabling conceptual and methodological exchanges.

As presented in the abstract, the pressure of concerns for increasing the complexity of research in different disciplines existed and was manifested in the different fields of knowledge. Given the subject of this article, the field of the theory of organizations is relevant here. The assertions in the beginning of this article can be exemplified by means of the socio-technical theory, a synthesis of the technological theory and the theory of human resources. The concept of socio-technical integration was developed by Trist in the '50s and further studied in the coming years and it is founded on the principle that the group is not only a technical or social system, but an interdependent socio-technical one. Each of the two systems acts coercively on each other, so it is pointless to assume that social relations are determined by technology (as asserted by the technological theory) or that the way a job is performed is determined by the psychology of the workers (such as the theory of human resources indicated). Since this is a system, separate action on each of its subsystems is an error. The practical solution proposed by Trist in order to increase overall system efficiency was that of exerting simultaneous action on both the technical elements and the socio-psychological ones [2].

Certainly things have changed and today, as a natural consequence of this evolution, we witness the affirmation of a complex area, "Engineering and Management", which supports very diverse specializations (i.e., Economic Industrial Engineering), which were imposed as a necessity of the labor market. Basically, it is a comprehensive demonstration, adapted to the context in which society develops, of the fact that a dynamic world in which services and production are highly diversified, engineering needs some more management and on the other hand, economists need far more solid knowledge of other branches, management and economy being based on and interpreting production processes in different areas. Economic Engineering is part of the so-called by some authors (but equally by universities with such specializations) "Competitive Engineering" and is an interdisciplinary field that combines in the formation of competencies, methods and instruments specific to engineering with economy, management, international relations and communication methods. It is increasingly considered that economic engineering in business, deals with the development and application of specific methods, tools and approaches through which different technical economic or mixed systems (products, processes, services) can be developed at higher parameters from an economical and technical point of view, in real working conditions (constraints and multiple demands). Therefore, in order to be competitive and efficient, one needs to expand the originally outlined educational and professional horizon.

Among the categories of organizational resources, addressed extremely variedly by management textbooks, there is, at first sight, a slight superiority in approaching "soft" resources (human, financial, informational, an absolutely arbitrary order) at the expense of material resources. Is there a shift in the center of gravity of the package of organizational resources? We believe this question is only natural because there are, in the specialty literature (mainly the engineering and technical side), views according to which any organization is a system of production that transforms inputs (human resources, equipment, technology etc.) into outputs (goods and services). In other words, transformation

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processes within organizations are founded essentially on techniques and the integrative science that is specialized in dealing with material resources, being mainly aimed at providing the utility of time, place, ownership and optimal cost, is Logistics.

2.Coordinates of Industrial Engineering

Industrial Engineering is a branch of engineering sciences that deals with optimizing processes or systems. In its broadest sense, according to the best known Manual of Industrial Engineering [3], it refers to the design, development and implementation of integrated systems composed of men, material and equipment. It is based on specialized knowledge and expertise in mathematical, physical and social sciences as well as engineering principles and methods of analysis and design for forecasting, specification and assessment of the results obtained through such systems. The main activities in this field are outlined, most often citing them as they were presented by the American Institute of Industrial Engineers: selection of technological and assembly processes, equipment selection and design, design of facilities and equipment for logistics activities, designing and improving planning and control systems for the distribution of goods and services, production, inventory, product quality, etc., designing and improving expenditure control systems, product development, design and practical application of informational systems for management; design and practical implementation of remuneration systems, design criteria and means of evaluation of various activities, operational research, systems, methodologies and policies of clerk works, planning and organizational design, etc.

In agreement with the subject of this article and its introductory considerations, it is worth mentioning that the field of Industrial Engineering, sometimes called Services Management, is included as a distinct chapter in The Gower Handbook of Management [4] and it comprises, synthesized, the following subjects:

- Improving the organization;
- Improving methods and equipment;
- Improving workplace conditions and working environment;
- Improving product or service itself.

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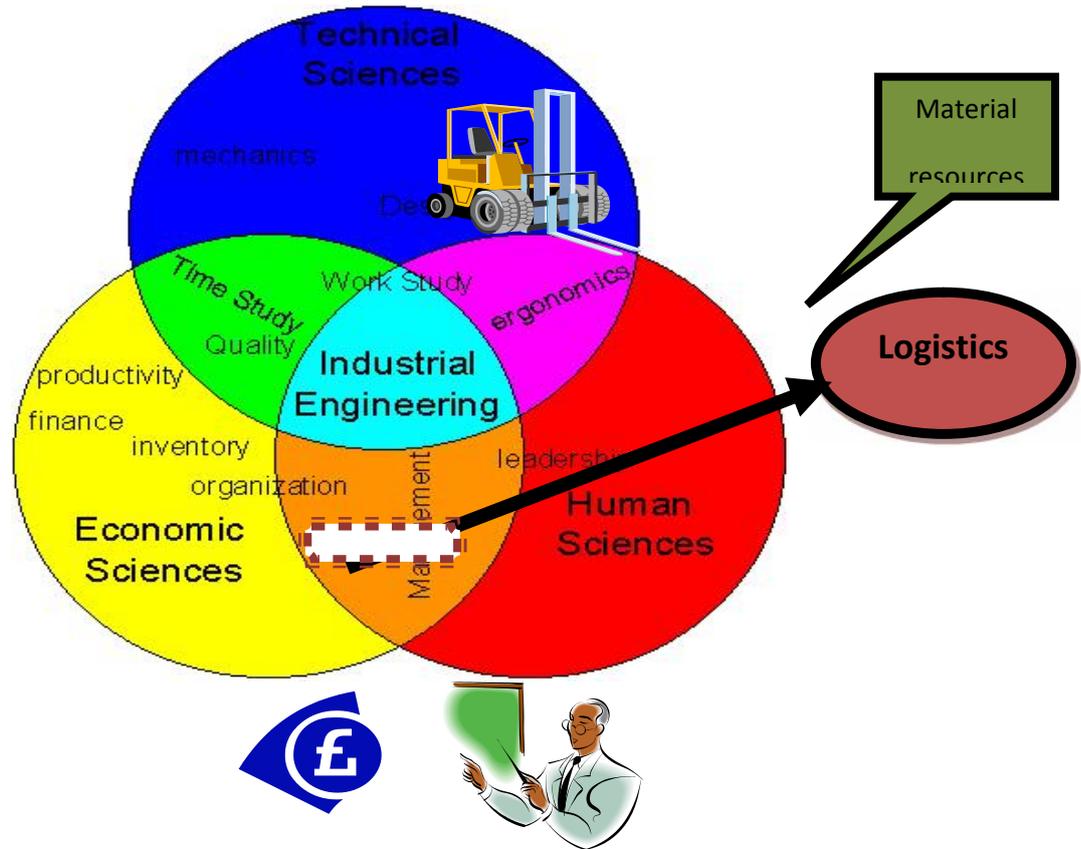


Figure no.1 Defining the area of Industrial Engineering
[adaptation of <http://www.kwaliteg.co.za/industrial/ie.gif>]

By highlighting the contents of Industrial Engineering (Figure No. 1) we wanted to address firstly the issue of interdependencies between Industrial Engineering and Management, as a rather plausible hypothesis brought to our attention the opinion of economists (specialized in management) according to which the field of management belongs to them. In order to support the aforementioned statements, we chose some of the opinions of the well-known Professor Ioan Abrudan, PhD, an engineer and an economist, an enthusiast of the management-engineering binomial, who, recently, in an editorial stated: "... every production system, every type of activity, generated a particular situation, but the gap between the general and the specific, is a true "tank" of productivity exploited through flexibility. Looking at the issue from another angle, each particular case sent a set of signals towards the general knowledge patrimony that could stand as validation for what was already common knowledge or as a new paradigm for future situations. Progress results therefore in a "propulsion-towing" dynamic, within which, as a first step, it reveals the particular and, during the second, it draws the progress of what is already possessed by human knowledge." [5]

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3. Logistics between Management and Industrial Engineering

According to the Society of Logistics Engineers in the UK "... modern logistics systems stand as the connector and interlacement of the weaving that gives cohesion to our society. Not only do they distribute goods and services to meet material needs and desires, but also the ideas that spread cultural, social and economic progress. The quality of logistics support can often explain the success or failure of an undertaking. "

In the civil purview, the emergence of logistics in the industrial and commercial sector, had as a premise the industrial development of the eighteenth and nineteenth centuries, when there appeared and developed factories that recorded superior levels of productivity. At a theoretical level, as D.M. Lambert and J.R. Stock assert, logistics has been an object of study in education as early as 1900. The first specifications in logistics are made by John Crowell (1901) who, in his work, analyzed costs and distribution factors for agricultural products in the U.S. Later on (1916), Arch Shaw dealt with strategic aspects of logistics in his work "Approach to Business Problems". That same year, L.D.H. Weld introduced concepts such as utility of time, space and possession to describe marketing activities and to determine the performance of distribution channels. [6]

Under the auspices of inter and transdisciplinarity, as of 2000, there is an ever growing interest in redefining business, which brings Logistics into a more than favorable light (both at a practical level and in theory), because of the opportunities that arise in this field, namely its role in ensuring competitive advantage.

In the context of markets globalization, an irreversible phenomenon, the concept of international logistics has been discussed ever since the end of the twentieth century. International Logistics is an area of increasingly importance for organizations that operate internationally and which, in the activity of procurement rely mainly on global sources and in the activity of supplying on international trade flows. Sophisticated technologies based on computer systems, such as computer integrated logistics, are used to enable international companies that provide logistics services to run efficient supply chains and the functions specific to the logistics activity.

International Logistics requires to a greater extent the proper integration of operations and logistics systems between the supplier / manufacturer and other forms involved in transporting goods along the supply chain across national borders. On the European market, competitive pressure and the continuing struggle for greater efficiency have forced distribution service providers, to focus, at first, intensively on improving service quality and reducing risks. Manufacturers and distributors have sought to establish pan-European distribution networks, although results were not always as expected [7].

From the definitions and explanations in the specialty literature [8] [9] [10], some important conceptual delimitations concerning logistics can be drawn, in agreement with the theme of this article:

- Logistics is expressed through a specific process of interrelated actions that are part of distinctive activities;
- the logistic process consists of two flows: a material and informational flow of raw materials, materials, intermediates, finished products, and that of services in the provider-producer-client (beneficiary) circuit;
- the purpose of Logistics is to meet the needs of beneficiaries (customers) in conditions of efficiency and effectiveness for the manufacturing organization;
- managerial involvement in the logistics process through actions in the field of strategy, planning and control of material and informational flows;

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- the scope of Logistics consists of specialized structural components (in logistics) within the organization or organizations specialized in logistics activities;
- a possible definition of the concept of logistics can be summarized as "the sum of the 7 R's" the right amount of goods at the right time, of the right quality at the right cost, at the right place with the right information for all participants.

The development of the field of logistics, regardless of the business sector or the country taken into consideration, has involved a large number of professionals who have tried to popularize the concept and the profession of logistician, concurrently with the development achieved in practice. Professional associations and specialty publications have played a significant part in formalizing knowledge and building professional networks, in this respect the remarkable progress made in economically developed countries such as USA, Germany, France, Japan and others, being a matter of common knowledge. [11]

4. Conclusion

We see therefore that the term "logistics" bears very diverse interpretations, from a simple transport to an interdisciplinary science combining Engineering with Management. As a result, the concept of logistics can be appreciated as a discipline in itself, very complex, focused on the issue of material resources. Logistics being closely linked to socio-economic and industrial development has evolved alongside it. This is how definitions have emerged with the aim of describing Logistics in line with its development and its area of addressability. In relation with the existing management definitions, logistics systems management stands as a complex of concepts, methods, processes, actions and measures undertaken in order to ensure normal, efficient and effective functioning logistics systems in their whole, as well as in each of their components and has as ultimate purpose to achieve planned objectives while making rational use of material, human, financial and other resources that the respective organizational structure holds.

As a corollary to the things stated in this article, we bring to attention the opinion of the reputable researchers Ayesha and Parag Khanna, who in a Foreign Policy article, said: *"There is no adequate word in English to capture this complex entanglement of humans and technology. The German word Technik comes closest: It means not just technology, but the mastery of the methods and processes that shape and steer it. In today's emerging world, Technik can be something of a broad index of preparedness for the future Hybrid Age. It rejoins the scientific and mechanical dimensions of technology with a necessary concern for its effect on humans and society. So while today we talk about promoting democracy, tomorrow we will realize we should be promoting good Technik."*

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