

**AN INQUIRY INTO THE CHARACTERISTICS, APPLICABILITY  
AND PREREQUISITES OF INTELLIGENT MANAGEMENT  
SOLUTIONS IN LOGISTICS**

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**Abstract:**

*Contemporary businesses require increasingly dynamic and effective logistic solutions in order to keep track with the volatile economic, social and political environment. The paper presents an insight into the challenges facing modern economies, the new trend in logistic planning and potential management solutions. We explain the prospects of adopting intelligent management solutions in logistics with the objectives of enhancing transportation systems and developing smart, sustainable urban areas. The discussion identifies and examines the prerequisites for developing modern intelligent systems and the situation in the Black Sea region.*

**Keywords:** *technological development, intelligent transport systems, management solutions, social development, business environment.*

**JEL Classification:** L91, O18, M14, O31

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## **1. Introduction**

Management functions as a living organism – it is continually transforming, evolving and reinventing itself. The reasons behind for these developments are represented by the dynamic nature of the economic activities and the complex nature of the business environment.

Contemporary businesses are confronted with an increasingly intricate environment characterized by higher customer expectations, complex market relations and heightened interdependency among social, political, economic and legal factors. While isolationism has never been a viable economic strategy, the recent preoccupation for business planners has been positioned at the other end of the scale, trying to develop new methods for integrating various activities, with the goal of obtaining optimum results for all participants.

In terms of transportation or logistics planning in general, a noteworthy moment has been that of the introduction of the supply chain management concept or SCM. Cooper and Ellram (1993, 13) state that the widespread use and interest in the SCM notion can be attributed to the fact that this represents a means of becoming or remaining competitive in the dynamic global environment. A successful supply chain management system places an emphasis on the needs and satisfaction of the final consumer (Harland, 1996) and the propagation of these elements, through a cross-functional integration of businesses (Lambert and Cooper, 2000, 65), along the path from source of production to place of consumption.

As defined by previous authors, supply chain management consists of an “end-to-end thinking” from the point of sale to the factory, a cost efficient and flexible infrastructure, an adequate information system and a focus on the management activity (Leeman, 2010, 9).

Ongoing communication between market partners leads to the identification of bottlenecks and, thus, permits the reduction of the effects ushered by unexpected situations and ad hoc decisions (Bretzke, 2009, 72). However, there are apparent limits to the SCM concept, as presented by Bretzke (2009). The ultimate goals of the efficient SCM are unattainable in real market situations due to the fact that the customer needs cannot resonate across the entire supply chain without imposing restrictions which would affect the latter’s complexity and dynamics. In numerous instances, for every point in the supply chain there are numerous suppliers and customers. While

this fact serves to enhance competition and the long term efficiency of resource allocation, it makes information sharing and objective creation difficult at best.

Furthermore, in certain industries, the final consumer is basically unknown to most of the businesses at the top end of the supply chain. Serving as an example, energy companies can have a hard time pinpointing the actual final beneficiary of their products and services, thus making complete end-to-end integration highly unlikely. From this perspective, it seems necessary that the “end-to-end” scale of the chain should be reduced to portray the process from a company’s point of view from its suppliers down to its customers. Thus, enterprises would not be expected to “manage beyond the limits of their ownership” (Bretzke, 2009, 71).

While the “bullwhip effect” considered by Lee et al. (1997, 546) can have severe implications for businesses, when faced with the complex nature of supply networks, the companies have little to no means of resolving the issue other than through their own management and dynamic approach to the market. In a simplistic line, although the bullwhip effect of a supply chain can be measured (Bray and Mendelson, 2012, 860) in real market conditions, the resolve and capabilities of businesses to mitigate such problems cannot exceed the company level.

Reducing the logistics planning to a microeconomic perspective does not eliminate the complex nature of the phenomena. While the planning and strategy creation addresses solely one economic entity, the factors which the policymakers have to address are numerous, sometimes insufficiently known or understood and typically uncontrollable. Consequently, modern economic entities operate with increased efficiency when utilizing intelligent logistics systems.

The concept of intelligence is widely utilized in numerous scientific fields, depicting the features of organisms in biology, the properties of software in information and technological domains or the characteristics of market entities in economics. In the latter situation, the intelligence property associated to market participants corresponds to the fact that they are perceived as being more than rational. While rationality depicts entities that understand their situation and seek to improve their payoffs, intelligence suggests that they are aware of their environment and understand that other participants are rational as well (Moorthy, 1985). As a result, intelligent strategies and solutions incorporate measures for enhancing the returns by

taking into account the possible actions of market participants and the effects of factors from other areas such as society or politics.

Intelligent logistics solutions utilize a wide range of methods and applications in order to integrate and increase the economic efficiency of supply, storage and distribution. With the use of specialized tools such as intelligent tracking technologies (Brewer et al. 1999, 245) and enterprise resource planning (Rizzi and Zamboni, 1999, 367) the logistic operations of companies are recorded, assessed and improved. Furthermore, intelligent logistics decision making is supported by the implementation of radiofrequency identification or RFID (Smirnov et al. 2008, 117).

## **2. “Intelligent energy” – the key to develop smart logistics and transport systems**

Since the early decades of the twentieth century the world has seen a trend in which numerous metropolitan areas have become more extensive, whereby existing urban centers have lost their position as the main actors in terms of economic and social development, the new suburban communities are developing in areas predominantly rural or farm-based. This takes place in a relatively uniform pattern. However, the process is relatively deficient with regard to their ability to ensure vital functions such as leisure, art, culture, ways of interacting between community members, easy access to shopping malls (Levy, 2003).

This phenomenon has been more relevant in the United States but it is also present in developing countries. Suburban development is a relatively recent phenomenon, which until now has been ignored both by the scientific literature and by architects. However, the experience of other countries in relation to the nearby development shows that adverse effects are associated with this phenomenon, especially when urban planning is flawed or missing entirely.

The uncontrolled development of the cities is affecting the transport system and needs the intervention of local authorities because of the negative effects it produces. Of these, the most relevant are:

1. loss of agricultural land where suburban development expands over villages or communes;
2. reducing green spaces when suburban development occurs

predominantly on the outskirts of town or in areas previously intended for entertainment (forests and outdoor areas);

3. increased air pollution (it increases the number of people who commute) and soil deterioration (many buildings in these areas are not connected to sewerage);

4. reducing opportunities for large building projects in the future;

5. pressure on the local budgets that need to finance new infrastructure in the distant areas;

6. creating a major discrepancy between downtown neighborhoods that already exist and new urban areas (Gillham, 2002).

Technology in the knowledge society is an integral part of the life of every consumer, and this is the result of the exponential growth in the number of users. It is for this reason that telecommunications networks have progressed steadily. New services are created continuously and, concurrently, the development of new technologies and new networks has to cope with the requirements of the telecommunications service market. For some geographical areas, the existing telecommunications networks provide opportunities for distance communication and eliminate differences due to lack of information and isolation. Proper use of modern technologies in order to enhance accessibility to information can lead to reduced administrative and social costs.

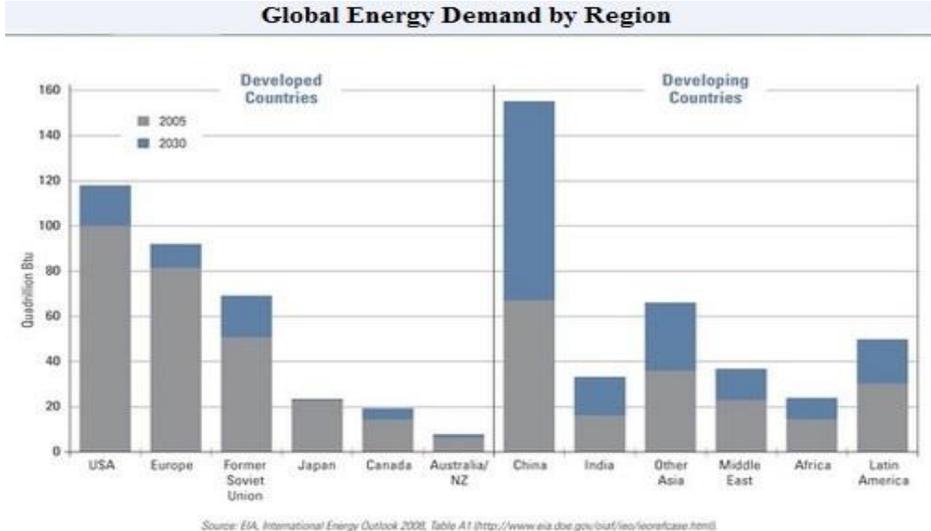
The smart management of the transport networks that are interconnecting the local communities are providing better services to citizens and businesses. Networks are established according to the needs of each community and ensure, through intelligent transport systems, access to all the parts of the city.

For several years, the demand for energy has grown faster than the supply, which means that, in order to achieve any level of sustainability, there is a clear need to increase the efficiency of the delivery and use of energy. To put it in a simpler manner, the world uses too much energy in an inefficient way (Marcu & Gherman, 2010).

The new-generation solutions for energy, combines the additional production capacity - including new and renewable sources – with better efficiency of use. Digital Intelligence, typically named smart technology, has an enormous role to play in all of these solutions. The challenges that we are facing today is to improve the global power networks that are overloaded and cannot satisfy the increasing demand of energy. By using the existing

technology that we can access today the consumption of energy can decrease with almost 30% (according to a study conducted by the International Energy Agency in 2012, [www.iea.org](http://www.iea.org); see Figure 1). The key to resolve this problem is to optimize consumption at the point of use.

Figure 1: The global energy demand divided by regions (Developed / Developing Countries)



Source: International Energy Agency,  
[http://vi.sualize.us/global\\_energy\\_demand\\_by\\_region\\_2005\\_2030\\_europe\\_latinafrica\\_china\\_infographic\\_picture\\_cv48.html](http://vi.sualize.us/global_energy_demand_by_region_2005_2030_europe_latinafrica_china_infographic_picture_cv48.html)

The energetic industry has realized that smart digital technology can improve the distribution of the energy along the entire chain of production from the point of generating the energy to the point of consumption. Digital intelligence overlaps the generation, transmission, distribution and power management with communications and computing infrastructures that allow the collection of data and control equipment to assure the reliability, safety and a good cost control.

The researchers from this field of activity bring new practical solutions from intelligent networks, industrial processes and smart management systems to intelligent devices and new software that helps develop new logistic and transport systems. All the proposed solutions can bring considerable savings to clients and suppliers. But above all, tremendous

improvements can be made by using the technology that already exists.

We believe that the world is on the verge of moving to the era in which the ingenious use of energy becomes the focus point of efficiency, from the utility provider to the consumer. The technology that is needed to implement new and smart management solutions already exists but we just need to deploy it and integrate it in the existing systems to manage and save energy worldwide.

An intelligent logistic and transport network borrows concepts from the internet, such as linking the products and systems to create a new network of components that can communicate one with each other in real time.

The solution to achieving a truly energy efficient system is that the global networks should interoperate one with each other and most importantly to develop new components and software that can be associated with a variety of systems, regardless of the manufacturer that can “communicate between them” to work together smoothly and achieving full operational effectiveness.

The administration of energy systems applied in logistics and transport have to create a real change in the way energy is managed and consumed. This requires changing the actual behavior of consumers and understanding the need for research in the field.

### **3. Prerequisites for developing intelligent transport and management systems in the Black Sea region**

The construction and operation of intelligent management systems require numerous prerequisites in the form of human resources, technology and equipment or communication networks. Thus, an inquiry into certain factors identified in Romania and the neighboring Black Sea region can indicate the potential development of IT based decision support systems for companies.

The rapid development of the Internet creates new theories and perspectives that emphasize the positive aspects and the involvement of new technologies in social life or the emergence of increased negative aspects that encores from the fast evolution of Internet progress.

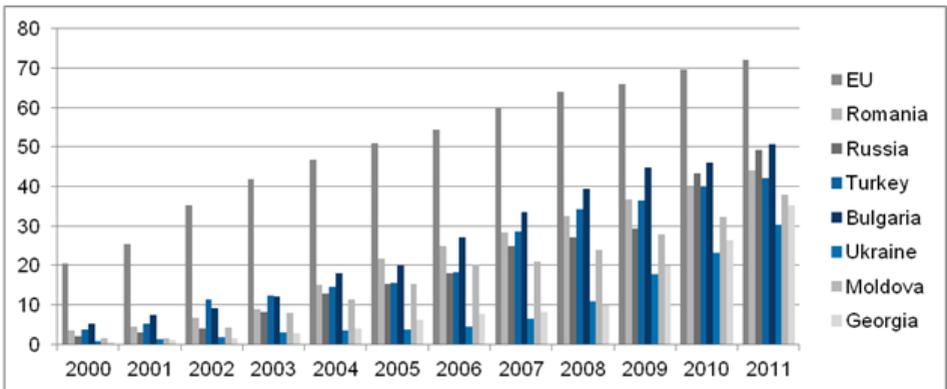
According to the World Bank Indicators (see figure 2) the development of the Internet in the EU and the Black Sea area has increase considerably in the last 10 years.

As a consequence of differential economic development, the

resources that are required for the implementation and development of new technologies are much higher in developed economic regions, such as Western Europe. Thus, the economic development is unequal between the regions of Europe.

The diffusion between the Internet and new technologies follows the pattern of evolution of old technologies like radio and television.

**Figure 2: Internet users (per 100 people) in the EU and the Black Sea area countries**



Source: Original representation based on data provided by World Bank Indicators, <http://data.worldbank.org/indicator/IT.NET.USER.P2>

Access to the Internet is fundamental for developing integrated and adaptive management systems. While the indicator previously presented is not restricted to companies utilizing the Internet, the number of individuals with direct access to a stable connection can generate valuable insight into the development of this form of communication and the openness of society in general to new forms of advertisement, entertainment and commerce.

As an answer to the fast development of the Internet in the Black Sea area we can take in consideration that almost all the countries presented in Figure 2 were part of the Soviet Union (except Turkey). The link between the former communist countries and the development of the Internet consists in the way that people are living; approximately 50% of the population from the Black Sea area is living in apartments and not in houses like in Western Europe. As a conclusion the Internet providers can penetrate

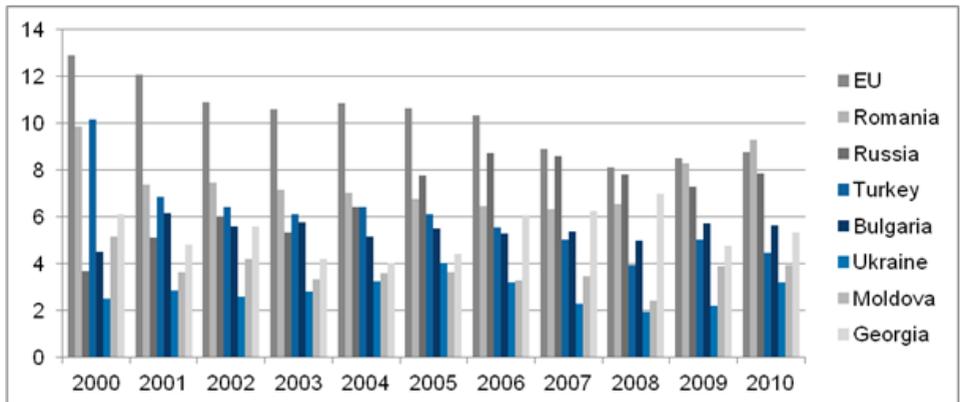
more easily into a district of apartment buildings and connect all the inhabitants more easily with less connections compared to a block of houses that are predominant in the Western part of Europe that need a more complex Internet infrastructure to connect all the residents.

One can notice the positive trend registered by the European Union and the Black Sea countries on the one hand, and the maintaining of a relative discrepancy between the values in the period analyzed. While the access in the EU for the year 2000 was approximately 20 and the Black Sea region averaged well below 5, in 2011, the values for the former rose to over 70 while the latter achieved approximately 50.

In the Black Sea region, Romania ranks third, behind Bulgaria and the Russian Federation.

Another indicator which comprises valuable conclusions for developing economies is presented in the following figure:

**Figure 3: ICT goods imports (% of goods imports) in the EU and the Black Sea area countries**



Source: Original representation based on data provided by World Bank Indicators, <http://data.worldbank.org/indicator/IT.NET.USER.P2>

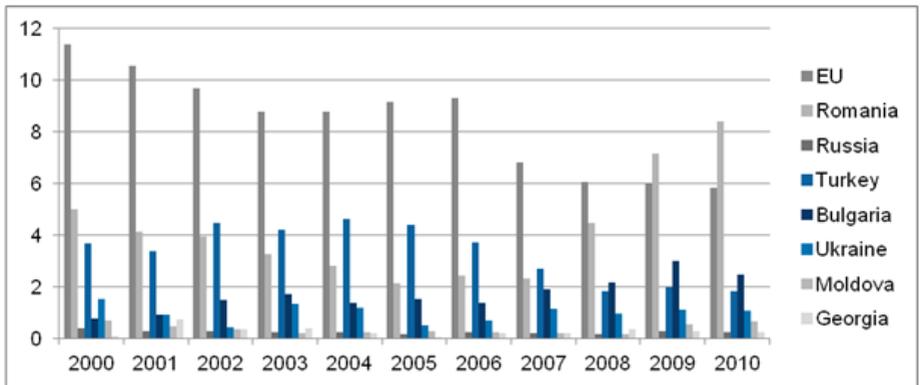
The trade in information and communication technology (ICT) represents a prerequisite for developing intelligent logistics systems as these applications need to be widespread in the economy. The implementation of modern technology and communication systems by one entity does not generate an adaptive and intelligent system. This requires that most, if not all, the market partners be included in the

system, so that information may be available in real time across the entire chain.

The imports of ICT goods as percentage of overall imported goods have declined in the European Union in the last decade. This can indicate that fact that other imports have grown in importance, a fact that can be justified by the notion that the European market has matured and become saturated.

In the Black Sea region the evidence proves the opposite. Countries like Romania and Russia have increased or at least maintained their relative imports of ICT goods. In 2010, the relative value of Romania surpassed those of the European Union and all the other Black Sea region countries.

**Figure 4: ICT goods exports (% of goods exports) in the EU and the Black Sea area countries**



Source: Original representation based on data provided by World Bank Indicators, <http://data.worldbank.org/indicator/IT.NET.USER.P2>

When it comes to exports of ICT good (as percentage of overall goods exported), the European average has decreased in the last decade while the values for Romania and Bulgaria have been gaining ground. The emphasis that Romania has placed in the last years on this sector can be highlighted by the fact that in 2009 and 2010 its values have surpassed those of the European Union and Black Sea region countries.

#### 4. Conclusions

Intelligent logistic systems represent an adaptive and dynamic decision mechanism which can be relied upon to mitigate the risks and

problems generated by an increasingly complex and volatile business environment.

The fast growth of metropolitan areas induces the need for integrated systems that would permit planners and administrators to manage key issues such as transportation and communication.

In terms of growth potential and existing prerequisites, differences can be noted between developed economies and emerging markets. Increased access to the Internet and a strong emphasis on the ICT sector generates new opportunities for companies and a stable basis on which to develop smart management systems.

## **5. Acknowledgement**

Adrian Vasile: This work was co-financed from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013; project number POSDRU/107/1.5/S/77213 „Ph.D. for a career in interdisciplinary economic research at the European standards”.

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