Three systems' collaboration for added value in the supply chain management area in Greece - the case of the Greek market

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ABSTRACT: This article examines the efficiency and effectiveness of three different systems in supply chain management in Greece: the RFID (radio-frequency identification) technology system, the education system and business competitive advantage. In-depth interviews in enterprises in several industries operating in Greece were held in order to measure the added value in today's enterprises. The authors collected specific indicators from these three systems and through interviews, they present the value that RFID systems offer to Greek enterprises, the percentage of value that the Greek higher education system prepares students for specific innovative technologies and how businesses in Greece are now willing to adopt and prepared for such technologies. A comprehensive critical evaluation has been presented to examine the advantages and drawbacks of the system's collaboration.

INTRODUCTION

Global competition pushes businesses and enterprises to use more efficient production systems in the area of supply chain management (SCM). Businesses use a variety of application packages, such as enterprise resource planning (ERP) and SCM in order to automate their business flows and, therefore, gain competitive advantage in the market.

More specifically, businesses use ERP and SCM application packages in order to become a strong player in the global market. Customer demands push businesses to use such application packages. Data and information need to be accurate and safe for SCM procedures, such as inventory, production planning, shop-floor scheduling, etc.

Competition in supply chain performance will increase the pressure on companies to meet customer demands, as well as to achieve customer satisfaction and loyalty [1]. An enterprise resource planning (ERP) system can help manufacturers achieve the efficient and effective use of their manufacturing assets and provide customers with visibility. Furthermore, an ERP system can provide a powerful opportunity for many manufacturers to gain competitive advantage by simply managing internal business processes.

ERP is a software solution, which integrates various functional areas of an organisation using best industry and management practices. ERP software is used in business not only for increasing the profits but also for improving operational efficiency and effectiveness of information services. ERP software has been used by capital intensive industries, such as manufacturing, construction, aerospace-defence, finance, education, insurance, retail and the telecommunications sectors.

ERP has been selected worldwide for its integration capability, reputation, standard software, three-tier client/server architecture, business engineering and migration tool from the mainframe [2]. Production is a method employed for making or providing essential goods and services for consumers. It is a process that puts intangible inputs like ideas, creativity, research, knowledge, wisdom, etc, in use or action. It is a way that transforms (converts) tangible inputs like raw-materials, semi-finished goods and unassembled goods into finished goods or commodities [3].

PROBLEM STATEMENT AND SIGNIFICANCE OF THE STUDY

A vast number of studies in the literature have shown the importance of supply and production systems through the SCM area. Such systems lead to companies' effectiveness and competitive advantage in the global marketplace. The implementation of such systems has shown that they can affect the conduct of business and also reorganise the whole supply chain. Therefore, everyone that is involved through the supply chain, need to understand these systems and

realise their importance. The less is the involvement of top, middle level, operational level management or other stakeholders of the company, the less competitive and effective the company will become.

This article contributes to the knowledge in the following areas:

1. the Greek market;
2. the focus on the RFID system, education system and business strategy;
3. the use of the above systems in Greece;
4. the benefits of the three systems in Greek businesses;
5. the encouragement provided to Greek businesses to implement such systems.

THE CASE OF THE GREEK MARKET

Greece is a small country with a long history. Technology appeared during the 5th Century BC, but from 1950 to 1973 there was a period of miraculous growth for the Greek economy. Following World War II and the Greek Civil War, the Greek economy undertook a massive reconstruction effort [4].

Due to its current economic crisis, Greece cannot expect that private investment will lift its economy. The Greek private sector is shrinking, production is declining and unemployment is increasing from day to day. Business performance is at low ebb because of social, political and cultural factors. Growth in capital equipment, machinery, resources and technology is slow, and there is a lack of research and innovation.

Even though Greece is in a very tough position, both the private and public sectors are trying to overcome all the obstacles and become strong market players despite the circumstances. It is worth presenting a SWOT analysis of the Greek market in order to show the range of internal and external factors that play a significant role in the adoption of supply and production systems in Greek businesses.

SWOT analysis is one of several strategic planning tools that can be utilised by businesses and present all the factors, positive and negative, that are identified and need to be addressed.

Strengths: RFID systems have already been adopted by a small number of enterprises and the length of time will show better and stronger results. Future promotions will become efficient and maximise enterprises profits. Education follows up global standards and institutions or universities use innovative technologies, such as RFID systems in libraries and, therefore, students become familiar with such technologies.

Customer focus will ensure that customers enjoy products and services through the supply chain. Enterprises need and want to follow technology and innovations.

Weaknesses: The cost of RFID technology systems is high. Enterprises need to know the return on investment in order to organise its operations and strategies. Economic crisis will not help enterprises to grow. Users and all the participants need training and know-how. Therefore, education system needs to encourage and support such innovative technologies.

Opportunities: The waterfall effect. By the time some enterprises have already adopted supply and RFID systems, others will also need to follow up on this change. Technological revolutions will help the growth of enterprises. Integration systems will help the implementation of the above systems. A few universities and technological educational institutes have already adopted RFID technology in some laboratories or libraries.

Threats: Some people believe that traditional ways of doing things are better. Perhaps suppliers are unable to afford the cost of implementation and training. The result will be that small enterprises will go out of business. Loss of jobs will cause Greece's unemployment level to increase. More devices will need support, which means more trained employees. The government needs to support the education system in Greece for implementing new technologies.

RESEARCH QUESTIONS

- What kind of technology systems do companies use in Greece?
- To what extent do these companies use the technology in order to automate the whole supply chain?
- How these companies are trying to get involved in the global market?
- Are these companies willing to adopt innovative technologies in the near future?
- Do employers need to educate their employees further?
- Do employees have the specific knowledge from their previous education?

The above questions are part of the authors' research into the Greek private sector of companies in the supply chain area. The methodology that was used included a small number of companies in Greece that play a significant role in the Greek and the global markets. The authors collected data in order to measure the use of the RFID technology system in these companies.

CASE STUDIES

Company in the Logistics Services

The authors investigated this specific company because it is a leader company in the area of logistics and SCM in Greece. Company infrastructure includes services, such as warehouse facilities, co-packing machines, distribution systems, vehicles, strong IT and electronic communication. The company's storage facilities are located in three strategic geographic areas in Greece. The warehouse equipment includes back-to-back, radio shuttle, drive in/drive through and block-stacking. Material handling is managed by the use of forklifts and electric pallet trucks. As far as the security measures are concerned, the company has fire detection alarms, fire protection, security cameras, a guarded yard and pest control. IT support of the company is made strong by the use of applications such as ERP systems, warehouse management system (WMS), RFID, on-line and real time stock, key performance indicators (KPI) of productivity, Navfleet and Dispatcher. Employees in the company's middle level hold at least a Master's degree, as well as having a valuable experience.

Trade and Telecommunication Company

This company assembles and trades in personal computers, telecommunication and office equipment. The company has three main segments of operation, product categories; namely, office products, PCs and digital technology products, as well as telecommunications products. The company has two more segments: it provides service for PCs and transportation services. Its products are distributed through a network of 23 stores in Greece and Bulgaria.

Having a lot of rivals in the Greek market, the company started investing in supply and production systems in 1999. Now, the company is one of the leaders in the trade and telecommunication industry. The systems that are currently used include ERP, customer relationship management (CRM), business warehouse (BW) for statistical and trend analysis of sales, stock figures, etc, WMS for managing the state of the art, brand new distribution centre, human relations (HR) and RFID technology.

Tobacco Company

The specific company is the largest tobacco company in Greece with automated production systems and supply chain systems such as ERP. The company achieves collaboration across multiple units. The main business drivers for technology adoptions included establishing a modular information management and reporting system to integrate machine level controls and an ERP application. This will help the company's supportability and extension into future operations. The company also established a standard platform based on market trends. The tobacco company turned to technology applications adoption in order to derive significant business value through the real time operations solutions transformation.

Dairy Products

The company offers products for everyday use in respect to the traditional Greek/Mediterranean diet and culture. The company is famous for producing high-quality fresh dairy and cheese products. The company uses the whole ERP application package to reduce time and cost.

The entire manufacturing area has been also equipped with RFID systems, combining both RFID and motion sensor technologies. Intelligent data gathering and processing units are also installed at each central hub location in the factory. In this way, they ensure data real time and data collection. Only RFID-identified personnel are allowed to enter or visit the premises. The application allows the company to allocate required resources to the production centres better and to manage the plant more effectively.

Oral Care - Personal Care Products

This company is one of the leaders in the specific industry. In order to stay competitive with thousands of suppliers and customers, they introduced ERP systems in order to access more timely and accurate data and reduce costs. The ERP system is used across the entire spectrum of the company. Innovative technologies such RFID systems are also used. The company spends a lot on personnel training.

Aluminium Processing and Trading Division

This company is one of the most important aluminium rolling industries in the world. It is the only group in Greece that focuses on this activity. The company is well known for its quality products and services, and emphasis on human resources management and environmental care. The company has integrated its operation to the principles of sustainable development, and has developed a comprehensive programme of environmental management and prevention.

The company's production is characterised by the following features:

1. High quality products that are competitive internationally (over 80% of production exported mainly in demanding markets such as Europe, USA, Australia and Far East);
2. Production flexibility that allows penetration of demanding aluminium market sectors, such as automotive, food packaging, etc;
3. The sale of stock in standard dimensions for immediate service;
4. After-sales technical support;
5. Offering integrated solutions through synergies with related companies;
6. Recycling of aluminium scrap for production.

The company also accommodates a modern product distribution centre in order to meet the needs of the wider geographical region of the Balkans and Central and Eastern Europe. The systems that the company uses are the following: FI (finance), CO (controlling), AM (assets management), SD (sales and distribution), MM (material management), PP (production planning and control), QM (quality management), PM (plant maintenance), HR (human resources and payroll), PS (project system) and WF (business workflow).

DATA ANALYSIS

The authors collected specific data from these companies in order to discover the level of performance and the importance of RFID technology systems that can lead companies to better levels of efficiency and, therefore, gain a competitive advantage. Furthermore, managers were asked about their employees' level of knowledge and education, and the level of education that they would prefer them to have.

The following assessment items were introduced to the above companies: corporate strategy regarding logistics, market trends and forecasting, SCM planning, electronic data interchange, usage of applications for forecasting, decision support systems for supplier performance, SCM applications, employees' education level, employees' training, cooperation with universities and support, cooperation with academics, government support and need for RFID technology to collaborate fully with the existing systems.

Companies needed to keep their internal information confidential for competitive reasons. All the above companies tend to be market leaders within the industry to which they belong. Each company gave an answer to the specific items.

RESULTS AND DISCUSSION

It is worth pointing out some of the results of the assessment items that companies selected. Even though these companies are market leaders, they do not fully automate all of their business processes and procedures. Most of the production managers believe that the Greek economic crisis is an opportunity for them to expand in the market. The economic crisis will help them act more intelligently in the marketplace.

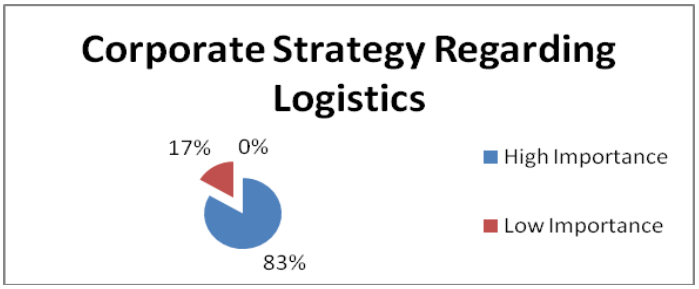

Figure 1: Assessment item: corporate strategy regarding logistics.

Most companies need to create a corporate strategy for the logistics area in order to define the service levels and become more effective. About 83% of companies believe in strongly developing a corporate strategy for specific product lines, specific countries, specific number of customers and innovative technologies. Only 17% of the companies do not believe strongly that the corporate strategy will lead them to effectiveness.

Most companies seek a strategy in order to manage all of the resources according to customer demand. In SCM planning, four out of the six companies are developing a set of metrics for monitoring the whole chain. In this way they improve their supply chain network, they minimise the number of days and they reduce costs. A small number of the companies believe that the investment of money, time and resources is too high.

Furthermore, most of the enterprises believe that as the market changes, they have to follow up these changes. Therefore, it is important for the companies to predict when the change will occur. These companies believe that they have to adapt to the changes and follow up customer and market demands. On the other hand, forecasting is another

way to measure such changes and predict the profits that will be made, the demand from the customers and the cost in order to produce the products or services.

Information from barcodes is transmitted through electronic data interchange (EDI) systems and, it is easy for the whole supply chain to get the right information for all products. On the other hand, EDI has too many standards and in order to use this technology all of the businesses that are involved through the supply chain need to have this system.

Some companies continue to prefer traditional methods of data interchange and communication and, it is worth pointing out that these businesses are considered to be market leaders in Greece. Not all small and medium enterprises in Greece use EDI, so the big players cannot make use of this technology.

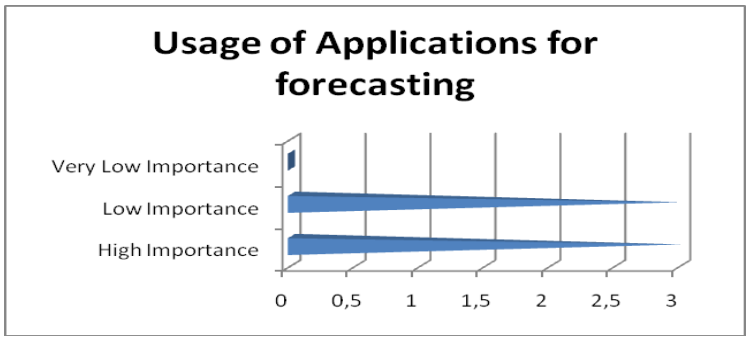

Figure 2: Usage of applications for forecasting.

At this moment, only one out of the six companies reviewed is using a separate application for forecasting via a business intelligence application. Three out of the six companies believe that such applications are useful but their enterprises are based on statistical data from market research. Even though the above companies strongly believe that forecasting is one of the best ways to predict customer demands, they do not make use of such an application. The forecasts they present are derived from the existing applications they use with statistical reports and the information flow from the market. Still, most managers believe that business intelligence application is a very strong tool for business strategy.

Through the interviews, it was also discovered that only one out of the six companies makes use of the Internet Supplier Portal. These companies made the interviewers believe that they do not take exact information from all of their suppliers because they do not have such a system. Five out of the six companies are not willing to invest in such an application in the near future. The supply chain in Greece includes a lot of suppliers that work in the traditional way but this does not mean that they are out of the market and are not strong market players. Another issue that should be pointed out is that most suppliers do not have the proper technology systems and, therefore, cannot collaborate electronically through the market.

As far as the SCM applications that companies use are concerned, it is worth noting that all companies use application packages for managing their operations in this specific sector. The next step, as the managers pointed out, is that they should integrate all their systems for better performance and to add value to their businesses.

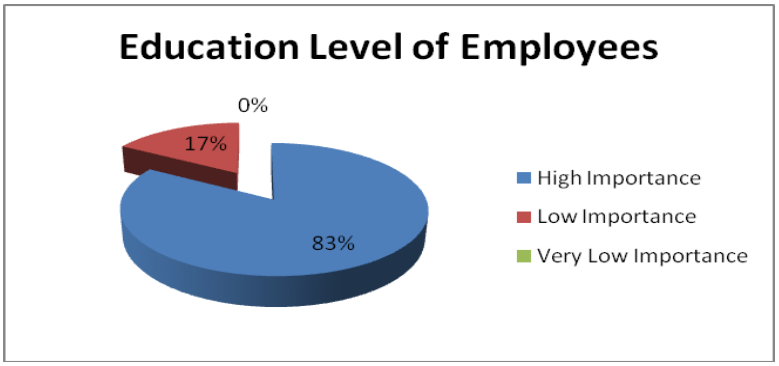

Figure 3: Education level of employees.

As far as the education level of employees is concerned, nine out of ten employees in consultant or management positions in the company hold a Master's degree in economics, logistics or information systems. Most students in Greece after completing their base university degree continue to a Master's degree in order to gain expertise in a specific area. 83% of employers agree that middle level employees need to have at least a Master's degree and several years of experience in similar positions. The other 17% believes that employees need to have a base university degree and some years of experience.

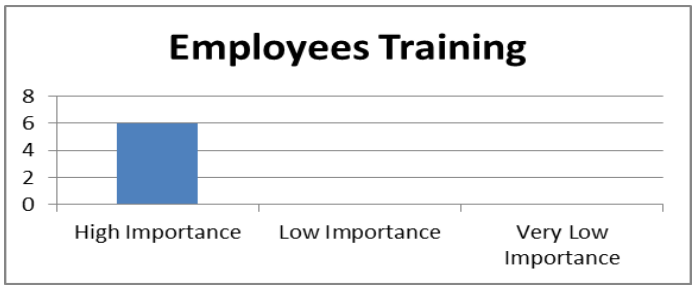

Figure 4: Employees training.

All managers that were asked strongly supported the training of their employees. They also pointed out that apart from the degrees that employees hold, they are ill-prepared, and not ready to use, innovative technologies, such as RFID systems and they need further training and support. Most employees are provided with academic content from the universities but not practical experience.

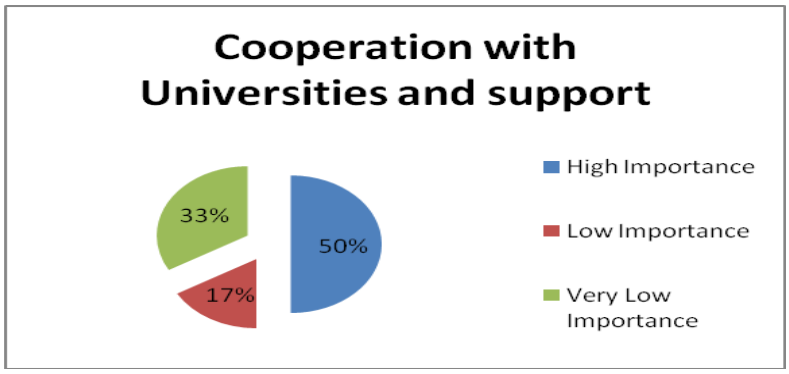

Figure 5: Cooperation with universities, academics and support.

Some managers believe that it is important to cooperate with universities and academics in order to exchange experiences in theoretical and empirical data. They also pointed out that it is very important for students to gain an extended practical experience on top of a theoretical background that will derive from the collaboration with the managers. Some could see things from a different perspective and pointed out that experience and the knowledge of businesses comes only from inside training and not from the universities.

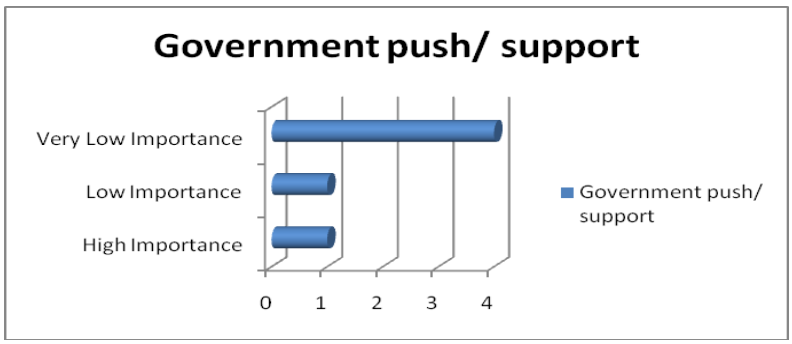

Figure 6: Government push/support.

From the figure above, it is worth noting that the government does not push or support companies in the private sector into adopting new technologies and systems. The push from government appears stronger in the public sector. Nowadays, due to the economic crisis, the private sector in Greece is trying to keep its position as a strong player in the global market without expecting government push or support.

REFLECTION ON THE RESULTS

Interviews took place in the above enterprises and can be summarised in the following diagram (Figure 7). In order to add value in future and competitive enterprises, RFID technology needs to be integrated into the education system and, therefore, educated students and professionals will collaborate together for a better business strategy for future enterprises. Enterprises can fully support RFID systems with their existing systems and, therefore, automate all their internal and external procedures.

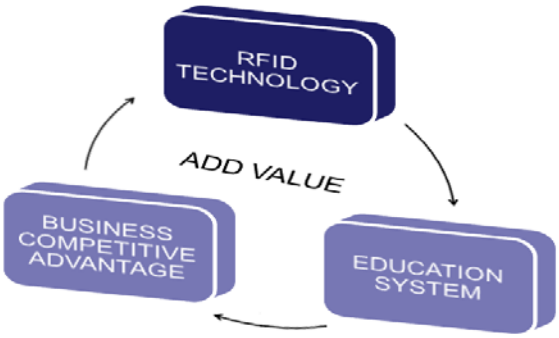

Figure 7: Three models collaboration.

Engineering education can follow up innovations, such as RFID technology and the adoption of SCM. Engineering academics will be able to focus on such technologies and create new problem-solving methods that will help all businesses to stay competitive in the global market.

Engineers' formation could include extensive analysis of the requirements and choosing the best selection criteria and concepts in RFID and SCM. Models, process models or meta-models could be developed in order to produce a comprehensive analysis of the framework of RFID technology and SCM. Furthermore, new and innovative applications could be also developed for better integration between RFID technology and supply chain applications. New implementations, skills and methods could also be used in order to act as a strong weapon for all businesses to gain a competitive advantage.

On the other hand, academics should follow all of the above technologies and give valuable knowledge and skills to students in order to increase their professional potential. The engineering curriculum could include comprehensive analysis with real life examples from companies, which have adopted RFID technology and lead to high-standard vocational education. Successful training processes could be achieved by engineering professionals' visits to the universities that would give students the chance to work on RFID technology practical activities and, therefore, realise their professional work.

RFID technology can be adapted to a range of sciences in schools and universities by developing an RFID laboratory that could help all students become familiar with the specific technology and, therefore, understand and develop new ideas. Engineering education could, therefore, give valuable knowledge and skills to future engineering professionals and, as a result, in the re-growth of small countries like Greece and help them overcome all obstacles and get over the economic crisis.

FURTHER STUDY

After completing this article, the authors want to move to the next stage of investigation. Questionnaires will be sent to a large number of Greek companies by email or by hand in order to collect specific data about their procedures, business processes and the level of education of employees. The above model will be expanded and will show the power of specific key performance indicators from each system.

CONCLUSIONS

The findings show that Greek companies have a positive view of the use of RFID technology systems as an aid to improving effectiveness and gaining a competitive advantage in the global market. Greek manufacturing and logistics companies that implement RFID and supply systems integrate all applications among several departments inside and outside the companies. Well-educated employees work hard to keep up with technology changes.

However, full automation is missing from most of the companies but there is a high interest in adopting all of the systems in the future.

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REFERENCES

1. Hsu, L.L., SCM system effects on performance for interaction between suppliers and buyers. *J. of Industrial Manage. & Data Systems,* 105, **7**, 857-75 (2005).

2. Chung, S.H. and Snyder, C., ERP adoption: a technological evolution approach. *Inter. J. of Agile Manage. Systems*, 2, **1**, 24-32 (2000).
3. Gaurav, A., What is production systems? Definition meaning examples (2012), http://kalyan-city.blogspot.com/2012/02/what-is-production-system-definition.html
4. Karagiannis., N. and Kondeas, A.D., The Greek Financial Crisis and a Developmental Path To Recovery: Lessons and Options. Winston-Salem State University, USA (2012).