

**NEW TECHNOLOGY BASED FIRMS AND COMPETITIVE ADVANTAGES:
THE NEOSYSTEMS CASE**

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ABSTRACT

In a global economy, every developed country needs a continuous flow of technological innovations which results in competitive advantages. But those technological innovations not only depend on the effort of existing companies. Then, entrepreneurship is another result of the innovation systems; in sum, it is the process of bringing a new idea to the markets. This process involves the identification and evaluation of opportunity, the decision whether or not to exploit it, the efforts to obtain resources, the process for organizing those resources into a new combination, and the development of a strategy for the new venture. New Technology Based Firms play a crucial role in those processes. A good example of this fact can be found in the software industry. Approximately in 2002, the consolidation of a technological development, “free software” and “free computing standards”, gave rise to the creation of a wide range of new products and entrepreneurial opportunities. Then, the “open source solutions” rushed into the industry as a strong substitute. These solutions have become in a new interesting segment with low entry barriers, which consequently demand high value added products and/or services.

This paper analyses and describes the Neosystems case. Neosystems is a Computing Engineering firm working on Information Technology. Its main purpose is to develop quality software and associated services for all kind of companies, trying to gain a competitive advantage through the open source solutions. In fact, it is the only firm in the region that works with open source software.

The Neosystems experience is a good description about the early stages of setting up a small New Technology Based Firm and the management strategies pursuing competitive advantages in the global markets.

NEW TECHNOLOGY BASED FIRMS AND COMPETITIVE ADVANTAGES: THE NEOSYSTEMS CASE

1. Industry Background

In a global economy, every developed country needs a continuous flow of technological innovations which results in competitive advantages. But those technological innovations not only depend on the effort of existing companies. Then, entrepreneurship is another result of the innovation systems; in sum, it is the process of bringing a new idea to the markets. This process involves the identification and evaluation of opportunity, the decision whether or not to exploit it, the efforts to obtain resources, the process for organizing those resources into a new combination, and the development of a strategy for the new venture (Shane, 2003).

New technology-based firms (NTBFs), defined as independent firms established for the purpose of exploiting an invention or a technological innovation (Little, 1977), play a crucial role in those processes, and also in the rest of the economic activities, because (Lutz, 2003):

- Technological Knowledge is transferred to their new products and/or services.
- New employment is created.
- Survival rates are often higher than the rest of firms.

A good example of this fact — NTBFs play an important role with regard to the transfer, adoption and diffusion of technology— can be found in the software industry. Traditionally, companies sold “proprietary software” whose main characteristics are:

- Manufacturers control the evolution of the software.
- Software is not compatible with other formats or products.
- Software is created in a common basis with some specific adaptations to client’s needs.

But, approximately in 2002, the consolidation of a technological development, “free software” and “free computing standards”, gave rise to the creation of a wide range of new products and entrepreneurial opportunities. Then, the “open source solutions” rushed into the industry as a strong substitute because:

- Clients are able to study, audit, adapt and improve the software.
- Total flexibility can optimize the scientific and industrial processes.
- There is not 3rd licenses payment; therefore, the Ownership Total Cost is reduced.
- Interactions between supplier and customer boost the productivity, dependability and technical quality of the software.

In sum, open source solutions have aroused as a new interesting segment with low entry barriers, which consequently demand high value added products and/or services.

2. The discovery of the entrepreneurial opportunity

Simón (2003) states that New Technology Based Firms are very often created by means of a spin-off process, having two typical specific components:

- They are often small companies, with a few employees, that produce high value added products and/or services.
- Origin, development and updating of their technologies are performed through relationships between the firm and Universities and/or Research Centers.

Neosystems fits the description mentioned above. It is a Computing Engineering firm working on Information Technology (IT). Located in the Technological and Scientific Park of Gijón (Asturias – Spain), it is a young and small company created in October 2004 by two students of Computing Engineering at the University of Oviedo. After two years, the company is the supplier of more than 300 companies, ranging mainly from medium to big size and from local to national markets. Due to the fact that Information and Communication Technologies improve the management of two kinds of knowledge, explicit knowledge and tacit knowledge, Neosystems develops specific services and software for both of them. In sum, it tries to help their customers on coordinating, collaborating and communicating their Knowledge Management:

- Explicit knowledge: Data bases, Documental Management, Intranets/Extranets, EIS, Workflows, Project Management, and etcetera.
- Implicit knowledge: Sharing networks, Knowledge Maps, and etcetera.

Its main purpose is to develop quality software and associated services for all kind of companies, trying to gain a competitive advantage through the open source solutions. In fact, it is the only firm in the region that works with open source software.

2.1. Founder's profiles

Because NTBFs depend heavily on knowledge and skills, their founders tend to have considerable experience in technological development activities or research and, typically, NTBFs are founded by more than one person, but in most cases these individuals have similar backgrounds (Delapierre et al., 1998). Neosystems follows this pattern:

- Jonathan Solís is a 26 year's old Computer Engineer and Auditor of Information Security Systems, with additional formation in business, quality management, environment, etc. His prior labor experience comes from another small Computing Engineering company, where he participated on various software and knowledge management projects for American and European multinational firms.
- David Zapico is a 28 year's old Computer Technical Engineer, with additional formation in a wide range of systems technologies. His prior labor experience comes from the University of Oviedo, where he made research on Artificial Intelligence (AI).

2.2. Entrepreneurial opportunity

When Jonathan and David started to think on the possibility of creating a new company, the development of Net Software (Internet, Intranet, Extranet) was the first idea that come out, but it was not worthy because of the high levels of competition. Then, they realized that firms are increasingly concerned with the achievement of sustained competitive advantages. Due to the fact that knowledge is the only resource able to be increased by use, they thought that a potential new way to succeed was through a differentiation strategy based on Knowledge Management: location, generation, structuring, storage, transfer, diffusion, and application (see Figure 1).

They found a potential segment of clients after analyzing the competitor's performance: there were only a few companies and they offered non standardized products with very high prices and costs. The clients need these specialized software solutions but also flexible solutions and at lower costs. They discovered the entrepreneurial opportunity facing this problem: *to help the customers on coordinating,*

collaborating and communicating their Knowledge Management through the open source solutions, because open source solutions drastically reduce the development and implementation costs and they are the most flexible technology (see Figure 2). This vicarious learning was not only the path to find the opportunity, but it has also become a core strategic tool —benchmarking of successful firms, is one of the founders' major decision making criteria—.

3. Decision to exploit opportunity

European citizens, specially the Spanish ones, do not feel motivated to set up their own business because of the economic climate, the lack of support and the poor entrepreneurial culture (European Commission 2004b, 2004a, 2002, 2001, 2000). For example, economic climate in Asturias is unfavorable: the adjustment of the coal and steel industries, main economic resources in that European region, has produced high rates of unemployment while reducing the economic growth. Moreover, their entrepreneurs are often reluctant to incorporate new technologies. On the other hand, regional politicians have mainly supported IT multinational firms (CSC, CAPGEMINI, INDRA, and etcetera).

In this situation, the founders decided to be self-employed because they wanted to grasp the technological opportunity and, foremost, by the independence or self-fulfilment that they associate with such a status and the interest of the tasks accomplished. A prospect of better income was also another important motivation factor, while a marginal reason was the lack of attractive employment opportunities in the region. Nevertheless, the possibility of suffering a personal failure, and the need to devote too much time to it, appeared as their most feared risks. Surprisingly, the possibility of going bankrupt was not a major fear because this kind of business does not require too much implementation costs.

4. Resource acquisition

In the context of NTBFs, the transfer of technology and entrepreneurial know-how from the 'parent' or 'incubator' organization (i.e., the founders' previous employer, which may have been an industrial firm, university or technical college, or research institute) and from other information sources is a central consideration (Lamont, 1972). It seems, therefore, that the continuous transfer of research-based knowledge into companies depends on the firm's adaptive capacity, knowledge of how to obtain knowledge from universities, and the prior experience of the decision-makers concerned (Licht and Nerlinger, 1998). But students, scientists and researchers are often without the appropriate experience and/or knowledge for creating and managing NTBFs (Bower, 2003; Lutz, 2003). As this was the case of the founders, prior to setting up the company they spent one year taking several courses on business administration and making the Business Plan. During that time, they were working in the attic of a factory, lent by Jonathan's family, with a basic Internet connection and with their personal computers. The overall activities they performed in that year were:

1. Entrepreneurial training.
2. Business Plan.
3. Development of beta software.
4. Corporate culture and marketing tools.

5. Search for financial support
6. Search for “the first project”.

The company’s mission is “impelling knowledge management efficient use as a corporative organizational culture by means of development and implementation of software tools and strategic consultancy”. As they want to turn companies business processes more efficient by means of implementing its software and stimulating their corporative cultures, they had to decide about their own corporative culture. Consequently, they have established these corporate values:

- Human quality: to treat people as we would like to be treated.
- Continuous improvement: to produce better and more innovative products.
- Continuous training: revaluation and anticipation.
- Competitive value increase of our clients.
- Quality: in the final products and in the whole process.

However, when establishing a new firm, founders normally draw on more than their own experience. Numerous studies have indicated that many factors —tax system, disadvantageous legal, political and institutional framework conditions and its laws— hamper the creation and development of innovative young firms (European Commission 2004b, 2004a, 2002, 2001, 2000; Licht and Nerlinger, 1998). In relation to the difficulties NTBFs experience at start-up, the main ones usually are: raising finance, establishing their credibility and proving that their ideas were well founded, and dealing with the complex administrative requirements necessary for the establishment of a new firm. Other, less acute problems mentioned by founders include difficulties in accurately forecasting innovation cost, and the length of time commercialization requires, finding a suitable location, inadequate public assistance, problems defining their market segments, and the lack of availability of skilled workers. However, financing is the main problem and it has become increasingly difficult for founders to raise external funds. Therefore, the support of financial and public institutions, as well as of customers and friends and relations, is very important. Indeed, it seems that this support can be vital to the success or failure of the NTBF in its early years (Ostgaard and Birley, 1996).

Neosystems reached support in every point of that net. A family loan supplied founders with the initial part of the money. Regional and Municipal Government subsidies, initiatives for entrepreneurs, and so on, also contributed to complete this first investment. When Jonathan and David thought that they were qualified enough, they started to look for clients. Two months later, after an arduous and selective search, they won an open bidding for a public building company. The reasons for that success were the high quality and the benefits of the open source solutions. This project took seven months and supplied enough funds to formalize Neosystems: a qualified technician was hired and the company installations were moved to their actual location, an office in the Technological and Scientific Park of Gijón.

5. Entrepreneurial strategy, the organizing process and performance

The involvement of NTBFs in their environment is important, and networking is fundamental to innovation and growth (During et al, 2001; De Barry and Savoye, 1995; Mustar, 1994a, 1994b). Then, Systems engineering is the guideline in Neosystems’ strategy. Consistently, two ideas form the core strategic characteristics of Neosystems: cooperation and specialization.

5.1. Strategic Alliances

Strategic alliances with another small companies boost an increasingly specialization of each unit, and allow all of them to apply for big projects at lower cost than bigger companies. The final purposes are to agglutinate knowledge with autonomy and, if necessary, to present themselves as a group. This group is implemented by using the Computer Integrated Manufacturing (CIM) model: none of the companies are specialized in more than two levels and Neosystems is located in the top level (see Figure 3).

In general, inter-firm partnerships are used to facilitate the development of skills, brand name recognition, and industrial and commercial learning. They can also help the formation of relationships with new customers and enhance the internal organization of the firm itself. Partnership, in the form of inter-firm alliances, is therefore regarded as one of the most important conditions for the success of NTBFs. The early creation of various links with different types of actors (R&D labs, public administration, customers, other firms, finance institutions), is regarded as being particularly important, because, for NTBFs, linkages with the industrial environment are primarily shaped by contractual arrangements in various fields—from R&D to manufacturing— rather than through market transactions (i.e., the purchase and sale of goods and standardised services). There is some evidence to suggest that those NTBFs that establish more intensive and lasting connections with the wider research system tend to be the firms that grow more rapidly, in terms of their turnover, exports and employment (Autio et al, 1997; Mustar, 1994a, 1994b) and that is the reason why recently multinational firms have been interested on Neosystems' products and their potential integration in common computer solutions —agreements with Ricoh and Bitdefender have been signed and probably ORACLE will also do the same in a few weeks—.

5.2. Structure

Strategic alliances, mentioned above, and the youngness and small size of Neosystems justify its initial simple structure, with only a hierarchical level. General strategic and marketing decisions are tasks for the General Manager, Jonathan Solis, while project managing and technical aspects are issues for David Zapico, the Technical Manager. The rest of personnel, 1 to 3 technicians, perform concrete production tasks. Consequently, centralization of decision in both founders is the main characteristic of its structure. Nevertheless, the expected growth of the company will probably change the previous structural form towards a functional structure, more decentralized and specialized by functions (see Figure 4). Last but not least, Neosystems is really aware of high labor costs. This reality is faced by means of both hiring personnel on a project by project basis and by establishing only long-term relationships for consolidated tasks.

5.3. Products and services

Knowledge is a major asset in a business but information is not valuable itself. The way to get a competitive advantage is to overpass more information to achieve knowledge with the help of specific computer tools. Therefore, according to Neosystems's working methodology (see Figure 5), two different kinds of products and services are offered: software and intranet services.

Software applications are intranet and/or extranet applications completely developed according to the clients' needs. They are built using a free framework called Zope

which allows creating high technical level solutions, due to its quality, versatility, and flexibility.

Intranets, corporative networks, are becoming one of the most important assets in modern companies. Some specific services are necessary for their adequate performance: database manager, file server, email server, web server, web engine, extranet access and other services designed to satisfy the client's demands.

All these knowledge management tools are classified in three different software solutions and their related services: NEOCS, NEODOC and NEOCMS. These programs and services form the Neosystems' groupware and they are characterized by their fully compatibility and modularity and the fulfillment of ISO 9001:2000 quality norms and the W3C Consortium requirements.

NEOCS is a multiplatform system (client/server) for working groups, communication and corporate managing. Based on innovative open standards (ZOPE, Python, O.O.D.B and Archetypes), it can be integrated with a wide range of systems (MS Active Directory; LDAP unified authentication; Oracle, MySQL and other relational databases, MS Office, and instances in foreign architectures as XML-RPC). So, it becomes an effective tool for sharing and accessing organizational knowledge (Intranet/Extranet). Its main modules are: document management, project management, incidents management (tickets), individual and group management, schedules and agendas, email systems, corporate wiki webs, weblogs, chats, contacts, corporate forums, and feedback surveys.

NEODOC is a complete solution for file management and its workflow: generation, distribution, prints, searches, storage, classifications, reviews, versions, accesses and security, reading acknowledges, paper documents digitalization, etc. It is oriented to generate and to manage knowledge repositories in the corporate intranet.

NEOCMS is a web site generator plus a Content Management System (CMS), based on ZOPE and Archetypes. Its flexibility allows the generation of multiple solutions: e-commerce, Business to business (B2B), Business to customers (B2C), and so on. Using a friendly workflow characterized by the flexibility of publications (web browser access), every kind of content can be created and managed: on-line editing of multiple contents, weblogs, documental and informational monitoring, access and permissions control, and individual and group management.

5.4. Commercial issues

Except Neosystems, no other firm currently offers open source solutions in Asturias. However, these kinds of solutions can actually be associated to a growing stage close to maturity. Then, Neosystems is thinking in R&D as a potential way to increase its differentiation strategy and create barriers against the expected newcomers in its markets.

In these software applications, consumers associate a high quality product with high prices. High value added, on its part, results in high gross margins. In the case of Neosystems, these margins are even higher because the absence of licenses and the lower levels of fix labor costs. Therefore, the company has decided to share this margin with clients by establishing medium-high prices. The added value for the customers is not only these prices, but also the huge bundle of associated services.

Distribution is selective. The founders address the entire market but, initially, they have focused on medium-high size enterprises and companies. They support the idea that the best way to contact them and to achieve clients' loyalty is through freelance agents and direct distribution. These agents are 7 small local companies located in Asturias, Galicia, Basque Country, Castile-Leon and Madrid. During the next two

years, new national and international distributors are expected to be included in the distribution network (50% of the current clients come from other Spanish regions).

Being member of several associations (i.e. regional entrepreneurs, computer users, etc.), attending both congresses and meetings, and applying specialized media (web positioning, computing publications, and so on) have been selected to be part of the company's communication strategy but it is still to be clearly defined.

5.5. *Performance*

Once established NTBFs' sales tend to be concentrated among a few main customers and they tend to develop specialised products in narrow market segments rather than widely used standardised products. Because of the narrowness of their markets, few NTBFs grow into medium-sized let alone large firms. It should be stressed, however, that the founders of NTBFs often wish to avoid rapid growth. There are two main reasons for this. First, the founders often consider a small firm to be more conducive to technological innovation (Geniaux, 1994) and, second, they often wish to remain independent, not wishing to share the ownership of their firm with others (De Barry and Savoye, 1995).

Those trends explain that, in a first sight, financial results of Neosystems seem a little poor (see Table 1). Apart from the youngness of the company, Jonathan and David present their modest achievements on their basic idea of avoiding an excess of bank debts and financial costs. Their reasons for this are the following ones:

- Basically, apart of using computers, the production function does not require so many tangible assets and they are relatively cheap ones.
- Besides, prior economic payments to suppliers are highly uncommon, as client payments usually came before.

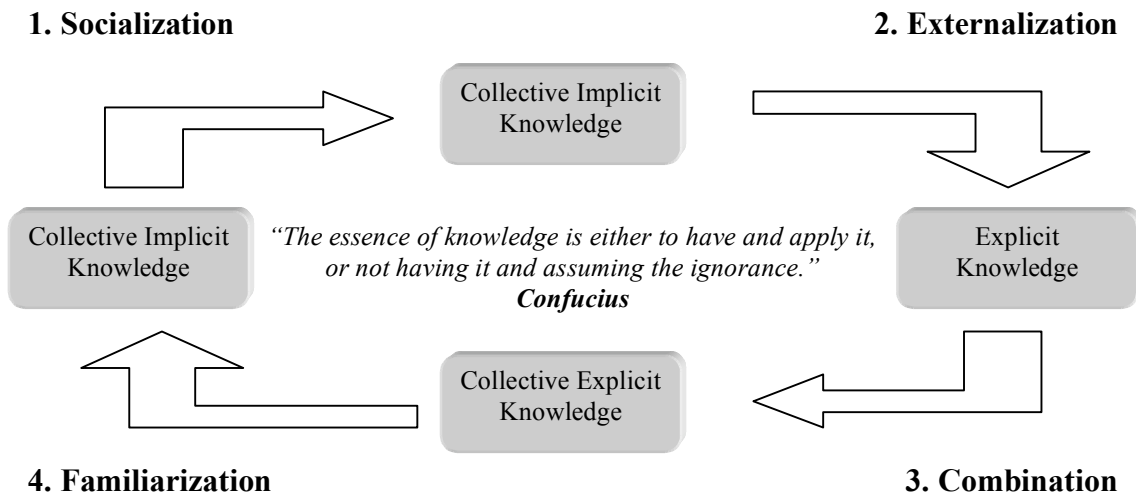
Anyway, recently Neosystems has been accredited, according with UNE 71502:2004 norms, as Auditor and Implementer of Management Systems for Information Security. It means that the company has implemented an adequate group of security controls assessing the integrity, disposal and high confidential level of their information systems. Also, ISO9000 accreditations are expected to be obtained the next year. Both accreditations are hoped to bring new business opportunities in developing new open source software solutions.

Some days ago Neosystems won a second prize of the "Best Entrepreneurial Initiative Award (2nd edition)", in the category of "Best Young Enterprise", which is conferred by the Town Council of Gijón (Asturias). This award recognizes the company's abilities to develop new open source software applications.

Figures and tables

Figure 1. Knowledge Management Model*

Source: Neosystems



**Necessary systems: Sharing networks, Knowledge spaces, EIS, CRM + continuous formation, collaborative culture.*

Figure 2. Technological Model

Source: Neosystems

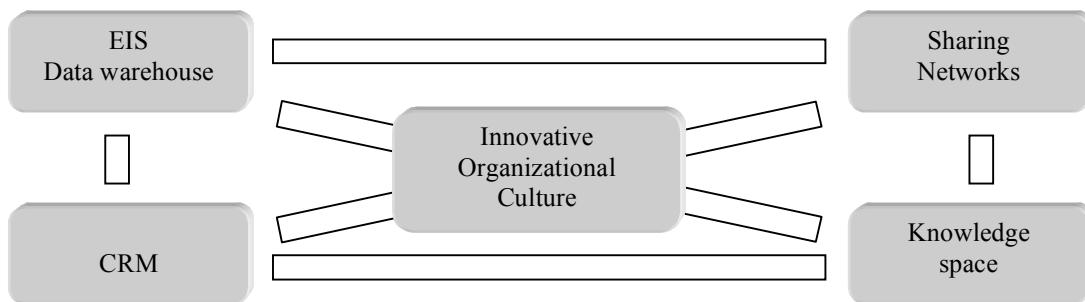


Figure 3. *Computer Integrated Manufacturing (CIM) model*

Source: Neosystems and Dataworks

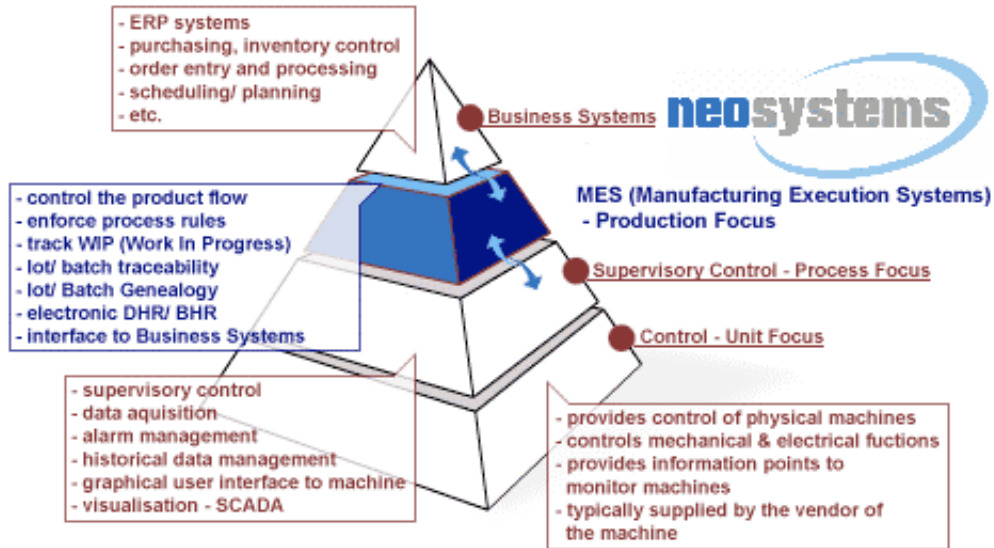
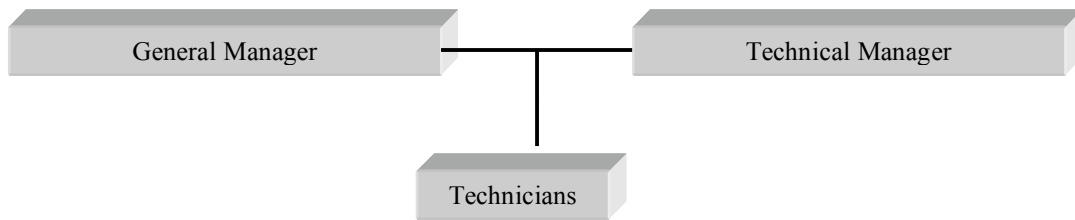
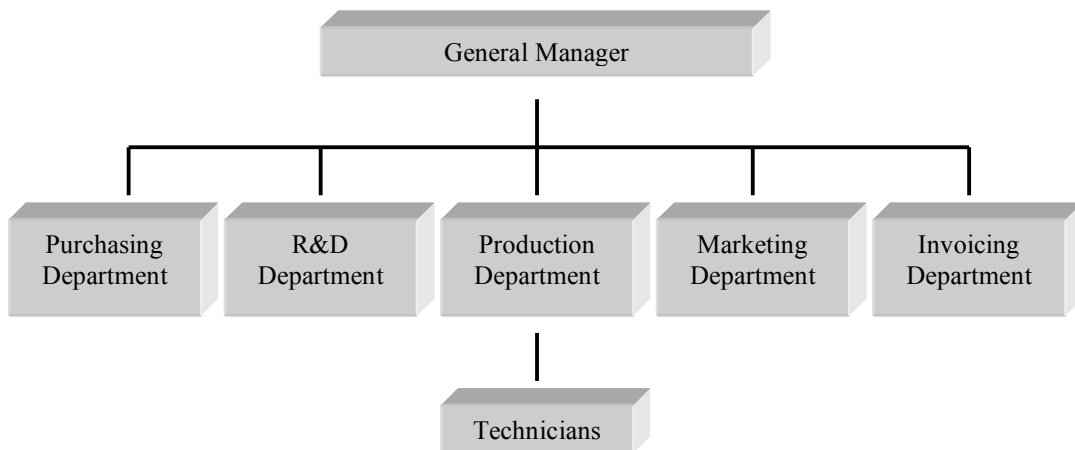


Figure 4. Neosystems Organization

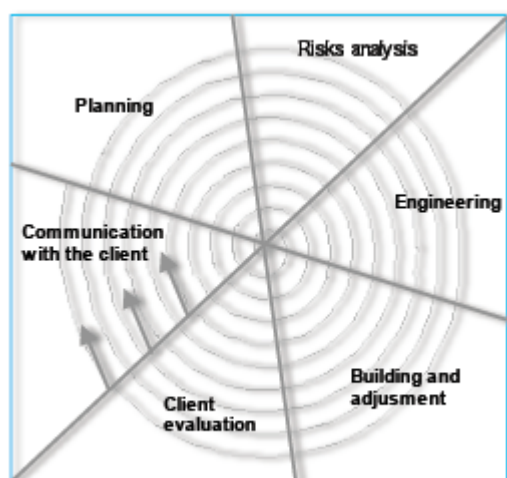
Source: Neosystems

INITIALEXPECTEDPERSONNEL

| | 2004 | 2005 | 2006 (estimation) |
|---------------------|----------|----------|----------------------|
| Employers | 2 | 2 | 2 |
| Permanent employees | - | - | - |
| Temporary employees | 1 | 3 | 4 |
| Trainee employees | 1 | 1 | 1 |
| Scholarship holders | - | 2 | 2 |
| TOTAL | 4 | 8 | 9 |

Figure 5. Working Methodology

Source: Neosystems



System Requirement Analysis stage (15% time)
 Design stage (35% time)
 Implementation and coding stage (35% time)
 Testing stage (15% time)

Table 1. Performance Results

Source: Neosystems

FINANCIAL DATA

| | 2004 | 2005 | 2006 (estimation) |
|------------|------------|------------|----------------------|
| Assets | 6.800,00€ | 5.500,00€ | 7.800,00€ |
| Equity | 4.400,00€ | 10.400,00€ | 14.000,00€ |
| Sales | 10.000,00€ | 70.000,00€ | 90.000,00€ |
| Net profit | 412,00€ | 250,00€ | 1000,00€ |

MARKET COVERAGE

| | 2004 | 2005 | 2006 (estimation) |
|---------------|------|------|----------------------|
| Local | 25% | - | - |
| Regional | 75% | 50% | 50% |
| National | - | 50% | 50% |
| International | - | - | - |

SELLING STRATEGY

| | 2004 | 2005 | 2006 (estimation) |
|------------------|------|------|----------------------|
| Own personnel | 75% | 50% | 40% |
| Freelance agents | - | 50% | 50% |
| Telemarketing | - | - | 10% |
| E-business | 25% | - | - |

COMMUNICATION STRATEGY

| | 2004 | 2005 | 2006 (estimation) |
|------------------|------|------|----------------------|
| Website | 75% | 80% | 80% |
| Freelance agents | 20% | 10% | 10% |
| Mass media | 5% | 10% | 10% |

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