INTRODUCTION
SPAGO Imaging AB is a relatively new R&D company, founded in the year of 2007 in Linköping, Sweden. The company is, since January 2008, located in the Ideon Bioincubator at BMC, Lund, and has in the current situation three fulltime and one halftime employees. The company develops a nanoparticle-based contrast agent for Magnetic Resonance Imaging (MRI) with applications in tumor diagnostics and the cardio-vascular field.

PROBLEM DEFINITION
In approximately 5 years, the product of SPAGO Imaging AB will be launched on the market. The company is therefore about to look for investors to fund the development and growth. To gain investors interest, a clearly defined market for this sort of contrast agent is required.

PURPOSE
The purpose of the study was to analyze the market of SPAGO Imaging AB’s contrast agent in the field of breast cancer. The study included both an analysis of the current methods to identify breast cancer, as well as an analysis of the properties of SPAGO’s product.

METHODOLOGY
The approach of the theses was a survey study because the interest was to gather basic knowledge from many fields. The data collection of the thesis was based both on primary and secondary sources. The primary material was collected through internal meetings, personal interviews and internet surveys. Secondary data was gathered through books, scientific papers and various websites.

THEORETICAL FRAMEWORK
To evaluate the product of SPAGO Imaging AB, a SWOT analysis was conducted. A SWOT analysis is a structured approach to evaluating the strategic position of a business by identifying its strengths (S), weaknesses (W), opportunities (O) and threats (T). If the analysis is used correctly it can help the manager anticipate important developments that can have an impact on the company.

The product life cycle (PLC) is a curve which breaks down product sales into four stages. The stages are introduction, growth, maturity and decline. The product life cycle concept is useful for management in several ways; one way is to conceptualize different general approaches to developing core strategies.

To better understand the challenges with the product faces, the Ansoff product /market growth matrix is a useful tool. The matrix provides a simple way of generating four basic alternative
directions for strategic development. The matrix considers four growth options: *market penetration, product development, market development* and *diversification*. [4]

THE MRI TECHNOLOGY

Magnetic Resonance Imaging is an imaging technology that produces three-dimensional images of the body's interior. MRI uses a static magnetic field (commonly between 0.5-3 Tesla) to align the nuclear magnetization of hydrogen atoms in water. Radio frequency pulses are used to systematically alter the alignment of this magnetization, causing the hydrogen nuclei to absorb and then re-emit the energy in a way that reveals information about the physical and chemical properties of the tissue’s environment in the body. [5]

For better contrast, patients get contrast agents injected. These agents enhance the tissue contrast by increasing the brightness in various parts of the body where the agent resides. The most common contrast media used today is made up of individual atoms of gadolinium, which are held tightly by a non-toxic small molecule, to prevent toxic effects. [5]

THE PRODUCT

SPAGO’s contrast agent is based on the so-called SPAGO-Platform: Safe Paramagnetic Gadolinium Oxide nanoparticles. The nanoparticles consist of 1000-2000 gadolinium ions (Gd³⁺), (conventional contrast agents have only one) and the ions have a higher individual efficacy than in conventional contrast agents. The size of a particle is approximately 10 nm in diameter and therefore small enough for being entirely excreted through the kidneys after administration. [6]

SPAGO’s contrast agent can selectively penetrate into tumor tissue, thus achieving what is called *passive tumor targeting*. [6]

In the future, the idea is that targeting molecules, which are molecules targeting a unique chemical structure of the diseased cell, can be attached. This kind of imaging is called *molecular imaging* and is not possible today in MRI due to far too weak signal enhancement of the conventional MRI contrast agents. The contrast of the particles in SPAGO’s contrast agent is however higher, enough to enable molecular imaging in MRI, hence improving selective localization of diseased cells. [6]

![Figure 1: The MRI equipment and a picture taken with MRI. The arrow points to a high-density mass that indicate cancer.](image-url) [7] [8]
The gadolinium core (1) is encapsulated by a silicate network (2) and the surface is coated with a bioinert and durable polyether shell (3), see Figure 1. The shell encapsulates and protects the gadolinium ions from degradation.

**RESULTS**

The most widely used screening test to detect breast cancer is mammography, but mammography involves ionizing radiation that can produce adverse health effects and the sensitivity of the test is limited (79%). [10] [11] [12] Magnetic Resonance Imaging is a valuable complementary modality to conventional screening methods. The strength of the MRI technology is the high sensitivity (92.5%). [9] MRI also uses radio-frequency waves, which is non-ionizing energy and considered safe. Nevertheless, breast MRI has played a limited role in cancer detection. It is probably due to a combination of a low specificity (72.4%) and the high cost ($1,000 to $1,500 per scan). [13] [14]

The new contrast agent, developed by SPAGO Imaging AB, will most likely give a higher specificity and a higher sensitivity. The product will however not change the fact that the MRI is not appropriate for general screening. The reason for that is the high cost together with the long waiting time after the administration of the contrast agent.

The screening has, however, become more individual-based and women with increased risk for developing breast cancer need a more sensitive screening tool. The contrast agent of SPAGO Imaging AB is therefore suitable for screening women with high risk of developing breast cancer.

Diagnostic tests are used to classifying the tumors and to gather more information about the cancer. For the purpose of determining the size and location of the tumors the most common methods are mammography and sonography.

However, the high soft tissue contrast and three-dimensional format of MRI allows anatomic structures of the breast to be viewed in greater detail. Why the MRI technique isn’t used to a higher extent for diagnostic purposes probably depends on a combination of a lack of availability and the risk of overestimating the extent of disease.

SPAGO Imaging AB’s contrast agent will most likely give a better contrast so the diagnostic area is also a potential segment.

The product of SPAGO Imaging AB is today in a stage before the introduction phase, because the product is not yet launched on the market. The nearest stage is, however, the introduction phase. In the introduction phase it is important to create a non-differentiated product. The product that SPAGO Imaging AB now is developing can be said to be non-differentiated because it can be applied in many different areas. There is an opportunity to attach different targeting molecules and create more differentiated products, targeted to specific segments, i.e. cancer types. However, according to the theory behind the product life cycle, it is good idea to first try to launch SPAGO’s original product without targeting molecules because otherwise the product becomes too differentiated and a too narrow market is created.

Since SPAGO’s contrast agent is a new product and it will be launched on an already existing market (MRI for breast cancer) it can therefore be said to
be a product development. The product of SPAGO Imaging AB is based on a whole new technology and is therefore a **product innovation**. There are two different approaches for innovation: **technology push** or **market pull**. Because the product is entirely based on the knowledge created by the scientists at SPAGO Imaging AB, the approach can said to be a technology push. One important thing regarding the technology push approach is to not lose the customer focus. Therefore, it is important that the company analyze the customers; who there are, their needs and their preferences, to maintain a customer focus.

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**REFERENCES**


