From Batch to Continuous Production in India

A market entry strategy aimed at the pharmaceutical industry

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Abstract

Title: From batch to continuous production in India – A market entry strategy aimed at the pharmaceutical industry

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Problem: In 2007, the Company launched a continuous reactor in Europe used for producing chemicals. The Product intends to replace the batch reactor for certain chemical processes, which would involve a major change for the customer. The Company wishes to launch the Product in India, but as the technology and the Indian market is young, there are uncertainties regarding how to launch it.

Purpose: The purpose is to understand the potential of the market for continuous production, to suggest a target group, to understand where in the customer’s organization it should be introduced, and finally to identify customer values and suggest marketing activities prior to the launch.

Method: The study starts with an explorative study, followed by a descriptive study where 12 pharmaceutical companies in Indian have been interviewed. An adductive approach has been used for relating theory to empirics.

Conclusions: Assuming full penetration, the yearly market potential is estimated to more than 50 continuous reactors. The Company should do a pilot launch with six of the companies in the primary target group, which are pharmaceutical companies conducting discovery research. Reference and buy leasing the Product are two important activities.

Keyword: Market potential, market segmentation, target group, buying center, diffusion process, market size, segmentation variables, buying decision process, new product launch, revolutionary innovation, introducing a new technology, launch activities, critical success factors, organizational buying behavior, Indian pharmaceutical market, continuous production, batch production.
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1. INTRODUCTION

The purpose of this chapter is to give an introduction to the studied subject. It starts with presenting the background of the thesis, followed by a problem discussion and a presentation of the purpose. The delimitations of the master thesis are furthermore explained and the target group is presented. The last sections include the disposition of the report and a list of definitions.

1.1 The Product

Chemicals today are produced in different ways: standardized bulk chemicals are produced continuously in large volumes, whereas more complex chemicals are produced in batches. Specialty chemicals, fine chemical and pharmaceuticals are usually complex chemicals, thus produced the traditional way – in batch reactors. The tool for designing the processes for batch production is empirical studies, as opposed to analytical studies for continuous production. There are some general differences between batch production and continuous production. Continuous production has a lower volume per time unit but an even flow, which gives higher outputs and less manual intervention. As a result, the processes are more stable, which leads to more stringent results, higher efficiency and cleaner processes. There is on the other hand a decrease in flexibility concerning volumes and which products that can be produced.

This master thesis was carried out for a company, which is called the Company throughout the report. By using its expertise in heat transfer and fluid handling, the Company has developed a continuous reactor – in this report called the Product – as a direct response to the needs of chemical manufactures. The industries for speciality chemicals, fine chemicals and pharmaceuticals are subject to significant legislative, cost and competitive pressures and there is a global demand for shorter time to market, improved safety, cleaner synthesis, improved energy efficiency and reduced environmental impact. The Company believes that this will be met by process intensification, which is one of the advantages of the Product. (Jönsson, 2 Sept 2008) By integrating a continuous flow with advanced plate heat exchanger technology, The Product enables safe, environmental and cost effective process intensification, since it goes beyond the limitations of a batch reactor. It is on the other hand less flexible than a
batch reactor and the Company has estimated that 15-20\% of all processes today performed in batch, could be suitable for continuous production. The estimation is based on the restrictions of the Product; the Product is suitable for liquid-to-liquid reactions, meaning that only a certain amount of solids can be present during the reaction, and has furthermore a limited throughput time, which means that the time of the reaction cannot be too long. Because of an efficient mixing and a high heat exchange, the Product is useful both for miscible and non-miscible fluids, and it is especially advantageous for highly exothermic reactions (reactions that generate heat during the reaction). (Jönsson, 2 Sept 2008)

The unit within the Company that developed the Product is today an independent venture financed by the Company. The unit is a part of Corporate Development – a division that works mainly with mergers and acquisitions and the facilitation of growth of new market concepts. The unit launched the Product commercially in late 2007 in Western Europe and is organized into three areas: Market, Process and Operations. The current role of the sales companies in Europe is to identify potential customers, and have a first product presentation for them. If the customer is further interested, the unit in Sweden takes over the technical discussions. It is today possible for customers to rent The Product for a period of time before purchasing it. This way, the customers can try their processes with the Product to see what the benefits are. The market organization handles the renting of The Product whereas the process and operations organization build and prepare the Product prior to renting or selling it. The customers are furthermore offered support to optimize the processes while renting it – either by testing the processes at the Company’s facilities or by having someone from the Company coming over to the customer’s facilities. Because there is a high degree of confidentiality in the pharmaceutical industry, the customers usually want to try the Product independently. (Jönsson, 10 Oct 2008)

A shift from batch to continuous production would involve a major change and will probably require the Product to be introduced in the development stages before it can be used in the production. As a result, it might take time to truly establish the technology and it will initially be used for producing new products rather than replacing an existing production line.

The future plan is to expand the geographical scope of the market and to expand the existing range of products. As a part of this, the Company is interested in launching the product in India, since it is a large and fast growing market with an increasing presence of fine chemicals and pharmaceuticals producers. To support the launch in India, the Company
gave us the overall assignment of studying the fine chemical and pharmaceutical industry in India and suggest how the Company should launch the Product. (Jönsson, 2 Sept 2008)

1.2 Problem Discussion

One main reason that the Company is interested in launching the Product in India is the significant size and growth of the country, in combination with India’s focus on quality and technology compared to other emerging markets. While the size of the market creates an opportunity where a large number of companies might be potential customers, it could also make it more difficult to identify the companies that are truly interested and have the resources of purchasing the Product. Hence, there is a risk that sales and marketing efforts are not effectively utilized. *This risk makes it important for the Company to understand and quantify the potential of the market, to be able to determine if The Product should take a wide approach or be limited to a specific group of companies.*

A shift from batch production to continuous production in the pharmaceutical industry and fine chemical industry involves a number of advantages depending on the process being changed. Generally, continuous production is faster and cheaper, cleaner, it reduces waste material, it facilitates surveillance, and it increases safety and quality. However, continuous production with The Product only suits a part of all reactions in these industries. The characteristics of the reaction determine if it is possible to operate it with the Product, and to what extent the advantages of the Product can be exploited. *One challenge for the Company is therefore to identify companies with matching processes within the Pharmaceutical and Fine Chemistry Industry in India; how can the market be segmented and according to which criteria should the Company select the target group for the Product?*

Compared to the Company’s other products, the Product will play a more central role in the customer’s operations. As a result, the Company might need to establish new contacts for existing customers, and understand the priorities of the new contacts. Even though the Company has sold a number of the Product, a reluctance to share data within the pharmaceutical industry has limited access to information on how the customer’s are using the Product. Functions that so far have been most interested are however head of R&D, head of processes, head of operations or head of business development (Jönsson, 10 Sept 2008). *To be able to introduce the Product*
in an efficient way, it is essential for the Company to know who in a target group company they should approach, and who in the company that would decide upon the investment.

Despite the advantages that The Product has on some processes, there is a challenge in introducing it even to customers with matching processes. A shift from batch production to continuous production requires the customers to change operating processes – either by introducing continuous production in a new process, or replacing existing batch equipment with new equipment. The pharmaceutical and fine chemistry industries are considered to be conservative, and processes today are often established through empirical studies. To be able to influence potential customers, it is necessary to understand what factors that the companies in the target group consider important when evaluating the Product, and what activities that can influence the decision.

1.3 Purpose
The purpose of the master thesis is first, to understand the potential of the market in order to determine if it should be a wide or narrow product launch and what the possibilities and challenges are. Second, the purpose is to identify potential customers in India and define the target group for The Product. Third, for the chosen target group, the Company needs to understand what part of the company that they need to approach and how the purchase decision will be made. Finally, the master thesis will suggest what customer values the Company needs to address when approaching the companies, and with what activities.

1.4 Delimitation
The delimitations of the thesis are a result of both external factors and the authors’ judgment and opinions. External delimitations originate from the requirements from Academy and the Company. Delimitations can be dived into task related delimitations and delimitations made as a result of time and cost restrictions associated with the study. (Lekvall & Wahlbin, 2001, p. 204-207)

The task related delimitations are the areas that do not fall into the purposes developed in section 1.3. The marketing plan, presented by Lehmann and Winer (2005), has served as a base from which some parts were chosen to be further investigated with additional theory, and some parts were decided
not to be covered. The first task related delimitation is current and future competition, which is a major part of the marketing plan. Competition was excluded because it is a major area and the Company already had rather good knowledge within this. Considering the newness of the Product, it felt more important to focus on the customer. Another task related delimitation was the implementation of marketing activities, such as promotion and advertising. Instead, the marketing suggestions derive from the customer perspective: who they are, what they value and how do they want to be approached. Marketing activities has therefore been included to the level of “what support does the customer want and what activities do they value?”.

A third task related factor, which is important for positioning a new product, is pricing. This will be discussed only briefly in the analysis. The reason not to focus more on pricing is that it is very complex and would have required an investigation of other areas than the customer side, such as image of the Company, cost of production etc. The last task related delimitation was not to focus on how the Company’s organization should be organized to support the launch in India. Once again, this would have required more interviews with people at the Company, and the purpose was to interview potential customers. Other areas, which have not been considered in the master thesis, are production and technical features concerning the Product.

The time constraint led to delimitations regarding how the subject was approached. The request from the Company was to limit the study to the pharmaceutical and fine chemical industry in India and not take the specialty chemical industry into consideration when developing an action plan for the launch. In the beginning of the study, both the fine chemical industry and the pharmaceutical industry were studied. But as the two markets are highly integrated, they were studied as one market. However, an early assumption was that pharmaceutical companies have more potential as customers than the fine chemical companies. For that reason, a larger focus was placed on companies that sell mostly pharmaceuticals than companies that sell mostly fine chemicals. Another assumption was that larger companies have more potential, why no truly small companies on the market were included. Finally, a delimitation of the master thesis was not to investigate the regulatory requirements in India more than to ask the customers what overall changes that were needed if introducing the Product.

### 1.5 Target Groups

The primary target group for the master thesis is people working with the Product at the Company, foremost the Sales and Marketing Manager for the
Product. The primary target group also includes people working within Life Science at the Company in India, and the person responsible for the Process Technology Division at the Company in India. In addition, the primary target group includes our academic tutor and students that are interested in marketing strategy, launch of a new technology, or the pharmaceutical market in India. The Secondary target group consists of organizations or individuals with an interest for the subjects addressed in the master thesis.

1.6 Disposition
The disposition of the master thesis is based on the chosen method and the chapter outline follows the working process.

Chapter 1 – Introduction
Chapter one presents the background of the studied subject, followed by a discussion of the problems concerned with the assignment, which results in the purposes of the master thesis. The chapter also includes delimitations, target group and a list of definitions used in the master thesis.

Chapter 2 – Methodology
Chapter two presents the choice of method and why certain methodology decisions were made. A figure of the work processes is presented.

Chapter 3 – Marketing Planning –Theoretical Framework
Chapter three presents the theoretical framework, which was used as a tool in the analysis of the empirics. An outline of a marketing plan by Lehmann and Winer (2005) was used as a foundation. Based on the four purposes of the master thesis were certain parts of the marketing plan chosen to identify complementing theories.

Chapter 4 – The General market study
Chapter four presents the material gathered during the first empirical study, called the General market study. The purpose of the study was to obtain a general understanding of the fine chemical and pharmaceutical industry in India, and to select companies to interview during the second empirical study, called the Company case studies.

Chapter 5 – The Company case studies
This chapter presents the result from the interviews performed with potential customers. The interviews addressed three major areas: the operations of the company, the purchasing process of
the company, and priorities regarding reactor technology, support needed if purchasing the Product and interest in the Product.

Chapter 6 – Analysis of the assignment
Chapter six presents the analysis of the empirical results. The analysis was structured according to the purposes of the master thesis and was supported by the theoretical framework.

Chapter 7 – Conclusions
Chapter seven presents the conclusions of the master thesis together with theoretical contributions and contributions to the Company.

1.7 Definitions

API stands for Active Pharmaceutical Ingredient, which is the molecule in a medicine that makes the medicine function.

API development or API Research is the activities to develop the chemical process for a known molecule.

CAGR stands for compound annual growth rate.

Dosage form is the distribution mode of the drug, e.g. capsule, tablet, injectable.

Drug discovery is the basic research that aims at developing a new drug, a new API.

Exothermic reaction means a reaction that generates heat.

FDA stands for Food and Drug Administration, and is the US authority for approving products and processes. The stringent FDA approval is necessary to be able to sell to most regulated markets.

Formulations means that APIs are made into dosage forms. Formulation is less complex than API production and does not require a reactor.

Generics means that the company produces and sells copies of pharmaceuticals that have gone off patent. The generic drug may have a patent protection on the formulation but not on the API. (Wikipedia, Nov
Development usually takes 6-24 months as opposed to 15 years for a new drug. (Company case studies. 3-14 Nov 2008; Pfizer’s homepage 20 Nov 2008)

*Intermediates* are the molecules used in the early reaction steps.

Para IV filing means that the first company to submit a new application with the US FDA has the exclusive right to market the generic drug for 180 days in the US.

*Process engineering* is a group of chemical engineers which handles the scale-up of a process from lab to plant and process optimization.

*Reaction Steps.* A large number of reaction steps are required to produce an API.

*The Big Pharma* includes approximately the 30 largest pharmaceutical in the world. (Wikipedia, Jan 2009)
2. METHODOLOGY

This chapter explains the methodology used throughout the master thesis. A model was developed for how the subject of the master thesis was approached and how the work was conducted. The work process followed five overall steps, which are illustrated in the figure below. Each step will be further discussed, explaining the chosen work method, why it was chosen and how it contributes.

The model illustrated in Figure 1 was developed early in the process and even though reality did not have as clear boundaries as the model, it simplified prioritizing and gave structure to the work process. Once the problem was defined and the main questions were formulated, a method was established. A first empirical approach, that we call the General market study, gave an understanding that was needed to be able to establish the criteria for choosing companies to be included in the second empirical approach, that we call the Company case studies. In order to support the Company case studies, related theory was identified while finalizing the General market study. The last step, succeeding the Company case studies, was to use the theories as a tool when analyzing the empirical findings to create an action plan.

![Model for describing the method used in the thesis.](image)

The purpose of the method was to help to gain compound knowledge about the questions formulated in the problem discussion. (Höst, Regnell & Runeson, 2006, p. 29)
2.1 Definition of Problem and Choice of Method

This section describes how the subject of the thesis was approached and how the problem was defined. It also provides a background of the choice of method.

First, the overall assignment was presented by the Company. In order to establish an overall problem formulation that everyone agreed on, it was then further discussed with our academic tutor and our tutor at the Company. A time plan with different milestones for the master thesis was established, in order to schedule follow-up meetings where thoughts and problems that were encountered could be discussed. Based on the overall problem formulation was the problem discussion developed and then further divided into sub-questions. The sub-questions were used to formulate the purposes of the master thesis. Each of the four purposes was addressed by finding a method that would help us fulfill the purpose. This laid the foundation for the choice of the overall method used in the master thesis.

2.1.1 Theory Related to Empirics: an Adductive Approach

There are three different ways in which theory can be related to empirics. By using the inductive approach a theory is generated from the gathered empirics by studying a specific case or time. In the deductive approach conclusions are based on existing theory about a specific case. The adductive approach combines the inductive and deductive approach by first formulating a hypothesis about a specific case and then applying theory in order to formulate a broader hypothesis. The result can then be applied on another case to modify the theory based on empirics. (Davidsson & Patel, 2003, p. 24-25) The adductive approach has similarities with the hermeneutic approach since it is an iterative process interpreting different parts of the problem in relation to the whole, based on the empirical findings. (Davidsson & Patel, 2003, p. 29-31) The adductive approach – further elaborated below – was used in the master thesis.

The work started with the General market study, which included interviews with people from the Company and external specialists of the market. The intention was to obtain knowledge about the pharmaceutical and fine chemical industry in India so that the formulated questions better could be understood. This way, criteria for choosing potential customers were identified with little influence from theory. The interviews were complemented with information from Internet and presentations made by employees at the Company. In parallel with the final parts of the General market study, relevant theories and models were indentified and the
theoretical framework was starting to take form. The findings from the General market study, together with the theoretical framework, created a foundation for identifying criteria for choosing companies to interview, and formulate questions for the interviews. The questions used during the interviews are presented in Appendix A. Once the criteria were identified, it was applied to a list of the 30 largest companies, which had been developed in the beginning of the General market study.

In addition to supporting the Company case studies, the theoretical framework supported the generation of ideas for how The Product should be launched. It was furthermore used as a tool for analyzing the empirical findings gathered in India (Rienecker & Stray Jørgensen, 2004, p. 161) The action plan for the launch of the Product in India was therefore based on an analysis that applied relevant theories on the earlier generated ideas and empirical findings gathered with the Company case studies.

The obvious risk with the adductive approach is that the first research was made without any theoretical foundation why the results were influenced from our ideas and preconceptions. However, by performing an extensive empirical study – with information both from the Company, specialists and companies in India – we have tried to produce objective conclusions.

2.1.2 Characteristics of the Study: an Explorative Study Followed by a Descriptive Study

The problem definition and choice of method was followed by the second step of the work process – an explorative study, called the General market study. The main reason for conducting the General market study was to get essential industry knowledge and explore different aspects of the questions that were developed in the problem formulation. This way, an external perspective could be obtained for choosing criteria determining if a company is a potential customer, and for choosing areas to investigate further in the Company case studies. (Lekvall & Wahlbin, 2001, p. 196-197) The General market study was made by gathering information – general industry information and information about the companies – and by doing a number of interviews with people that possess knowledge about the fine chemical and pharmaceutical industry in India. The result was a selection of companies that would be a part of the Company case studies, a specification of areas to examine further, and a basic understanding about the major companies in the industry.

The Company case studies were built from the result of the General market study, but as opposed to the previous explorative study, the Company case
studies was a descriptive study. A descriptive study focuses on describing how something can be done, or how something works. (Höst, Regnell & Runeson, 2006, p. 29)

The Company case studies intended to describe company specific factors used for determining if it should be a part of the target group or not, and how the Company should approach the target group. The intention was furthermore to describe the best launch approach for the Company regarding the studied companies and other similar companies. There were several reasons for choosing case studies as a main method. When performing a case study the objective is to get a complete picture by studying one or a few objects in-dept. (Lekvall & Wahlbin, 2001, p. 209) Since The Product is a new, advanced technology it was more important to learn a lot about a few potential customers, as opposed to a more shallow study of the entire market. Case studies were therefore necessary to truly understand the specific needs and characteristics of the pharmaceutical and fine chemical companies in India. A drawback of case studies is that the result cannot be generalized the same way as, for instance, with surveys. How well the result of case studies can be generalized depends on how the cases have been selected. (Davidson & Patel, 2003, p. 54) It is easier to generalize if a series of case studies are performed. (Höst et al., 2006, p. 34) To allow some generalization, the master thesis included twelve case companies, of which two of the companies differed in characteristics. Mainly qualitative data that is gathered when case studies are used. Since the Company case studies were based on interviews, most of the material is qualitative, however a few questions involved quantifications. (Höst et al., 2006, p. 34)

The companies on the list were ranked according to the criteria identified during the General market study. Initially, eight companies were selected for interviews, with the intention of making two interviews per company – one with a person working close to R&D and one with a person working close to manufacturing. The Company in India supported the Company case studies by providing contact information to the companies that were selected for interviews. While most of the contacts worked well, there were a few that were not reachable, a few that were not available during the time of the visit to India, and a few that were located some place were we were not able to go because of the time it would take. As a result, more contacts had to be established, which resulted in 17 interviews with 12 companies, instead of 16 interviews with 8 companies. This means that two interviews were made at five companies (including one telephone interview) and one interview was made at seven companies. Based on the empirical findings from the Company case studies and the theoretical framework,
recommendations for how the Company should launch the Product were developed.

2.1.3 Qualitative Data

Collected data can be qualitative or quantitative. Data that can be quantified and analyzed by using statistical methods are called quantitative data. Data that cannot be presented in terms of numbers are called qualitative data. Qualitative data is presented in terms of words and descriptions, and is often used when performing one or several case studies whereas quantitative data often is used when conducting an experiment or a survey. (Lekvall & Wahlbin, 2001, p. 210-215) The objects or persons being studied or interviewed in a qualitative study should vary as much as possible to get the largest variations in the observed phenomenon. (Höst et al., 2006, p. 34-35) Some characteristics of qualitative research methods are:

- The selection of objects or people is not based on any statistical method.
- A small group of objects or people selected for the research.
- The researcher’s values and original thoughts influence the research process.
- The structure of the interviews is relative low, with more focus on interaction between the interviewer and the person being interviewed.
- The data is easy to understand, no need for revision by experts. (Lekvall & Ahlbin, 2001, p. 214)

The main part of the data collected for the master thesis is qualitative from in-depth interviews, articles, reports, etc. Since qualitative data can be quite detailed, the purpose of using qualitative data was to gain an understanding about the relation between different factors, and to allow new perspectives to emerge.

Some quantitative data was also gathered in the master thesis, both during the General market study and the Company case studies. The purpose was to compare the companies and rank them according to how they met the criteria, and to be able to rank different customer values and activities. Quantitative data used as criteria were the turnover of the company, company growth, R&D expenditures, and business segment revenues.

2.2 General Market Study

This section will describe how the General market study was conducted. Secondary and primary data will be presented separately, as well as how the
data was used to develop criteria for choosing companies for the Company case studies.

2.2.1 Secondary data for the General Market Study

Secondary data are data already gathered by somebody else, while primary data are data that are gathered on your own from the original source. (Lekvall & Wahlbin, 2001, p. 212) As a first approach, secondary data was found through searches on the Internet: Google, Wikipedia, trade organizations for pharmaceutical and fine chemical companies in India, and similar search engines. Articles and Internet links provided by employees at the Company were other helpful sources to get an overview of the pharmaceutical industry and fine chemical industry in India. From these articles were further sources identified, for instance a newly written market report about the pharmaceutical market in India by KPMG. Key players on the market were identified by various homepages and articles and were saved in a long list of companies. Company turnover and growth were some of the information collected from Annual Reports. Based on growth and turnover were about fifteen companies from the list chosen for further investigation. This made it possible to crosscheck figures and to find good information both about the companies and the market, in order to make the final selection of companies to interview in India.

2.2.2 Primary Data for the General Market Study

The primary data collected during the General market study derive from interviews with people with good market knowledge in India. A total of seven interviews were made, out of which three were telephone interviews.

The first interview was with an Indian journalist who had long experience from the fine chemistry industry in India, and who worked for a company called ICIS. The second interview was with the person within the Company who is responsible for the business segment that works with chemistry companies in India. The third interview was with the person within the Company who used to be responsible for the Life Science segment in India. The next interview was with a Swedish person who is responsible for the Swedish trade council in Bangalore, India, with a specialization in life science. Another interview was made with a person working with process engineering at Astra Zeneca. One interview was with the Vice President for the Process Technology Division for the Company in India. The last interview was made with a person at the Company in India, working close to the customers within the pharmaceutical industry. The interviews made with internal people were identified with help from the Company, whereas
external people were identified via an article, via the Swedish trade council’s homepage and with help from the Company. In addition, primary data was obtained from sporadic conversations with employees at the Company. The purpose of the first interviews was to get an overview of the subject and to get other perspectives of the market than what was obtained through secondary sources. The interviews helped to understand what questions that would be important to ask during the Company case studies.

There are two aspects to be considered when data are collected through interviews: the structure and the standardization. The structure of the interviews determines to what extent the questions are open to be interpreted by the person being interviewed based on his or her previous experience and thoughts. The degree of standardization determines the order and formulation of the questions. When performing completely standardized interviews the exact same questions are asked in the exact same order for all the interviews. Standardized interviews enable generalization and comparison. (Davidson & Patel, 2003, p. 71-77) Qualitative interviews are almost always semi-structured or open, which enables the person being interviewed to answer in his or her own words. (Davidson & Patel, 2003, p. 78) Different types of interviews can also be combined. A more open interview, that is less structured, can be used to collect material before a more structured interview is carried out. (Höst et al., 2006, p. 91)

For the General market study, open interviews with a low degree of standardization were chosen. The purpose was to collect a large quantity of high quality material in a short period of time, and not limit or control the answers. The material was used to understand the market, identify areas to focus on in the Company case studies, and develop a more structured interview guide for the interviews in the Company case studies. Before the interviews, a presentation of the master thesis was sent to the person that was going to be interviewed. The intention was to clarify the purpose of the interview and how he or she could contribute. Furthermore, the interview questions were sent to the person in advance to make it possible for them to prepare. Two interviews were made over the phone because of geographic distance. This method consumes less time but a drawback of a telephone interview is the risk for miscommunication.

During the interview one person asked the questions while the other person took notes on the computer. Another option would have been to record the interview, which ensures that there is no loss of information. This is however more time consuming and could make the person being interviewed more restricted in answering questions. (Davidson & Patel,
A review of the material was made after every interview and discussions took place if there were any uncertainties about the answers, which minimized the loss of relevant information.

2.3 Identify Related Theory

The third step in the working process was to identify related theory, which began after about five weeks. This section describes how relevant theory was identified and how it was used throughout the thesis.

The theoretical framework contributed in three ways. First, it supported the method by illustrating areas of interest when doing a market study or marketing plan. Second, it brought to light ideas for different launch strategies. Last, the theoretical framework was a tool when analyzing and evaluating the results from the market study. (Rienecker & Stray Jørgensen, 2004, p. 161)

The marketing plan presented by Lehmann and Winer (2005) was chosen as a theoretical foundation. Based on the purposes of the master thesis were certain areas of the marketing plan chosen for a more thorough study by identifying related literature. The search for relevant literature was made through a search engine called ELIN at University of Lund, and trough visits to the library. Furthermore, literature and articles from previous courses have been reused.

2.4 Company Case Studies

This section will describe how the Company case studies were conducted. Since primary data was the focus during the Company case studies, the secondary data will not be presented in detail. Secondary data complemented the primary data and involved the same type of data as in the General market study: mainly annual reports, articles and homepages.

Eight companies were selected to be a part of the Company case studies, based on the result from the General market study. Out of the eight were five focused on pharmaceuticals and three were focused on fine chemicals. As was described earlier, various reasons led to a change in the initial list of people to interview. Interviews were made with seven of the eight companies and only one interview could be conducted in some companies. Instead of 16 interviews and 8 companies, 17 interviews were made at 12 companies. There were generally 2-4 people present during the interviews.
and sometimes representing different functions. Most of the companies were positive to meet us and took their time in answering all questions. A few of the interviewed people were however more negative and were skeptical regarding why they should answer all questions. By performing interviews with different types of companies, and by interviewing people with different positions within the same company, our intention was to give an objective perspective and minimize influences from our own ideas and original thoughts.

Since most of the companies already were customers of the Company, contacts were provided with help from current contacts at the customer. Once the right person had been reached, it was generally easy to make an appointment for an interview. The interview questions were sent to the person prior to the interview and the questions were developed from the results of the General market study, through identified theory, and by discussing them with people working with The Product.

The interviews were semi-structured with a high degree of standardization; the same questionnaire was used for all interviews and the interview started with open questions, followed by a larger number of specific questions. The reason for using semi-structured questions, as opposed to only open questions, was to ensure an efficient interview time and to simplify the analysis of the answers. Similarly, the purpose of doing standardized interviews was to make comparison easier between the different companies, and to decrease the risk that the person being interviewed starts leading the interview.

2.5 Create an action plan

The fifth, and last, step in the work process was to compile and analyze all material with support from theory. After more than three weeks in India, and a total of eleven weeks of work, the Company case studies were finalized. All the gathered material was compiled and processed in excel and word. When the results had been formulated, they were analyzed with support from the theoretical framework. The focus was to develop recommendations for an action plan by finding support for hypotheses and identifying new aspects brought up by theory.

2.6 Summary of Methodology

Chapter two presented the method for collecting data and transforming the data into results and analysis. The first part was to formulate the problem
and choose an appropriate method to address the problems. Once that was clear, the work of collecting data began. First, a study called the General market study was made, which aimed at understanding the market and developing criteria for selecting companies to interview. A few open interviews with people possessing knowledge about the market were conducted. The results from the General market study, together with identified theories, laid the foundation for the second study, called the Company case studies. This involved 17 standardized and semi-structured interviews at 12 companies in India. The last step was to compile the extensive material and analyze it with help from the theoretical framework.
3. THEORETICAL FRAMEWORK: MARKETING PLANNING

This chapter presents the theory and models, which have been the foundation when analyzing the empirical findings in chapter six and when generating ideas for launch alternatives. It starts with an introduction to why certain theories were selected and continues with theories valuable for understanding the market potential, buying behavior, and how to choose launch activities.

3.1 Introduction

As illustrated in Figure 2 the theoretical framework was chosen according to the four purposes of the master thesis. The first section contains theory that supports the first purpose, for instance industry size, industry growth and product life cycle – factors that determine a market’s attractiveness. The second section contributes to the second purpose by describing variables that can be used for segmenting a business market, and criteria for choosing a target group. The third section is connected to the purpose of understanding the decision process and identifying the buying unit, since it addresses organizational buying behavior. The last section presents a number of tactics that can be used when introducing a new product, when the tactics should be used, and the meaning of critical success factors. This will be useful when analyzing what customer values the Company should focus on and with what activities they should approach the customers.

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<th>Purpose 4: Suggest customer values and marketing activities</th>
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Figure 2. Outline of chapter three.
The book *Analysis for marketing planning* was chosen as a theoretical foundation for the master thesis. The book describes the areas that need to be addressed before developing a marketing plan. In accordance to the purposes and delimitations, a few areas in the marketing plan were chosen to be included. Table 1 illustrates the areas that a marketing plan contains according to Lehmann and Winer (2005), and the areas that are included in the master thesis (marked grey). For each area that was included were the theories of Lehmann and Winer studied, and complemented with theories by other authors.

Table 1. Marketing plan (Lehmann & Winer, 2005, p. 23-24)

<table>
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<th>Marketing plan according to Lehmann and Winer (2005)</th>
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<td>Category analysis</td>
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<td>Competitor targets</td>
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<td>Product/service features</td>
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<td>Core strategy</td>
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<td>V. Supporting marketing programs</td>
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<td>VI. Financial documents</td>
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<td>VII. Monitors and control</td>
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<tr>
<td>VIII. Contingency plan</td>
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</tbody>
</table>

The situation analysis is one of the headlines in the marketing plan. It intends to give the marketer an understanding about the market or product category\(^1\), by analyzing six major parts: definition of the category, category analysis, customer analysis, company and competitor analysis and planning assumptions. Category, or industry analysis involves estimating the attractiveness of the industry, by looking at e.g. the size, growth, threat or new entrants, technological factors, and pressure from substitutes. Since the category analysis is connected to the market potential, parts of it were included in the master thesis. In addition to category analysis, planning assumptions, which involve methods for estimating the potential, was included. The situation analysis furthermore contains a customer analysis – Who are the customers? How do they choose? Segmentation? Etc. – which contributes particularly to the second and third purpose.

The theories of Webster and Wind (1979) were used to give more depth to the customer analysis. The last purpose involves suggesting customer values and marketing activities, which is connected to the overall headline that Lehmann and Winer call *Product/Brand Strategy*.

\(^1\) The term *product category* is used instead of *industry* by Lehman and Winer (2005), while, this is a more narrow definition – since it includes a set of competitors against which one most often competes at a daily bases – they say that one can choose to apply their framework at an entire industry when that is more appropriate.
This section aims at formulating what customers that should be targeted, what competitors, what product features that should be addressed and what the core strategy should be. Except for competitor target, which is one of the delimitations of the master thesis, all parts of the product strategy were included. Supporting Marketing Programs is the last part of the market plan that was included in the master thesis, and was addressed by integrating a study of Beard and Easingwood (1996). (Lehmann and Winer, 2005)

3.2 Market Potential
To be able to understand different aspects of the market potential a few factors to determine the attractiveness of a market will be presented, followed by theories regarding the diffusion process and the rate of adoption. Finally, a few reasons for estimating the market potential, and a method for doing so, are presented.

3.2.1 Industry Size, Industry Growth and Product Life Cycle
There are a few different factors that can be studied more closely to identify the attractiveness of a certain market. The category size is useful to understand if a product will create profits to justify an investment, but can never be used as a standalone measure for a decision. Larger markets are often more attractive since they offer a higher market potential than smaller markets, and possibilities for segmentation. On the other hand, larger markets are generally not as attractive for smaller firms, since they usually attract companies with a lot of resources. (Lehmann & Winer, 2005, p. 52-53)

Category growth is another essential factor; both present growth and future growth are important when planning for investments. Fast-growing markets have attributes that enable high margins and continuous profits for the future, but they also attract competitors and create a dynamic market structure. (Lehmann & Winer, 2005, p. 53)

A third factor, which is important to look at, is the life cycle of the product, which shows the relation between category size and category growth. The curve divides product sales in four parts: introduction, growth, maturity and decline. In the first phase, sales are low and the growth is low as well. The second phase, on the other hand, is characterized by a strong growth. When entering the third phase, the maturity phase, the sales slow down to later decline in the last phase. Because the dimension of the market and market growth is small, the attractiveness of the category is low in the introduction
phase. The attractiveness of the market increases when the market starts to
grow and the sales increases. In the maturity stage, the volume of the market
is at its top, but the market has usually stopped growing. When entering the
decline phase, companies usually try to exit the market. (Lehmann & Winer,
2005, p. 53-54)

3.2.2 Diffusion Process and Adoption
A market can be seen as a social system, where diffusion of a new product
takes place. The social system in an industrial market contains the following
elements: firms, employees, and individuals, which for example can be
management or engineering consultants. The different members of the
system influence each other in the diffusion process. The influence could
come from demonstrations or released information that shows the benefits
of the product. The diffusion process of a new innovation consists of both
an economic process, and a social influence process. The social influence
process is taking place between the different members in the social system,
while revenues, costs, competitive conditions and market structure are
considered in the economic process. (Webster, 1979, p. 112-113)

There are different adopter categories in the diffusion process. This means
that the rate at which products are purchased for the first time varies for all
firms in the industry. The process over time can be described by an s-shaped
logistic curve. The first to purchase a new product are called innovators, and
compromise 2.5 % of the market. The next category is called early adopters,
which represent 13.5% of the market. The early adopters are followed by
the early majority, which constitute 34% of the market. The fourth group is
called late majority, and represents 34% of the market. The last category,
the laggards, compromise 16% of the market. According to Webster,
research have shown that it takes roughly 5-10 years before half of the
industry has adopted the new innovation and is using it. The diffusion rate
of a new innovation is determined by the needed investment relative the
total resources of the firm, and the profitability of the new product
compared to other alternatives. (Webster, 1979, p. 118-119)

According to Webster, studies have shown that the larger companies in an
industry usually are early adopters. This is related to larger financial assets,
which makes those companies less risk avert towards new technology.
Another explanation is that larger companies usually have a wider range of
possible uses for a new product. However, the process from awareness to
adoption can take longer time for larger firms, since the decision process
often is more complex. Early adopters are usually the companies that obtain
the greatest benefits from a new technology. (Webster, 1979, p. 118-119)
Furthermore, it has been shown that early adopters are investing more money in R&D and have a younger president with a higher education. (Webster, 1979, p. 120-121)

Webster presents five different factors that can affect the diffusion rate. The higher relative advantage the new product gives compared to the present product, the faster will it diffuse. To higher compatibility the product has with existing products on the market the faster will it diffuse. The less complex the product is the faster will it diffuse. The more divisible it is – the extent to which the product can be tried before purchasing it – the faster will it diffuse. And finally, the easier it is for early purchasers to communicate the advantages obtained from the product, the faster will it diffuse. (Webster, 1979, p. 122)

Another aspect, highlighted by Atuahene-Gima and Hultink, is the importance of the sales force. A number of studies have shown that the sales force is an important factor regarding how well a new product is received by the customers. If the sales force adapts to the new technology, the product will diffuse faster, since the sales force can be seen as the initial set of customers. Factors that influence a new products success are how the sales force is trained, which resources that are available for them, and their selling techniques. (Atuahene-Gima & Hultink, 2000, p. 436)

3.2.3 Estimation of the Market Potential

3.2.3.1 Reasons for estimating the market potential

Lehmann and Winer define potential as: The maximum sales reasonably attainable under a given set of conditions within a specified period of time. (2005, s.170) Five uses of potential approximations are presented:

- **Foundation for entry/exit choice.** When making a strategic choice about which market the company should operate in, both sales and market potential are important.
- **Foundation for resource allocation.** This is partly linked to where in the product life cycle the product is; usually, companies are more positive to allocate resources in the growth stage, however, even though sales are slowing down the market might not have reached its full potential.
- **Foundation for choice of location and other resource allocations.** Calculations of market potential can support the decision for where to place production and distribution facilities, or retail stores.
Advertising and sales force are also assigned to products and locations based on the expectations of the market potential.

- For establishing objectives and assessing performance. Market potential can be used as a standard to evaluate against when a company is developing objectives. If it does not meet the standard, strategies for different markets are usually changed.
- Basis for forecasts. The market potential is the main input for sales forecasting used for the yearly planning. The sales forecast is determined by multiplying the market potential with the estimated market share. (Lehmann & Winer, 2005, p. 172)

3.2.3.2 Method for estimating market potential
Lehmann and Winer furthermore present an analysis-based method for estimating market or sales potential. The method is based on three steps, which include potential users or buyers of the product and the usage rate:

1. Estimate the possible buyers or users of the product. Understand which customer that has the need and the required resources to use the product, and financial possibilities to invest in the product. Another way of estimating possible users is through doing the opposite way: which companies do not meet the requirements needed to be able to use the product?

2. From previous step, appreciate the potential buyers in each group of possible users or buyers. Step one and two are usually done at the same time.

3. Appreciate the buying or usage rate. If the buying rate has been estimated through research or a survey, the average rate of the answers can be used. Another way is to use the purchasing rate from the heaviest user, which would be assuming that all buying the product would buy at the determined rate. (Lehmann & Winer, 2005, p. 175-177)

The market potential is calculated by multiplying step two and three. The yearly market potential is obtained by multiplying with the percentage that represents the annual purchase. The procedure of getting the result is sometimes more important than the result itself, since it forces the person making the estimation to consider who the possible customers are, which often leads to new ideas of segments to target. (Lehmann & Winer, 2005, p. 176-177)
3.3 Market Segmentation and Target Group Selection

Section 3.3 will cover different segmentation variables for business markets and criteria for target group selection, in order to support the segmentation of the market for continuous production in India and to choose a target group for the Product.

3.3.1 Segmentation Variables for Business Markets

Keller and Kotler highlight five different segmentation variables that business markets should be segmented according to. A number of questions related to each segmentation variable are presented. Marketers should consider these questions before making a decision on which customers and segments to target. The most essential segmentation variables are the demographic variables followed by operating variables. (Keller & Kotler, 2006, p. 258-259)

Demographic

- *Industry:* For which industries should we aim our actions?
- *Company size:* What range of companies should be supplied?
- *Location:* Which geographical regions should we give our attention?

Operating Variables

- *Technology:* What kind of customer technologies should we consider?
- *User/nonuser status:* Should we give our attention to profound, average, small, or non-users?
- *Customer capabilities:* Should our focus be on customers requiring little or a lot of service?

Purchasing Approach

- *The purchasing function of the organization:* Should our focus be on companies having a centralized or decentralized purchasing organization?
- *Power structure:* Should our attention be given to companies, which are engineering dominated, financial dominated etc.?
- *Nature of existing relationship:* Should our attention be on the most attractive customers, or should we focus on customers that we already have strong relationship with?
- *General purchase policies:* Should we give our attention to companies that prefer leasing? Service contracts? Sealed bidding? Systems purchase?
- *Purchasing criteria:* Should we give our attention to companies that value quality? Service? Price?
Situational Factors

- **Urgency**: Are companies who want fast delivery or service to prefer?
- **Specific application**: Is it better to focus on a specific application of our product instead of all applications?
- **Size of order**: Are small or large orders to prefer for our company?

Personal Characteristics

- **Buyer-seller similarity**: Are customers who have the same values as us to prefer?
- **Attitudes towards risk**: Should we give our attention to customers that are risk avert or willing to take risks?
- **Loyalty**: Are companies with high loyalty towards their customers to prefer? (Keller & Kotler, 2006, p. 259)

Lehmann and Winer write that another important aspect when segmenting in technology-oriented industries is a firm’s innovativeness. An innovative firm or organization that rapidly absorbs new technologies is often called “lead users”. The characteristics of lead users are that they encounter general needs before the majority does. By getting an early solution to an identified need, lead users can get considerable advantages. Lead users are considered important customers since they can help the company to identify needed adjustments and improvements. Lead users also contribute to early sales and are important for giving word of mouth information to other companies. (Lehmann & Winer, 2005, p. 125)

### 3.3.2 Target Group Selection

The step that succeeds the market segment identification is to choose what customers and how many customers that should be targeted. (Keller & Kotler, 2006, p. 261) Keller and Kotler highlight five criteria that market segments must fulfill to be effective. While the criteria are developed for consumer markets, they are believed to be applicable to business-to-business markets as well. The first criterion is that the characteristics of the segment should be **measurable**, which means that e.g. the purchasing power should be possible to determine. The segments should furthermore be **substantial**, which means that the segments should be sufficiently big and beneficial to focus on. The third criterion to fulfill is **accessible**, which can be achieved if the segments can be reached and served effectively. The segments should also be **differentiable**, which means reacting in a different way to different marketing activities, and it should be possible to distinguish differences between the segments. The last criterion is **actionable**, i.e. it
should be possible to catch the attention and serve the segments by developing effective programs. (Keller & Kottler, 2006, p. 262)

Lehmann and Winer suggest three aspects to consider when choosing which customers to target:

- **Size/growth of the segment** – establish which set of customers that are growing at a high speed.
- **Possibility to gain competitive advantage** – look at competitors’ future marketing strategies, competitive advantages, available assets, and the markets they are active in.
- **Resources available** (Lehmann & Winer, 2005, p. 221)

### 3.4 Industrial Buying Behavior

In order to give the Product the best possible chance to be adapted by a customer, it is important to understand the purchasing process and the people being involved in the purchase, which will likely differ from the Company’s other products. To create this understanding it can be helpful to apply the organizational buying behavior model by Webster and Wind (1972). Except for an overall presentation of the model, a more thorough description of the decision process, the buying center, and the different factors that influence the model will be covered.

#### 3.4.1 Model for Organizational Buying Behavior

Webster and Wind have developed a model for organizational buying behavior where the buying behavior of the buyer in the organization is influenced by four factors: environmental factors, interpersonal factors, individual characteristics and organizational factors. These factors can either be task-related or non-task related. Task related factors are related directly to the organizational buying problem, e.g. a company’s policy regarding the quality of the product. Non-task related variables are factors that are not directly related, e.g. a person’s own personal values. The four factors will be explained in the end of section 3.4. As can be seen in Figure 3, the center of the model for organizational buying behavior is comprised by the decision process, which is carried out by the members of the organization. The decision process is affected by the four factors, and leads to a buying response of the organization. The process is complex and entails connections with members in the organization as well as in other organizations. (Webster & Wind, 1972, p. 28-30)
One of the four factors is interpersonal, which involves the relations between the people in the buying center, and will be one of the focuses of the master thesis. According to Figure 3 the buying center is influenced by marketing stimuli and the first two factors: environmental and organizational factors.

**3.4.2 Buying Decision Process**

According to Webster and Wind there does likely not exist a general decision-making process for organizational buying decisions, since organizations involve different features, different people taking part in different stages, variations in how important the specific assignment is, and different circumstances of the specific purchase. Even though an organization can have several purchasing processes that change depending on the situation, Webster and Wind present a general model for describing the decision process. As can be seen in Figure 4, the model contains five stages. The significance of the different stages, their features and how they

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**Figure 3. Model for organizational buying. (Webster & Wind, 1972, p. 30)**
relate to one another varies between organizations and buying situations. The first step is *identification of need*. When a person encounter a problem, which can be taken care of through buying a certain product or service, a need is created. The second step is *establishing objectives and specifications*, which means that when the need has been clearly defined, specifications derived from the buying problem can be developed, in order to describe the objectives the purchase has to fulfill. The third step consists of *identifying buying alternatives* on the market. The alternatives that are investigated first are previously used suppliers and sources of information. Various members in the organization can be involved in the search for buying options depending on the character of the purchase. The purchasing department will take part and engineers in the organization will most likely give their opinion. The fourth step involves *evaluating alternative buying actions*, which is a key activity in the buying decision process. The criteria, identified when the specifications were developed, are compared to the features of the existing alternatives. This is an easy process only when the case is fairly simple. For instance, if a standard commodity is being purchased it is an easy task to rank the different alternatives against each other and get competitive bids. However, the different alternatives will often vary to a large extent, which make it important to weight the criteria against each other, e.g. price versus quality. Different people in the organization often have different priorities, which can lead to conflicts between the involved people. The final step consists of *selecting the supplier*. This can be affected by the relative power from people taking part in the process and their ability to affect the rest of the group. (Webster & Wind, 1972, p. 31-33)

Figure 4. A general model for the organizational decision process. (Webster & Wind, 1972, p. 31)

The model is a simplified version of the reality, since there are numerous decisions taking place in each phase. There are furthermore a number of
persons involved, such as gatekeeper, influencer and decision maker, that influence the decision, which increases the difficulty of the decision. The buying decision process can be seen as a continuous process where some steps may be done several times. (Webster & Wind, 1972, p. 33)

3.4.3 Interpersonal Factors: the Buying Center

One of the factors that influence the decision process is the interpersonal factor. Generally a number of people are participating in the buying process in an organization and people in the organization have different roles in the buying process, which affects how they interact with each other. The different roles are: users, buyers, influencers, deciders, and gatekeepers. Previous experience from communicating with each other influences the cooperation of the different roles. (Webster & Wind, 1972, p. 35) Webster and Wind define the buying center as: members of the organization who interact during the buying decision process. (1972, p.77) Several people can have the same role, and one person can have several roles, e.g. it can be more than one user. As illustrated in Table 2, the different roles influence different steps of the earlier described buying decision process. The roles and their influence on the decision process will be further explained in order to understand how people interact and how they influence each other. (Webster & Wind, 1972, p. 77)

Table 2. The different roles in the buying centre and their influence on the buying decision process. (Webster & Wind, 1972, p. 80)

<table>
<thead>
<tr>
<th>Identification of need</th>
<th>User</th>
<th>Influencer</th>
<th>Buyer</th>
<th>Decider</th>
<th>Gatekeeper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishing specifications and scheduling the purchase</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Identifying buying alternatives</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluate alternative buying actions</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting the supplier</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

3.4.3.1 User

The user is the one who in fact uses the purchased product or service. Table 2 shows that the user participates in all decision steps. However, the user’s possibility to influence buying differs – in some cases the users have modest or no buying power. The user is likely the initiator of the buying process or
the person setting up explicit purchase requirements. The influence from the user can originate from an individual or from a group. (Webster & Wind, 1972, p. 35, 78)

3.4.3.2 Influencer
The influencer can be people in the organization who indirect or direct affect the buying or usage of the product or service. The influence can derive from someone establishing criteria, which might exclude a certain supplier. It can also come through providing certain information, from which suppliers are assessed. Members of the organization that possess technical knowledge are likely to influence the buying decision when a manufacturing organization is buying production equipment – especially if the decision involves a new technology. Production engineers, manufacturing management, R&D, and design engineers may also influence the purchase decision, but will likely highlight different issues. Their main influence can be to clarify the purchase and lay the foundation for what economical and technical specification the purchase must fulfill. (Webster & Wind, 1972, p. 78)

3.4.3.3 Buyer
Buyers are the people in the organization with the power of selecting a supplier and setting up the agreements of the purchase. Based on the size and the structure of a company, the buyer is called Purchasing Manager, Purchasing Agent or Buyer. However, the buyer can also be a person who does normally not deal with this kind of decisions, e.g. a vice president of manufacturing. Even if the official authority for bargain and setting up agreements with suppliers belongs to the buyer, other functions can influence the decision and narrow down the available choices, e.g. technical personnel with the power to define specifications, which may leave the buyer with only one choice. While Table 2 shows that the buyer participates in all steps except identification of need, its possibility to influence the decision process depends on the type of buying assignment: it could be a routine decision process, where criteria already have been defined and there are a specific number of suppliers to choose from, or it could be a more complex decision process involving negotiations, establishing criteria, and evaluating different options. The buyer is mostly involved during the steps of establishing possible suppliers and selecting a supplier. (Webster & Wind, 1972, p. 79)
3.4.3.4 Decider
The deciders are the people in the organization with the official or unofficial authority to make the final choice of supplier. The buyer is not always the decider since the decision can be made by one person but executed by the buyer. It can be difficult to determine who actually makes the final decision and when. For example, the purchasing agent can be the person signing the contract, but the real decision can be done when the development engineer establishes specifications without knowing that it can only be met by a certain supplier. Usually the purchaser has a financial limit for which he or she is allowed to make decisions, and if it exceeds that limit decisions are made by other members of the organization, e.g. a vice president, the president or the board of directors. (Webster & Wind, 1972, p. 79)

3.4.3.5 Gatekeeper
Gatekeepers are the part of a group that manages the information that goes into the group, e.g. the buyer who is responsible for supervising the relationship with present and potential vendors. Sales and marketing can be another supply of information regarding new products. Furthermore, technical personnel are likely to find out about new technologies and products, which can be useful for the firm. As presented in Table 2, the influence from gatekeepers is generally given when defining buying alternatives. Gatekeepers highly affect the result of the buying decision, since they affect the possible buying options. (Webster & Wind, 1972, p. 79-80)

3.4.4 Other factors affecting the Buying Decision
As described in the beginning of 3.4 there are four factors influencing the buying behavior of the buyer in the organization. Interpersonal factors (the buying center) have already been presented, and the other three factors are: environmental factors, organizational factors, and individual characteristics. (Webster & Wind, 1972, p. 28-30)

3.4.3.1 Environmental factors
According to Webster and Wind the environmental factors affect the three other factors: the organization in question, the people in the organization and their relations with others in the organization. The environmental aspects can be seen as a number of non-controllable restrictions, in which the organization and its members function. It also involves factors considered when a buyer is making a decision within the organization. There are six types of environmental factors: technological, physical, economical, political, legal and cultural. The factors can have an affect
through a number of institutional forms: suppliers, customers, competitors, governments, trade association, labor unions etc. To what degree these institutional forms influence an organization differs between countries. The environmental aspects change constantly and the buying organization is directly and indirectly affected by the changes. One of the most important task-related factors is the marketing stimuli from potential suppliers. Non-task related factors could be the personal values of the individuals in the organization, since they carry out the buying decision process. Other organizations can also influence and the common environment affected by social, political and cultural factors. (Webster & Wind, 1972, p. 34, 40-41)

3.4.3.2 Organizational factors
There is a number of task and non-task related dimensions within the formal organization that affect the decision process. Guidelines, procedures, goals, systems used for compensation, power structure, communication, and status – all affect the buying process. An example of task related factors, which are the organizational aspects that are directly connected to the buying task, is organizational policies regarding specifications of the product quality and choice of material. Another example is technical requirements that create constraints related to the organization’s current operations. Examples of non-task related factors are the status and power structure within the organization, as well as how communication is carried out. Other examples are if an organization prefers to buy from local suppliers or a supplier with which they already have a relationship. (Webster & Wind, 1972, p. 34-35)

3.4.3.3 Individual factors
In all organizational buying, the people involved in the decision contribute with his or her own goals, needs, past experiences and attitudes – factors that are taken into account when making a decision. The actions of each person in the organization define the decision-making system. The individual factors can be both task and non-task related. (Webster & Wind, 1972, p. 36-37)

3.5 New Product Launch Activities
In order to get ideas of how to approach customers when launching a new technology, a company needs to know what alternatives there are and when different alternatives should be used. The following section presents a model of how to develop launch tactics with a focus on tactics used for preparing or attacking a market. In addition, the definition of Critical
Success Factors is addressed since it is important that a new technology meets the features that are highly valued by the customer.

### 3.5.1 Launch Tactics

High technology markets possess high risks for both suppliers and customers: both technologies and market change very fast, which make business strategies less important and technology vision and marketing tactics more significant. Consequently, marketing and technical functions have to be more responsive to changes, why marketing activities can be viewed as technology driven instead of driven by the market. Beard and Easingwood consider marketing actions and tactics as the main concern when launching high technology products. (Beard & Easingwood, 1996, p. 89)

As presented in Figure 5, a study by Beard and Easingwood shows that marketers usually follow four steps when developing launch tactics. The first step involves *preparing the market*. Simultaneously or right after, tactics for *targeting* the product are developed. The third step is concerned with *positioning* of the product at the target market. The final step consists of *attacking* the market by developing and carrying out tactics for the market. (Beard & Easingwood, 1996, p.90)

![Figure 5. The different steps when developing launch tactics. (Beard & Easingwood, 1996, p. 91)](image)

#### 3.5.1.1 Preparing the market

Beard and Easingwood present a number of tactics for preparing the market. Each tactic is associated with different “actions”. One preparation tactic is licensing the technology. Licensing can boost adoption since it supports the formation of standards. Furthermore, a larger market can be reached with licensing and it can increase the revenues in order to cover previous R&D
investments. Another option, if the company prefers not to enter the market alone, is to sell to other equipment manufacturer. This tactic makes it possible to reach a larger market but the ownership of the technology stays within the company. A third tactic concerns the information that is released before the launch. Examples of actions associated with this tactic are to distribute technical information to media and support industries, give demonstrations of the product, or hold a seminar regarding future technology trends. It is however important to consider what information that should be released; the purpose is to increase the interest while not sharing too much technical information to competitors. (Beard & Easingwood, 1996, p. 91)

3.5.1.2 Tactics for targeting

The adoption rate of a new technology will be faster if it is targeted to a segment that responds to the marketing strategy. (Easingwood & Koustelos, 2000, p. 29) The study described customer targets according to when they adapt to new technology, which is similar to the diffusion process theory presented in section 3.2.2. (Beard & Easingwood, 1996, p. 91) Since target group selection was discussed in chapter 3.4.3 Target group selection, it will not be further discussed in this section.

3.5.1.3 Tactics for positioning

Some technologies that are highly specialized and have small markets might not need to go trough targeting or positioning. Other technologies have such a wide range of applications that targeting and positioning is necessary. A number of tactics can be used for positioning a new product. One positioning tactic is to emphasize exclusivity by focusing on the quality and engineering of the product. This tactic enables the product to be positioned in the upper pricing segment, which often gives a higher margin. In contrast to this tactic, low prices is another option, which to a larger extent is used in high-technology markets. (Easingwood & Koustelos, 2000, p. 31) This involves pricing the product below average, or letting a usually expensive technology be sold at a much lower price. (Beard & Easingwood, 1996, p.93)

3.5.1.4 Tactics for market attack

The tactics used for entering a market are related to the goals of the launch. The goals originate from how much the market knows about the technology, and in which position the technology presently is. For a very new technology, the tactics focus on presenting the obtained advantages, and
focus on brand or image of the company is sometimes very low. (Beard & Easingwood, 1996, p. 94)

One tactic is to lend or lease the product before selling it. Leasing and lending can decrease the resistance of technology adoption, and it is beneficial when a new technology involves changes in the way a company operates. Leasing and lending is however not as common since it involves high administrative costs. Small firms with no stated experience in the industry usually lend their products. One common disadvantages of lending is longer decision times since there is little incitement to have a short decision process. (Beard & Easingwood, 1996, p. 95-96)

When there is little product knowledge on the market, a useful tactic is to educate the market about the product and its advantages. Marketing activities for educating the market could be to focus on PR activities, such as lectures and seminars. Educating the market is used to spread the vision of the technology. Once there is product knowledge on the market, the best way to present the technology’s advantages is to use reference sites. (Beard & Easingwood, 1996, p. 94)

Another way to establish a new product on the market is through dedicating large resources to a big launch in order to create a winner image. The tactic aims at generating awareness and building an image, since big PR events create word-of-mouth communication among users and media for example. (Beard & Easingwood, 1996, p. 95) If it is not possible to create a leadership position for the technology on the entire market, the company should instead focus on a certain segment. A strong position on the market makes other companies feel more secure in adapting to the new technology. (Easingwood & Koustelos, 2000, p. 33)

Finally, a company can use “opinion leaders” for creating a word-of-mouth effect. Opinion leaders are usually active within the industry and obtain knowledge about the product by using it. (Easingwood & Koustelos, 2000, p. 32)

3.5.1.5 When are different launch tactics used?

Beard and Easingwood explain when it is suitable to use different tactics. They make a distinction between new and established markets, as well as between new and established technologies. Combining the characteristic of the market with the characteristic of the technology gives four scenarios: a new technology launched on a new market is called a revolutionary innovation, an established technology launched on a new market is called a
market innovation, a new technology launched on an established market is called a technology innovation, an established technology launched on an established market is called a normal innovation.

For new markets the first and second stage – preparation and targeting – are less relevant, while positioning and attack are highly important. Beard and Easingwood state that technological dominance and stressing a certain application are among the most important tactics when positioning a product. Opinion leaders, reference sites, triability of the product, and educating techniques are emphasized as important tactics in the attack phase. All these tactics require a high level of participation from the sales force since it is essential with an interaction between the buyer and the seller when launching on a new market. (Beard & Easingwood, 1996, p. 96-98)

For new technologies, targeting is more important than for new markets. Groups to target are innovators and early adopters, while late adopters should be avoided. Prelaunch information about the product is also common for new technologies in order to give the market time to understand the advantages. Positioning based on focusing on technology lead, as well as focusing on a special application, is often used for new technologies just as for new markets. When launching a new technology, it is important to make the market aware of the technology and its advantages, why educating the market is an important tactic. (Beard & Easingwood, 1996, p. 98)

In the case of market innovation it is important to prepare the market. Producers often use strategic alliances to bring an existing technology into unfamiliar markets. This can be done through strategic licensing or using OEMs. (Beard & Easingwood, 1996, p. 100)

A revolutionary innovation involves a change in industry paradigm, which in turn can create new needs on the market. When a new technology is introduced into a new market it is usually targeted at early adopters, and tactics for positioning are to focus on technological lead, exclusivity, or certain areas of use. Prelaunch information is often provided in order to prepare the market. Tactics used for attacking the market is to educate the market and use reference sites. (Beard & Easingwood, 1996, p. 100) Beard and Easingwood suggest that this kind of innovation should be marketed to a small group of well-educated customers, where the goal is to increase the knowledge about the product. The tactics needed for this type of product is often expensive; if focus is to position the product based on exclusivity, the promotion will have to be exclusive, which is associated with high costs. Furthermore, early adopters want proof of the advantages and quality of the
product, before adoption. The sales people handling the seminars and conferences have to be well-educated engineers or specialists. (Beard & Easingwood, 1996, p. 100)

3.5.2 Critical Success Factors
To be able to create suitable strategic possibilities within the organization it is vital to know the requirements of different customers and how the requirements vary between different customer segments. Since different segments appreciate different product features, the company needs to understand what different customers and segments value. The factors that are particularly appreciated by a group of customers are called Critical Success Factors, and it is concerning these factors that the organization must perform better than then the competitors. (Johnson, Scholes, Whittington, 2005, p. 96)

3.6 Summary of the theoretical framework
A few areas from the market plan, presented by Lehmann and Winer (2005), were selected and described more thoroughly with additional theories. The four overall areas of chapter three were: market potential, market segmentation and target group selection, organizational buying behavior, and activities for launching a new product. The first section explained that market size, growth and product life cycle are important factors to determine the market potential. The second section said that business markets can be segmented by demographics, operating variables, purchasing approach, situational factors, and personal characteristics. The third section presented the organizational buying behavior by Webster and Wind (1979), which includes the buying decision process influenced by the people that comprise the buying unit, their goals and experiences, environmental factors, and organizational factors. The last sections presented the results of a study made by Beard and Easingwood (1996) which showed that when introducing a new technology, marketer’s use different tactics that can be separated into preparing the market, targeting the market, positioning the product, and attacking the market.
4. THE GENERAL MARKET STUDY: THE INDUSTRY FOR FINE CHEMICALS AND PHARMACEUTICALS IN INDIA

Chapter four presents the results from the General market study that was made before the interviews in India. The purpose of the chapter is to give an understanding of how the pharmaceutical industry and fine chemistry industry are connected, what operations the companies have and finally, to provide support for estimating the market potential and doing a market segmentation.

As presented in Figure 6, the empirical findings in chapter four contribute to the first two purposes, and were furthermore the foundation for selecting companies to interview. The first section gives a background for better understanding the other sections. The market structure section contributes both to understanding the potential of the market, and to identifying initial characteristics of potential customers. The geographical distribution section is valuable to take in before entering a market and contributes to the segmentation.

4.1 Business Activities on the Pharmaceutical and Fine Chemistry Market

To get an understanding about the potential customers’ operations and background, section 4.1.1-4.1.3 will describe the differences between companies operating in fine chemicals and pharmaceuticals, the main activities for the pharmaceutical companies and finally, how the background
of Indian pharmaceutical companies differ to pharmaceutical companies in e.g. Europe.

4.1.1 Fine Chemicals verses Pharmaceuticals

Pharmaceuticals can either be produced through chemical synthesis or through biotechnology. The majority of pharmaceuticals are produced through chemical synthesis, which means that petroleum or natural gas will be refined through chemical reactions to create a number of chemicals, which in turn will go through further reactions to create new chemicals, and so on and so forth. Each reaction is called a reaction step. An Active Pharmaceutical Ingredient, from now on called an API, is the molecule in a medicine that makes the medicine function. A large number of reaction steps are required to produce an API and the molecules used in the early reaction steps are called intermediates. APIs, which are also called bulk drugs, and intermediates are sometimes called fine chemicals. (Jönsson, 10 Sept 2008) Except for APIs and API intermediates, fine chemicals can be categorized into biocides and specialty chemicals for technical applications. (Wikipedia, Nov 2008) Three important differences between intermediates and APIs are that intermediates are produced in larger volumes – could be a thousand tons for intermediates, as opposed to one to a few hundred tons annually for APIs – the molecules are less complex and the regulations for intermediates are less stringent. (Gregertsen, 13 Oct 2008) To obtain the final medicine the API is formulated to compound non-active ingredients such as solvents, water and pigments, into dosage forms, which could for instance be a capsule, tablet or injectable.

The fine chemistry industry and the pharmaceutical industry in India are closely linked together since many companies sell both formulations (the final pharmaceutical) and API. Intermediates are sold as well, although it is not as common among the top pharmaceutical companies in India. (Company Case Study, 3-14 Nov 2008) One way of selling APIs or intermediates to a pharmaceutical company is on a contract basis and similarly can different types of R&D be conducted on a contract. With a common name, these activities are called CRAMS – Contract Research and Manufacturing Services. As illustrated in Figure 7, CRAMS is an activity that links the fine chemical and the pharmaceutical industry in India since fine chemistry companies to a large extent operates within CRAMS, and pharmaceutical companies often are involved in contract manufacturing besides their own products.

The Indian fine chemistry industry is dominated by CRAMS, which is a growing market because of an ongoing outsourcing trend among global
pharmaceutical companies. (Hariharan, 1 Oct 2008) 60 % of revenues in the Indian fine chemistry industry derive from the pharmaceutical business and Indian companies have emerged as major players in the global manufacturing space.

Revenues earned from contract manufacturing are in many companies invested in R&D with the ambition of developing and launching their own molecules. (Roychowdhury, 2007)

The empirical study of this master thesis has a greater focus towards the companies that are more into pharmaceuticals. However, because of the lacking border between the fine chemistry industry and the pharmaceutical industry in India, the fine chemistry industry is partly addressed.

4.1.2 Business Background for the Indian Pharmaceutical Companies

As opposed to global pharmaceutical companies in the West, Indian pharmaceutical companies have traditionally focused on generics. India has a long history of chemistry and producing formulations and there are large production plants for this throughout the country. At 75 facilities, India is the country outside US with the largest number of FDA approved facilities (Johansson, 1 Oct 2008) According to the report Pharma Summit 2008, India’s adoption to WTO’s patent legislations in 2005 has facilitated the integration into the global industry and resulted in the growth of partnerships between Indian and foreign companies across a wide range of areas such as discovery research, development and manufacturing (KPMG, Sept 2008). It is no longer obvious that the companies can continue focusing mostly on generics why the pharmaceutical companies have invested in developing new drugs. Several of the larger Indian pharmaceutical companies have developed a pipeline of molecule candidates to become a new drug, either through in-house research or by purchasing an R&D project and production facilities. The companies are transferring from
generic companies to traditional, global pharmaceutical companies. (Johansson, 1 Oct 2008) Still, only a small part of all the Indian pharmaceutical companies are conducting discovery research and the companies that do usually began less than ten years ago. (Company case study, 3-14 Nov 2008) Experience in discovery research is therefore still a differencing factor between Indian pharmaceutical companies and Western pharmaceutical companies. (Johansson, 1 Oct 2008)

Another difference between Indian and Western pharmaceutical companies is that Indian pharmaceutical companies have a wider business portfolio with many processes in parallel. Typically, a Western pharmaceutical company focuses solely on providing final pharmaceuticals, for which the API is produced in-house or outsourced. An Indian pharmaceutical company typically has a large number of final pharmaceuticals, for which the API is produced in-house, and in addition APIs are sold on a contract or to the open market. Bengt Johansson at the Swedish Trade Council in India says that the players operating in API are the same players that operate in generics, and that API-producers in India originate from generics. Those companies are today widening the business portfolio; some companies are for instance looking into the business of medical devices. (1 Oct 2008)

4.2 Market Structure

Section 4.2 aims at explaining the structure of the Indian pharmaceutical market by first presenting the overall Indian pharmaceutical industry in 4.2.1. Section 4.2.2-4.2.4 will be devoted to the different parts of the overall Indian pharmaceutical industry described in 4.2.1. Research activities will then be a complementing section in 4.2.6.

4.2.1 The Indian Pharmaceutical Industry – Production for Exports and Domestic Consumption

The structure of the pharmaceutical industry, and to a large part the fine chemistry industry, in India can be explained by three businesses: domestic formulation, formulation exports and API exports. Domestic formulation refers to the Indian retail pharmaceutical market, i.e. the domestic drug consumption. Figure 8 shows that the export of formulations (or generics) is estimated to be more than USD 3 Bn, the export of APIs (called bulk drugs in the figure) is closer to USD 4 Bn, and the domestic formulation market is more than USD 6 Bn. (KPMG, Sept 2008) Of the APIs produced in India only 10-20 % are consumed domestically and this value is included in the value of domestic formulation. (Gajaria, 6 Sept 2008) Together, API exports
and formulations export compound a greater value than the pharmaceuticals consumed domestically. Included in the value of formulation exports and bulk drug exports is the contract manufacturing business of India. The other business of the CRAMS industry – contract research – is not included in the above estimated market value.

The pharmaceutical industry is projected to have a CAGR of about 21% between 2006 and 2011 where all product groups will face a strong growth. The strongest growth will come from API exports with a CAGR of about 28%, whereas formulation exports are projected to grow at a CAGR of about 24% and the domestic formulation market will grow at a CAGR of about 13%. (KPMG, Sept 2008) The growth of the domestic pharmaceutical market will thereby be significantly larger than the two main markets today – North America and Europe – that together compound 77% of the global pharmaceutical market.

4.2.2 CRAMS – Contract Research and Manufacturing Services

Over the years several Indian companies have shifted their focus from pure generics business with small revenue originating from CRAMS to an increased focus on CRAMS, providing services that span the entire drug development and manufacturing value chain. The pharmaceutical industry is

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**Figure 8. Structure of the pharmaceutical industry in 2006-07**

A growth of 4-5% is expected in the US pharmaceutical industry and the aggregate growth of the five major European markets France, Germany, UK, Italy and Spain was less than 5% over the last year. (Lupin Ltd, Annual Report 2007-08)
the big business of CRAMS and to a small extent agrochemical, which has developed in the last years. (Hariharan, 25 Sept 2008)

Outsourcing is not new to the global pharmaceutical industry; however companies today are exploring new outsourcing activities, such as discovery research or clinical trials, and the Big Pharma companies are becoming increasingly involved in the outsourcing trend. Drivers behind the increased interest in outsourcing are the many challenges that the Big Pharma face today. First, drugs worth billions of USD in revenues are going off patent in the years to come, and the number of new drugs to boost the revenues has decreased. Second, generics players are increasingly penetrating the regulated markets that traditionally have been dominated by the innovator companies. Considering the time and cost to develop a new drug, the global pharmaceutical companies are under pressure to develop new drugs in a shorter time and to a lower cost. By outsourcing the manufacturing of molecules used during development, or by outsourcing R&D services can the pharmaceutical companies obtain a more efficient time line and save cost. According to Mr. J.R Vyas, managing director at Dishman Pharmaceuticals and Chemicals Ltd, multinational pharmaceutical companies were earlier only buying intermediates and had little relationship with the Indian supplier whereas today, partnerships are emphasized. (KPMG, Sept 2008)

As illustrated in Figure 9, the market value for contract manufacturing was estimated at USD 870 Mn in 2007 and is projected to grow at a CAGR of about 42 %. The contract research market in India was estimated at USD 118 Mn in 2006, with a projected CAGR of 32 %. (KPMG, Sept 2008)

### Estimated CRAMS market 2007

<table>
<thead>
<tr>
<th></th>
<th>Value (Mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract research</td>
<td>$155 Mn</td>
</tr>
<tr>
<td>Contract manufacturing</td>
<td>$870 Mn</td>
</tr>
</tbody>
</table>

*Figure 9. Estimated market value for CRAMS divided into contract manufacturing and contract research.*

In the years to come, Indian CRAMS providers are likely to move up the value chain and to increase the activity in high-complex segments such as injectables and biologics. (KPMG, Sept 2008) Bengt Johansson at the
Swedish Trade Council also supports these changes. He however believes that the Indian CRAMS companies today are adding less value than their counterparts in other parts of the world and that the companies to a large extent work according to a given specification. (1 Oct 2008)

Despite the favorable projections of the Indian CRAMS market and the fact that China today is lagging behind in the same area, competition from China could grow stronger in the next ten years. (KPMG, Sept 2008)

4.2.3 The Domestic Pharmaceutical Market of India

4.2.3.1 Size and Growth

Figure 8 showed that the domestic formulation market in India was estimated to USD 6.2 Bn in 2006. This number represents the retail sales, and in addition to that about USD 1.2 Bn were institutional sales, giving a total value of the market of more than USD 7.3 Bn. From 2005 this represents a growth of more than 17 %. (Ernest & Young, July 2008) The market value in 2007 was estimated at USD 7.8 Bn and the market value has grown at a CAGR of 13 % over the last four years (Dr.Reddy, Annual Report 2007-08). As illustrated by Figure 10, McKinsey & Company projects that the Indian pharmaceutical market will continue to grow faster than the rest of the industry and that the country by 2015 will be the 10th largest pharmaceutical market of the world. India is today the 14th largest market and the projected growth would place India on a tied 3rd place in absolute growth – surpassed by USA and China and tied with France and Japan.
4.2.3.2 Company Structure

As Figure 11 illustrates, the pharmaceutical market in India is highly fragmented and dominated by Indian companies. The ten largest companies have together 36% of the market (Ranbaxy, Annual Report 2007) whereas one un-dated source states that the 250 largest companies compound 70% of the market. (Pharmaceuticals & Drug manufacturer, Nov 2008) The Swedish Trade Council in India estimates that there are about 20,000 registered pharmaceutical companies in India, of which 250 are of significant size and about 15-20 are large, dominating players that are, or will be, operating on a global basis. Out of the top 50 pharmaceutical companies are only 11 companies multinational, and as illustrated in Figure 11, the Indian companies contribute to about 80% of the market value (KPMG, Sept 2008). GlaxoSmithKlein is the largest multinational pharmaceutical company on the Indian market. (Ernest & Young, July 2008)
Small companies starting in the pharmaceutical business tend to have a narrow focus, and as the company grows it needs to widen its operations. Furthermore, small companies are less active in R&D. (Hariharan, 25 Sept 2008) The larger companies have a wide business portfolio – both compared to small domestic players and to global pharmaceutical companies. The larger Indian pharmaceutical companies operate within a number of therapies, and as opposed to the global trend of focusing the business; the Indian companies are trying to grow into more therapy areas and related businesses like medical devices. (Johansson, 1 Oct 2008) According to Malini Hariharan the number of specialties, reactions and capabilities has been key differentiating factors for the Indian companies, and she also highlights the geographical scope as a differentiating factor. (25 Sept 2008)

4.2.4 Formulation Export

Despite that many of the Indian pharmaceutical companies are moving into verticals such as CRAMS and discovery research generics will continue to remain the key area of interest for the companies. Indian generics have seen a strong growth in export over the years, and this trend is projected to continue. Semi-regulated markets have dominated Indian exports but, as Figure 12 illustrates, export to regulated markets is witnessing a strong growth and is believed to bypass the exports to semi-regulated markets with a projected annual growth rate of about 34%. (KPMG, Sept 2008)

One pattern observed both during the interviews with companies in India and in various reports, is that as competition intensifies, more companies are exploring high-complex generics in segments such as oncology, peptides, dermatology etc. This type of operations requires dedicated production equipment, as opposed to equipment that can be used for multiple products, and creates a high barrier of entry. As a result, these segments enable higher margins.
4.2.5 API Exports

A majority of the pharmaceutical companies in India are producing both the final generics and unformulated APIs; APIs are produced both for internal use and sold externally – either on a contract or to the open market. (Johansson, I Oct 2008; Hariharan, 25 Sept 2008) India is among the top five largest producers of APIs in the world and about 80-90 per cent of the APIs produced are being exported. Demand for API derives from semi-regulated markets, e.g. China and Russia, generics players and innovator companies: total demand grew at a CAGR of about 31% between 2000 and 2005. (Ernest & Young, July 2008) As Figure 13 illustrates, semi-regulated markets account for a majority of the export. However, demand from the regulated markets is projected to be the key driver in growth since it has been growing at a faster rate. In addition, the share of pharmaceuticals sold to innovators of the total exports has increased and is projected to reach about 15% in 2011/12. (KPMG, Sep 2008)

![Bulk Drug Exports by India](image)

Figure 13. Projected bulk drug/API export to innovator companies, generic players and semi-regulated markets (KPMG, Sept 2008)
ed market, the company needs to file a DMF (Drug Master File) and get it approved. This is needed both for new drugs and known molecules. The number of DMF filings in an Indian pharmaceutical company is an indicator of the range of products the company has and the number of products that it will launch in the coming years. DMF filings from India composed 46% of the total DMF filings with US FDA in 2007. Responding number in 2000 was 15%. (KPMG, Sept 2008)

### 4.2.6 Research Activities

The research activities on the pharmaceutical market in India have traditionally been focused on generics. The objective of generics research is to develop a process for producing an already known API and then to formulate it in a way so that it is safe and appealing to the customer. Furthermore, the objective of the research is to optimize the API process. Optimization could involve reducing the number of reaction steps or improving the percentage of the raw material that is converted into the final product. The percentage obtained from each reaction is called the yield and is typically 70-95% in each reaction step (Jönsson, 10 Sept 2008). Generics research typically includes three different areas. One research area is API research, or chemical research for API, which includes organic synthesis and process development for an already known API. This is done by reversed engineering. Another research area is formulation research, which includes New Drug Delivery System (NDDS), i.e. distributing the drug as a capsule or chewing gum instead of a tablet. It also involves mixing the API with the right ingredients so that it functions the way it is supposed. A third research area is analytical development, which involves identifying the impurities, i.e. the bi-products that are created, and investigating the characteristics of these, which requires a lot of analytical tools. (Company Case studies, 3-14 Nov 2008)

In addition to the above, some pharmaceutical companies in India are developing processes in the CRAMS business. This is either a pure contract research assignment or, more commonly, the innovator company wishes to outsource the production of a certain API and the Indian company develops a process to do this before starting the production. It could also involve an established process that the innovator company wishes to optimize. (Company Case studies, 3-14 Nov 2008)

As opposed to global pharmaceutical companies, Indian pharmaceutical companies have traditionally not focused on discovery research. This is however changing since several Indian companies are striving to move up the value chain, and have begun doing discovery research. The enactment of
the patent legislation in 2005 has further acted as a catalyst in this trend. The annual R&D spend of Indian companies has had a CAGR of about 38% between 2000 and 2005. Between 10 and 20 Indian companies are estimated to conduct discovery research, and given the presence of a large number of projects in clinical phase I and clinical phase II, some of these projects are likely to approach commercialization over the next 2-3 years. (Ernest & Young, July 2008) The drug development pipeline of some of the key R&D companies for 2006 can be found in Appendix B.

One trend within R&D in India is collaboration with a global pharmaceutical company. A growing number of drug discovery and development partnerships between Indian pharmaceutical companies and the Big Pharma have been established, either through in-licensing, out-licensing or joint development. (KPMG, Sept 2008)

Another trend among the Indian pharmaceutical companies that are conducting discovery research is to demerge the discovery research from the generics business. Traditionally, the resources for discovery research have derived from the generics business, and the price pressure in this market is considered to be a potential threat for further funding in the drug development value chain. As a result, a number of pharmaceutical companies are separating the drug discovery from the generics business to improve focus on drug discovery. (KPMG, Sept 2008) Examples of demergers in 2007/08 are Nicolas Piramal that was divided into Piramal Healthcare and Piramal Life Science, and Glenmark that was divided into Glenmark Pharmaceuticals and Glenmark Generics.

4.3 Geographic Distribution of the Market

The Indian pharmaceutical market has some defined manufacturing and R&D clusters. Most companies have the headquarters in Mumbai but production is located mainly in Western India (Gujarat), Hyderabad and a part of North India called Himachal Pradesh. (Shetty, 11 Nov 2008) The interviewed companies often had a number of production locations, and R&D facilities were usually distributed at the production facilities except for one or a few, central R&D facilities, which were either located in connection to the corporate office, or in connection to a major plant.

Traditional manufacturing clusters are limited to a few Indian states such as Andhra Pradesh (Hyderabad), Gujarat (Ankleshwar and Ahmedabad), Maharashtra (Mumbai and Pune) and Goa. India has however witnessed a
movement of the pharmaceutical companies to new locations. Primary factors supporting the clustering are environmental issues, space constraints, and incentives offered by a few developing states such as Himachal Pradesh. (Ernest & Young, July 2008) Figure 14 illustrates the manufacturing clusters (left picture). The clusters visited for the interviews, and where a majority of the top Indian pharmaceutical companies are located, are Gujarat – particularly Ankleshwar and Ahmedabad – and Andhra Pradesh, where Hyderabad with surroundings is a pharmaceutical hub. Visakhapatnam (Vizag) is said to be the upcoming API cluster. (Ernest & Young, July 2008)

**Key Manufacturing Clusters**

<table>
<thead>
<tr>
<th>Traditional Bulk Drugs Cluster</th>
<th>Traditional Formulation Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gujarat - Ahmedabad, Ankleshwar, Vapi, Vadodara</td>
<td>Goa, Mumbai, Pune, Hyderabad</td>
</tr>
<tr>
<td>Maharashtra - Mumbai, Thane, Aurangabad, Pune, Andhra Pradesh - Hyderabad, Medak</td>
<td>Tamil Nadu - Chennai</td>
</tr>
<tr>
<td>Andhra Pradesh - Vizag, Pondicherry</td>
<td>Pondicherry</td>
</tr>
<tr>
<td>Karnatak - Mysore, Bengaluru, Goa</td>
<td>Tamil Nadu - Chennai</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emerging Bulk Drugs Cluster</th>
<th>Emerging Formulation Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh - Vizag</td>
<td>Himachal Pradesh - Baddi</td>
</tr>
<tr>
<td>Uttarakhand - Chamoli</td>
<td></td>
</tr>
</tbody>
</table>

Figure 14. Manufacturing clusters in the pharmaceutical industry in India. (Ernest & Young, July 2008)

The R&D clusters have been limited to the established pharmaceutical regions in the country. In addition there is an R&D cluster in the north of India, called the National Capital Region (NCR). Important R&D locations among the interviewed companies were Ahmedabad, Mumbai and Pune.

### 4.4 Summary of the General Market Study

Chapter four addressed three overall areas: business activities on the pharmaceutical and fine chemistry market in India, market structure, and geographical distribution. The first section explained that the fine chemistry
industry and the pharmaceutical industry in India are closely linked together since many companies operate in both. This is furthermore one difference in India compared to e.g. Europe and US. Another difference is that generics is the main business, which makes the product portfolio in India much larger. The second section showed that the Indian market has a favorable size and growth, and that one trend is that more Indian pharmaceutical companies have begun discovery research. The third section illustrated manufacturing and R&D clusters in India, which for instance highlighted Gujarat as a manufacturing cluster and Mumbai as an R&D cluster.
Chapter 5 presents the result from the interviews made with Indian companies operating in the pharmaceutical industry. The interviews involved three major areas that will be described in section 5.1-5.3: questions about the companies’ business and interest for the Product to enable a segmentation and selection of a target group, questions about the companies purchasing process, and questions to identify customer values and support needed if purchasing the Product.

As presented in Figure 15, the empirical findings in chapter five contribute to purpose two, three and four. The first section presents details about the interviewed customers and how this relates to the company’s interest for the Product. The buying behavior section contributes to understanding the decision process and identifying the buying unit. The third section presents the customer values, factors that influence the decision, and support needed if purchasing the Product. This is closely connected to the last purpose.

5.1 Results to support Market Segmentation and Target Group Selection

5.1.1 Key Players on the Market

A major part of the General market study was to identify the key players on the market. Companies were identified through various lists on the Internet and were investigated more thoroughly through homepages and annual
reports. The result is presented in Table 3. Be aware that the fiscal year is Jan-Dec in some companies and April-March in other companies. Furthermore, a part of the revenue is devoted to non-pharmaceutical businesses in some companies. Consequently, the list should not be considered to have an exact order but it indicates which Indian companies are among the 30 largest and approximately how the companies are ranked. Interviews were made with companies that are marked grey. The selection was primarily based on size, R&D spends and to what extent the company was more into generics than API. In addition, Hikal and Dishman were chosen to verify previous assumptions that the target group would be more pharmaceutical companies than CRAMS companies. Finally, availability and chance affected the selection of IPCA, Reliance Life Science and Cadila Pharmaceuticals.

5.1.2 Attitude Towards the Product

Table 4, Table 5 and Table 6 will contain compiled information obtained from the interviews. All three tables include a column named “Product Interest”, which refers to a subjective grading that we made after the interviews: 5 means that the company seems to be very interested in the Product, whereas 1 means that the company could not see any use of the Product. Companies graded 4-5 are marked in green, companies graded 3 are marked in orange and companies graded 1-2 are marked in red. The grading is based on the general impression obtained from the interviews, together with the answer on two direct questions regarding the interest for the Product. The first question concerns the percentage of the company’s processes that could benefit from continuous production with the Product. The second question concerned if the Product was of interest for the company. A table presenting the results from the questions is available in Appendix C.

According to the subjective grading we made, three groups can be observed: the interested green group, the uncertain orange group and the uninterested red group. The green group consists of Cipla, Piramal Healthcare, Lupin Ltd, Zydus Cadila and Ipca. The orange group consists of Dr. Reddy, Cadila Pharmaceuticals, Reliance Life Science and Hikal. The red group consists of Dishman, Sun Pharmaceutical and Glenmark Generics. This color scheme is used in order to enable an understanding of common characteristics for companies that show an interest.

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2 Reliance Life Science is part of the Reliance Group, which is India’s 2nd largest company and operates within e.g. oil and refinery. Pharmaceuticals is a new initiative: they are setting up a large API facility and hope to have a turnover of about Rs 5 Bn in a few years.
Table 3. Key players on the Indian pharmaceutical and fine chemistry market (homepages and annual reports)

<table>
<thead>
<tr>
<th>Company</th>
<th>Global Sales (M Rs)</th>
<th>Growth (%)</th>
<th>R&amp;D spends</th>
<th>NCE research?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranbaxy Laboratories Limited</td>
<td>66927</td>
<td>22%</td>
<td>7.0%</td>
<td>Yes, Japan</td>
</tr>
<tr>
<td>Dr. Reddy’s Laboratories</td>
<td>50006</td>
<td>-23%</td>
<td>7.0%</td>
<td>Yes</td>
</tr>
<tr>
<td>Cipla</td>
<td>44290</td>
<td>18%</td>
<td>5.0%</td>
<td>Yes</td>
</tr>
<tr>
<td>Sun Pharmaceuticals</td>
<td>34606</td>
<td>57%</td>
<td>9.0%</td>
<td>Yes</td>
</tr>
<tr>
<td>Piramal Healthcare¹</td>
<td>28728</td>
<td>16%</td>
<td>3-4%</td>
<td>No</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>27730</td>
<td>34%</td>
<td>7.5%</td>
<td>Yes</td>
</tr>
<tr>
<td>Wockhardt</td>
<td>26532</td>
<td>53%</td>
<td>5.7%</td>
<td>Yes</td>
</tr>
<tr>
<td>Jubilant Organosys</td>
<td>24889</td>
<td>38%</td>
<td>3.6%</td>
<td>Yes</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>22660</td>
<td>27%</td>
<td>8.8%</td>
<td>Yes</td>
</tr>
<tr>
<td>Aurobindo Pharma Ltd</td>
<td>22347</td>
<td>19%</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Glenmark Pharma Ltd²</td>
<td>20092</td>
<td>61%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>GlaxoSmithKline Pharma, Ltd</td>
<td>17128</td>
<td>2%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Torrent Pharma</td>
<td>13123</td>
<td>4%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Orchid Pharmaceuticals</td>
<td>12389</td>
<td>36%</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>IPCA Labs</td>
<td>10419</td>
<td>15%</td>
<td>N/A</td>
<td>Some activity</td>
</tr>
<tr>
<td>Divi’s Laboratories</td>
<td>10332</td>
<td>43%</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Atul Limited</td>
<td>10137</td>
<td>11%</td>
<td>1%</td>
<td>No</td>
</tr>
<tr>
<td>Cadila Pharmaceuticals</td>
<td>10 000⁶</td>
<td>N/A</td>
<td>N/A</td>
<td>Some activity</td>
</tr>
<tr>
<td>Matrix Laboratories</td>
<td>7495</td>
<td>12%</td>
<td>11 %</td>
<td>No</td>
</tr>
<tr>
<td>Abbott</td>
<td>5943</td>
<td>16%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Elder Pharmaceuticals</td>
<td>5512</td>
<td>23%</td>
<td>0.5%</td>
<td>No</td>
</tr>
<tr>
<td>Shasun Chemicals and Drugs Ltd.</td>
<td>4318</td>
<td>7%</td>
<td>4,8 %</td>
<td>N/A</td>
</tr>
<tr>
<td>Strides Arcolab</td>
<td>4031</td>
<td>-11%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dishman Pharma. &amp; Chemicals Ltd.</td>
<td>3592</td>
<td>31%</td>
<td>0.61%</td>
<td>No</td>
</tr>
<tr>
<td>Hikal Ltd.</td>
<td>3117</td>
<td>27%</td>
<td>3 %</td>
<td>No</td>
</tr>
<tr>
<td>Wanbury Ltd.</td>
<td>2200</td>
<td>52%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TTK Healthcare Ltd</td>
<td>1990</td>
<td>-6%</td>
<td>0.13 %</td>
<td>N/A</td>
</tr>
<tr>
<td>RPG Life Sciences</td>
<td>1277</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Siven Life Science</td>
<td>1200</td>
<td>6%</td>
<td>25 %</td>
<td>N/A</td>
</tr>
<tr>
<td>Qualigenz Fine Chemicals</td>
<td>1000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Alkem Pharmaceuticals</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Reliance Life Science</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
</tbody>
</table>

¹ 1 Rupee is about 0.02 USD. Ranbaxy’s turnover would then be USD 1200 Mn. In comparison, the pharma company ranked 1<sup>st</sup> and 20<sup>th</sup> in the world had a turnover of about USD 44 400 Mn and 4 300 Mn respectively in 2007. (Contract Pharma, Dec 08)

² Company divided into Piramal Life Science and Piramal Healthcare

³ Company divided into Glenmark Pharmaceuticals and Glenmark Generics

⁴ Rough estimation based on turnover in 2004. Is said to be among the top 18<sup>th</sup> in size.
5.1.3 The Interviewed Companies in a Nutshell
Table 4 illustrates the general businesses of the interviewed companies, sorted by sales. Note that API sales and formulation sales in some cases are based on approximate estimations derived from the interviews. Table 4 does not illustrate any clear relation between the company’s interest for the Product and their type of business, however two indications can be highlighted. First, the larger companies seem to be more interested. Second, companies that are doing discovery research are slightly more interested than the companies that are not doing discovery research.

5.1.4 Product Portfolio
The product portfolios of the Indian companies cover a wide range of products in a wide range of therapies. The four basic revenue streams identified from the interviews were finished formulations, APIs, biotechnology and non-pharma products e.g. specialty chemicals or veterinary products. The two later are not as common and typically constitute a very small part of the business. The percentage of revenues originating from formulations partly depends on the extent to which the company is doing CRAMS and whether the company’s background is generics or fine chemistry.

For most of the interviewed companies, some 60-85 % of the turnover originates from formulations. The companies with the greatest part of revenues from formulations were Sun Pharmaceuticals, Cipla, Zydus Cadila, Ipca and Glenmark Generics. These companies either had a small CRAMS business or no CRAMS business at all. The number of finished formulations, i.e. the total product range including different versions of the same medicine, was several hundred for most interviewed companies, and some had more than a thousand. The exception was Dishman and Hikal – the two companies that were more CRAMS companies than pure pharmaceutical companies – which only produced intermediates and APIs and no finished formulations. Most of the APIs that go into the companies’ finished formulations are produced in-house, but when volume or cost cannot justify in-house production APIs are sourced from outside. Sourced APIs is one explanation for the large difference between the number of APIs produced and the number of formulations sold. Another, more important, explanation is that each API is used for a variety of finished formulations e.g. injectable and tablet.
The second largest revenue stream is sales from API. Since CRAMS to a large part consists of API manufacturing, the extent to which the company is involved in CRAMS influence the part of revenues originating from API sales. Of the interviewed companies were Hikal, Dishman and Piramal Healthcare the three companies that had a large part of revenues from APIs.

### 5.1.5 API Development

All interviewed companies developed the API process internally and the way the APIs are developed is similar in all companies. For a generic drug, Table 4. Some key information about the interviewed companies (Company Case Studies).

<table>
<thead>
<tr>
<th>Company</th>
<th>CRAMS?</th>
<th>Discovery research?</th>
<th>Approx. No of APIs</th>
<th>Product interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr.Reddy</td>
<td>Yes</td>
<td>Yes</td>
<td>120</td>
<td>3</td>
</tr>
<tr>
<td>Cipla</td>
<td>Yes: small extent</td>
<td>Yes</td>
<td>180</td>
<td>4</td>
</tr>
<tr>
<td>Sun Pharmaceuticals</td>
<td>No</td>
<td>Yes</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>Piramal Healthcare</td>
<td>Yes: large extent</td>
<td>No</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>Yes: small extent</td>
<td>Yes</td>
<td>65</td>
<td>5</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>Yes</td>
<td>Yes</td>
<td>55</td>
<td>4</td>
</tr>
<tr>
<td>Ipca</td>
<td>No</td>
<td>Some activity</td>
<td>60</td>
<td>5</td>
</tr>
<tr>
<td>Cadila Pharmaceuticals</td>
<td>Yes</td>
<td>Some activity</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>Glenmark Generics</td>
<td>No</td>
<td>No</td>
<td>55</td>
<td>2</td>
</tr>
<tr>
<td>Reliance Life Science</td>
<td>Yes</td>
<td>No</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Dishman</td>
<td>Yes: large extent</td>
<td>No</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Hikal</td>
<td>Yes: large extent</td>
<td>No</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>Global Sales</th>
<th>Indian Sales</th>
<th>Approx. API sales</th>
<th>Approx. Formulation sales</th>
<th>Product interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr.Reddy</td>
<td>50006</td>
<td>21 %</td>
<td>30 %</td>
<td>70 %</td>
<td>3</td>
</tr>
<tr>
<td>Cipla</td>
<td>44290</td>
<td>49 %</td>
<td>20 %</td>
<td>80 %</td>
<td>4</td>
</tr>
<tr>
<td>Sun Pharmaceuticals</td>
<td>34606</td>
<td>45 %</td>
<td>20 %</td>
<td>80 %</td>
<td>1</td>
</tr>
<tr>
<td>Piramal Healthcare</td>
<td>28728</td>
<td>N/A</td>
<td>50 %</td>
<td>50 %</td>
<td>3</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>27730</td>
<td>45 %</td>
<td>35 %</td>
<td>65 %</td>
<td>5</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>22660</td>
<td>N/A</td>
<td>20 %</td>
<td>80 %</td>
<td>4</td>
</tr>
<tr>
<td>Ipca</td>
<td>10419</td>
<td>48 %</td>
<td>25 %</td>
<td>75 %</td>
<td>5</td>
</tr>
<tr>
<td>Cadila Pharmaceuticals</td>
<td>10000</td>
<td>N/A</td>
<td>30 %</td>
<td>45 %</td>
<td>3</td>
</tr>
<tr>
<td>Glenmark Generics</td>
<td>7903</td>
<td>N/A</td>
<td>25 %</td>
<td>75 %</td>
<td>2</td>
</tr>
<tr>
<td>Reliance Life Science</td>
<td>50000</td>
<td>N/A</td>
<td>40 %</td>
<td>60 %</td>
<td>3</td>
</tr>
<tr>
<td>Dishman</td>
<td>3592</td>
<td>32 %</td>
<td>100 %</td>
<td>0 %</td>
<td>1</td>
</tr>
<tr>
<td>Hikal</td>
<td>3117</td>
<td>21 %</td>
<td>100 %</td>
<td>0 %</td>
<td>3</td>
</tr>
</tbody>
</table>

The second largest revenue stream is sales from API. Since CRAMS to a large part consists of API manufacturing, the extent to which the company is involved in CRAMS influence the part of revenues originating from API sales. Of the interviewed companies were Hikal, Dishman and Piramal Healthcare the three companies that had a large part of revenues from APIs.

#### 5.1.5 API Development

All interviewed companies developed the API process internally and the way the APIs are developed is similar in all companies. For a generic drug,
the company starts by searching the market for available patents and do lab experiments. (Gupte & Hedaoo, 11 Nov 2008) At this stage it is important to evaluate how well the product will be doing: what are the market requirements and can it be produced cost effectively? (Srivastava & Iyer, 14 Nov 2008) For instance, about one third of the products at Cipla are stopped half way in the development. (Rao, 13 Nov 2008) Scientists that work under a company unit, called e.g. chemical development group or chemical research for API, which is located at a central R&D unit, do the basic research behind the development. When the API has been developed at lab scale and the chemical route has been chosen, the API must be scaled-up to commercial level. This is major part of the process development for the Indian pharmaceutical companies. The product is first produced in gram labs, then in kilo labs, then at pilot plant, and finally at commercial scale. (Thyagarajan & Bhadwaj, 3 Nov 2008) Pilot plants are located at the plant where the scale-up is taken care of. Scale-up and process optimization is handled by a group that usually is called process engineering, or process development group (chemical engineers), and is located close to the plant. (Rao, 13 Nov 2008) When the process development is finalized, the technology has to be transferred to the commercial production team. In many cases, the company has a certain group of engineers that handles the transfer from R&D or process development to the commercial production. The group is called transfer technology group or technology absorption team.

The time it takes to develop a new API does not differ greatly between the companies but differs from molecule to molecule, and is determined by the number of reaction steps, complexity of the molecule and availability of raw materials. The development time could be anywhere from three months to two years. One exception is Dishman where development takes less than two months (missing answer from Hikal, but it is likely similar to Dishman). At Glenmark Generics for instance, it normally takes 6-7 months excluding the transfer to pilot plant and plant scale. (Srivastava & Iyer, 14 Nov 2008) Furthermore, it takes about 1.5-2 months for validation and 4-6 months for construction of the plant, however these two processes are run somewhat parallel to the other development.

5.1.6 Scope of Current and Future Production

The interviewed companies were asked to answer questions about the number of products produced, the complexity of the products, the number of batch reactors in the company, to what extent the company produces or sources intermediates, and whether the reactors are used for many different
products or if the reactors are dedicated to one or a couple of products. The result is presented in Table 5 and is explained in this section.

Table 5 shows that the companies that are producing more intermediates in-house showed a greater interest for the Product. Furthermore there are indications that companies producing in larger quantities and have more dedicated production facilities are more interested, while the number of batch reactors operated by the company is not a determining factor.

<table>
<thead>
<tr>
<th>Company</th>
<th>Production volume</th>
<th>No of batch reactors</th>
<th>Dedicated equipment</th>
<th>Intermediates Production</th>
<th>Product interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Reddy</td>
<td>Produces more large scale</td>
<td>500 (maybe 1000)</td>
<td>70 % (about 2-3 changes/year)</td>
<td>Buy some and produce some.</td>
<td>3</td>
</tr>
<tr>
<td>Cipla</td>
<td>Produces both large &amp; small scale</td>
<td>500 (Around)</td>
<td>5 % (about)</td>
<td>Balance between buying and making</td>
<td>4</td>
</tr>
<tr>
<td>Sun Pharma.</td>
<td>Produces both large &amp; small scale</td>
<td>200 (At least)</td>
<td>0 % (all on campaign)</td>
<td>produce some, purchase some</td>
<td>1</td>
</tr>
<tr>
<td>Piramal Hlth. care</td>
<td>Produces more large scale</td>
<td>500 (Maybe around)</td>
<td>30 % (around)</td>
<td>Large molecules: produce. Small molecules: source.</td>
<td>3</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>Produces more large scale</td>
<td>300 (Maybe)</td>
<td>75 % (to 80%)</td>
<td>Most are produced from scratch</td>
<td>5</td>
</tr>
<tr>
<td>Zydus Ltd</td>
<td>Produces both large &amp; small scale</td>
<td>300 (Maybe)</td>
<td>5 % (2-3 products are dedicated)</td>
<td>about 50-70% is produced from scratch.</td>
<td>4</td>
</tr>
<tr>
<td>Jpea</td>
<td>Produces more large scale</td>
<td>200 (More than)</td>
<td>20 % (About)</td>
<td>Most are produced from scratch</td>
<td>5</td>
</tr>
<tr>
<td>Cadila Pharma</td>
<td>Produces more large scale</td>
<td>100 (More than)</td>
<td>3 % (3 reactors)</td>
<td>Some produced from scratch</td>
<td>3</td>
</tr>
<tr>
<td>Glenmark Generics</td>
<td>Produces more small scale</td>
<td>140 (About)</td>
<td>0 % (all multiple purpose)</td>
<td>Mostly they buy.</td>
<td>2</td>
</tr>
<tr>
<td>Reliance L.S.</td>
<td>50 reactors by 2009. 150 reactors by 2011</td>
<td>Initially multipurpose</td>
<td>Mainly source intermediates initially</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dishman</td>
<td>Produces both large &amp; small scale</td>
<td>400 (Maybe)</td>
<td>10 % (about 10-15 %)</td>
<td>Yes, produce intermediates.</td>
<td>1</td>
</tr>
<tr>
<td>Hikal</td>
<td>Produces more small scale</td>
<td>32</td>
<td>15 % (4-5 reactors)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

5.1.6.1 The number of APIs Produced by the Companies

The number of APIs produced for the interviewed companies is illustrated in Table 4. In general, larger companies produce a larger number of products. It is however not a linear relationship saying that the largest company produces the largest number of products. One factor positively
affecting the number of products is the extent to which the company focuses on the domestic market. The three largest companies – Dr. Reddy, Cipla and Sun Pharmaceuticals – are producing 100-200 APIs. Another group of companies, consisting of Lupin, Zydus Cadila, Ipca, Cadila Pharmaceuticals and Glenmark Generics, are producing about 50-70 APIs. The last group of companies consists of Piramal Healthcare, Dishman, Hikal and Reliance Life Science and produces 7-30 APIs. This group, except for Reliance Life Science, has a larger focus on CRAMS than the other companies interviewed. Reliance Life Science just began operation and is investing heavily why it will likely be closer to the second group in the long run.

5.1.6.2 Production Volume

Results regarding the companies’ production volumes were rather difficult to compile. First, the production range varied greatly from product to product in all companies. Second, the companies had different perspectives on what small and large scale was, and quantified the answer in reference to the areas where reasonable assumptions could be made. Some companies did however relate the production volume to competitors’ production volumes. Based on this, and the numbers concerning volume and dedicated equipment, have the companies’ production volume been grouped into “produces more large scale”, “produces both large & small scale” and “produces more small scale”.

The volume produced of one API varies between grams and more than 100 tons/month. (Chunodkar, 14 Nov 2008) How many products that are produced in small and large scale varies somewhat between the companies but in general a small part of the products are produced in small volumes and a small part of the products are produced in very large volumes, whereas the majority is produced at 1-10 tons per month. Maximum amount produced of a product was between 50 and 100 tons/month for a few companies, e.g. Lupin and Ipca, whereas 8-12 tons/month was the maximum in for instance Zydus Cadila. Table 5 moreover illustrates that the quantity produced of a product is related to how many dedicated reactors the company has, since dedicated facilities are used for high volume products. For instance, Glenmark Generics stated that the volumes produced were smaller than the competitors’ volumes, and that the company had no dedicated facilities. (Srivastava & Iyer, 14 Nov 2008) Lupin Ltd said that they produced in larger quantities and had 75-80 % dedicated facilities. Sun Pharmaceutical answered that they had no dedicated equipment, which is not aligned with the quantities produced by the company. An explanation could be that the interviewed person might have referred to completely
dedicated facilities, whereas other interviewed persons might have included equipment used for 2-3 products as well.

As can be seen from Table 5, the number of batch reactors in each company varies. Companies with more than 400 batch reactors are Dr. Reddy, Cipla and Piramal Healthcare. The other companies have in general 150-300 reactors.

5.1.6.3 Complexity of the Products

The number of reaction steps a company uses to produce an API depends on the complexity of the product – some molecules require a large number of steps and some require a smaller number of steps – and whether the company produces or sources the intermediates. Reactants that are used in the early reaction steps are less complex and do not need as stringent approvals as the reactants in the final steps. As a result, the chemicals used for early reaction steps are sometimes purchased from outside to save money and time. In general, the companies answered that there were around five reaction steps for each API, excluding the intermediates. Several companies mentioned that there are products that require more than 10 steps, however these were not common. Consequently the differences lie more in whether the company chooses to produce or source the intermediates. The majority of the interviewed companies answered that there is a balance between purchasing and sourcing the intermediates. Piramal Healthcare produces the large-scale intermediates whereas they source small-scale intermediates (Naik & Roy, 12 Nov 2008). This is most likely applicable to the other companies since small-scale producer Glenmark Generics buys most of the intermediates, and large-scale producers Lupin Ltd and Ipca produce most APIs from scratch.

5.1.6.4 Operations Today and Tomorrow

During the interviews questions were asked concerning the extent to which the company is using continuous processes today (supporting processes can be made continuously even though the reaction is not done continuously), and what future trends there are within operations.

The result showed that operations of the pharmaceutical companies today are largely handled manually. Half of the companies answered that no processes are handled continuously and two thirds answered that micro reactors⁹ are not being used in the labs. Of the four companies that are using

⁹ A micro reactor is a continuous reactor that shares some of the advantages with the Product but handles very small quantities.
micro reactors have none showed an increased interest for the Product. A few companies answered that filtration and distillation sometimes are done continuously. The companies that seem to be on the higher side for having tried continuous are Lupin Ltd, Piramal Healthcare and Dr. Reddy. The two first have semi-continuous production for one product, and Dr. Reddy have some continuous processes and have tried continuous at pilot plant a couple of times. (Bhatt & Patel, 7 Nov 2008. Naik & Roy, 14 Nov 2008. Chaudhary & Kelkar, 3 Nov 2008). Of the four companies that are considered most interested, three have some experience from continuous processes and/or have considered trying continuous production.

A number of different aspects were highlighted during the discussions concerning what future trends the interviewed person saw within operations. First, a few companies discussed changes in the product portfolios. Half of the companies said that there is an increased focus on more complex, high value, low volume products, e.g. oncology molecules, hormones and steroids (Chaudhary & Kelkar, 3 Nov 2008). At the same time several companies, e.g. Ipca and Zydus Cadila are increasing the focus on high volumes, which makes the gap larger between the small-scale and large-scale products. In addition, the companies are increasingly pursuing regulated markets. According to the persons interviewed at Reliance, as more markets are becoming regulated, processes will change more slowly than today, and in that sense, automation will be very useful. (Gupte & Hedaoo, 11 Nov 2008). Automation is moreover the second trend that was raised during the interviews. Because manpower in India is less expensive than in many other countries, incentives for automation have been few (Dhotre, 6 Nov 2008). The automation trend will be a slow process since capital investments are high, but there will have to be a shift (Kumar, 13 Nov 2008).

Additional trends are safer and more environmental friendly processes, and an increased focus on multiple purpose plants. (Gupte & Hedaoo, 11 Nov 2008. Thyagarajan & Bhardwaj, 3 Nov 2008)

5.1.7 Process Characteristics
Since the Product only can be used for certain processes, a part of the interviews was dedicated to questions regarding the company’s processes. The use of the Product is limited to reactions that are liquid-to-liquid (i.e. it only handles small amounts of solids) and reactions that are fast. Moreover, it is best suited with reactions that generate heat, called exothermic reactions, and it is efficient for mixing the reactants. In addition, it makes certain processes safer, which might allow reactions that companies today
avoid or outsource. Consequently, the questions aimed at understanding if the characteristics of the company’s processes matched the benefits of the Product. The result from this part of the interview is presented in Table 6.

5.1.7.1 Reactions Containing Solids
One challenge illustrated by Table 6 is that only a small part of the reactions do not contain solids; the majority answered that less than 10 % are liquid-to-liquid reactions. Since the Product can handle small amounts of solids, and reactants can resemble liquid reactions when mixed with solvents, this limitation is not necessarily as large as 90% of all reactions, yet it is a limiting factor that must be addressed. At around 25%, Piramal Healthcare and Lupin Ltd are the companies with the highest percentage of reactions that do not contain solids.

5.1.7.2 Reaction Time
Another challenge apparent from Table 6 is the reaction time. In most companies the reaction time ranges from minutes to one or two days, while 2 to 8 hours seem to be most common. Comparing this result with the capability of the Product is however somewhat complicated, since some reaction take a long time in a batch reactor but are fast enough if transferred to the Product. Dishman, Glenmark Generics and Ipca are the companies that seem to have longer reaction times. Because of uncertainties, both in the data gathered and in what the reaction time would be with the Product, reaction time will be difficult to use to separate the companies.

5.1.7.3 Highly exothermic reactions
A third subject illustrated in Table 6 is the extent to which the interviewed companies have exothermic reactions (reactions that generate heat). A few companies – e.g. Sun Pharmaceuticals, Glenmark Generics and Cadila Pharmaceuticals – say that very few reactions are highly exothermic since these types of reactions are avoided or outsourced (Rehani, 6 Nov 2008). The other companies have about 5-15 % highly exothermic reactions. Companies with more highly exothermic reactions seem to be slightly more interested in the Product.
### 5.1.7.4 Other Characteristics

Two other areas investigated were the extent to which the company had processes where mixing is a problem, and to what extent current batch reactors are limiting the development of new products. The outcome from the discussions about challenges in mixing was the same in most companies; most reactions require good mixing, but the nature of the mixing varies from reaction to reaction and is handled either by phase catalyst or by the speed.
and design of the propel. The discussions will not be described in detail since it would not contribute to the purposes of the master thesis.

The outcome of the other area – safety limitations in the batch reactor for developing certain processes – is presented in Table 6. Two thirds of the companies (8 companies) have agreed that there are some reactions that are avoided with the batch reactor, either because it is highly exothermic or because it is poisonous. There is no clear relationship between the companies that answered that certain products were not produced because of safety, and the companies that have shown interest in the Product. The reason could be that this did not seem to be a great issue for the interviewed companies.

5.2 Buying Behavior in the Studied Companies
Compared to the Company’s other products, the Product will have a more central role in the business of the pharmaceutical companies. As a result, new ways of approaching a potential customer could be needed, and it is important to understand the customer’s buying behavior. One part of the interviews was therefore dedicated to understanding how the decision is made, where the Product should be introduced, and what parts of the customer’s organization that will be involved in the decision. The results from the four areas are presented in section 5.2.1-5.2.4.

5.2.1 Purchasing Processes
The purchasing process for a new process technology is similar in the companies, as described by the interviews. The timing of the decision can either be in the last quarter when the budget is established (Chakraborty, 5 Nov 2008), when a new plant is being built and the basic design is decided upon (Chunodkar, 14 Nov 2008) or, most commonly, when the process for a certain product is being transferred from R&D to process engineering who determines what type of equipment is needed for producing the Product. Typically, this could be 3-4 months into the development. (Damodaran, 11 Nov 2008) Most of the times, process engineers can utilize available equipment, but new technology must be purchased if the available equipment isn’t suitable. (Rehani, 6 Nov 2008)

Depending on the background, the need for new process technology originates from process engineering\textsuperscript{10}, technical team\textsuperscript{11}, R&D, the projects

\textsuperscript{10} Chemical engineers handling the process scale-up from lab to plant level.
organization, or sales & marketing. Sales & marketing was mentioned only by two companies, while the common answer was that R&D or process engineering flagged for the need and described the requirements. Many of the companies said that a technical team refined the requirements for the purchase and developed different alternatives (Gupte & Hedao, 11 Nov 2008). The cross functional team evaluates and makes the recommendation to the decision maker. (Srivastava & Iyer, 14 Nov 2008) Process engineering and the technical team work close to each other. (Chaudhary & Kelkar, 3 Nov 2008) Once the specification has been done it is floated around to different vendors via the projects organization and the vendors come back with an offer. For each quotation there is a technical discussion to accept or not accept. Once that is done, the technical comparison is sent to the commercial team (or called purchase team or procurement team) to handle the negotiations with the supplier. (Damodaran, 11 Nov 2008) Furthermore, Cipla highlighted that once the project is finalized it is handed over to the central part, which circulates it to other production units. (Pawar & Dorlikar, 12 Nov 2008)

5.2.2 Introducing the Product in New or Established Processes?
The chemistry involved in pharmaceuticals is not so complex compared to e.g. specialty chemicals. However, production regulations are much more stringent for pharmaceuticals (Bhoosmurmath, 8 Nov 2008). As a result it becomes expensive and time consuming to change a process that has already gone through all approvals. To understand whether the Product can replace existing processes or should focus on new products, one question during the interviews concerned if it was possible to change an established process. All companies answered that it was complicated to change an established process since new DMF (Drug Master File) were required, but the change was possible if the new technology proved to be very beneficial. The first step for changing an established process would be to have the facility on pilot level where the stability is tested. The next step would be to go for process change applications to the FDA, which can take 12-18 months in approval time. Once that is finalized and there is a confidence for the Product in the company the process can be transferred to production plant. The total cycle time could be as much as 24 months in some cases. (Chunodkar, 14 Nov 2008) For the APIs that are produced for other companies, there is a resistance from the customers to change an established

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11 A cross functional team consisting of senior persons from functions such as R&D, production, quality and engineering
12 The unit that works with designing new plants and modifying current facilities
13 GMP - Good Manufacturing Practice are regulations for producing pharmaceuticals
process, since the customer many times need to get new approvals as well and there is a risk that the supply will be interrupted. (Thyagarajan & Bhardwaj, 3 Nov 2008; Rao, 13 Nov 2008; Dhotre, 6 Nov 2008)

Even though it is quite challenging to change current processes, the regulatory issues are not as stringent for all processes. Products that are sold in India do not need DMF approvals why it is less challenging to change those processes. (Rao, 13 Nov 2008) Furthermore, early stage intermediates do not always require approvals. (Pawar & Dorlikar, 12 Nov 2008)

5.2.3 Buying Center
The Product will be used for producing APIs, intermediates, other fine chemicals or specialty chemicals. Following the discussion about changing an established production process, the Product will probably have to be introduced at lab level or pilot plant level. Consequently, there are some uncertainties concerning what part of the company that will be most interested and what part that will take the final decision. The companies were asked to describe which part of the company that would be involved in the decision for purchasing the Product: who would create the interest, who would make the final decision, and what other parties would influence the decision? Not all companies had the same answers, and for the companies where two interviews were made, the answers obtained from one interview differed from the answer obtained in the other interview. Some answers were however recurring more than others, and these will be explained.

5.2.3.1 Interest Creator
The majority of the companies answered that the interest for the Product would come from R&D, Process Engineering or both. In many cases the interviewed person answered that the interest would come from the part that they were working for. One difference between the two was that a few answered that R&D will not play a great role in the decision (Bhatt & Patel, 7 Nov 2008; Sheth, 7 Nov 2008), whereas similar comments cannot be found about process engineering.

Other units that were included in the answer were the projects organization, sales & marketing and the customer. The two last answers were both from Dishman. (Dhotre, 6 Nov 2008)

5.2.3.2 Decision Maker
The final approval for purchasing the Product will be made by top management and in several companies even by the managing director.
Where the decision is taken depends on the cost and the risk involved – a standard purchase verses a futuristic change. (Damodaran, 11 Nov 2008) Half of the companies answered that the final approval would come from managing director, whereas the others answered business unit head, site head or head of the projects organization. No correlation could be observed between the decision level and the size of the company.

5.2.3.3 Other Units Influencing the Decision

The answers regarding other units that could influence the decision are widely spread: a couple of companies answer that many parts of the company will influence the decision. (Thyagarajan & Bhardwaj, 3 Nov 2008) The units that were brought up several times will be explained.

The technical team is a cross functional team that many times develops and evaluates different alternatives and make the recommendation to the decision maker. (Srivastava &Iyer, 14 Nov 2008)

Certain companies said that R&D will have a key role since they can turn to process engineering with requirements, or ask for a certain technology if it is needed. (Pawar & Dorlikar, 12 Nov 2008) Whether R&D is involved or not seems to depend on if the technology will be tested in the lab, which likely will be the case of the Product. (Chunodkar, 14 Nov 2008)

Production is another unit that will influence the decision, since eventually that is the part that will operate the Product. (Chunodkar, 14 Nov 2008) The focus of the production is existing processes, why the projects organization and process engineering – two units that work close to production – seem to be involved to a larger extent. (Sheth, 7 Nov 2008)

The part of the company that handles the design, purchase and implementation of new plants, or modifications of existing ones, is called the projects organization. A number of companies have answered that the projects organization influence the decision, but that they come in later in the process. (Chaudhary & Kelkar, 3 Nov 2008)

Later on in the decision process is purchasing, or commercial team, included. They handle the final contact with the suppliers including price discussions. (Rehani, 6 Nov 2008)

In addition, the decision can be influenced from individuals that are interested or the people that got the first hand information about a new technology. (Gupte & Hedao, 11 Nov 2008)
5.3 Results Concerning the Launch Activities

In order to strengthen the knowledge about the potential customers, questions were asked regarding factors that would influence the decision, main concerns in current processes and when developing new processes, priorities when purchasing a new process technology, and support needed if purchasing the Product. The result from the three areas will be presented in section 5.3.1-5.3.4.

5.3.1 Key Areas to Consider in the Processes of the Companies

The main concerns in the current processes and the main concerns when developing new processes were discussed with the companies. The results can be divided into five main areas, which are described in decreasing importance. Moreover, the companies were asked about the largest cost. Almost all answered raw material, while two companies answered solvents and one company answered overhead cost originating from infrastructure set up.

Safety is the area that was most often brought up as a concern when developing new processes. Most processes develop heat during the reactions and to prevent the process from escalating, the companies need to strike the right balance in adding solvents and in size of the batch. Naturally, it becomes more expensive to consider batch size and add solvents, which needs to be removed and recycled afterwards. Safety is however not something the companies usually needs to change in current processes. Safety is especially necessary for highly exothermic processes, why it is more important for the companies that have more processes of that kind. (Srivastava & Iyer, 14 Nov 2008)

The second most important area, both when developing new processes and when changing current processes, is economy of the process, i.e. the revenues that can be obtained verses the production cost. Basically there are two main benefits for all processes: yield and reduced cycle time. You must convince the customers that these are improved! (Bhoosmurmath, 8 Nov 2008) This statement is supported from the interviews since higher yield and reduced cycle time were the two factors that were brought up the most. The cycle time depends on the number of reaction steps needed and the reaction time for each step.
The third factor, also considered to be very important by the companies, is environmental friendly processes. This is important both because of regulatory issues and because it is a major cost. (Pawar & Dorlikar, 12 Nov 2008) Bi-products, or waste, are created in a reaction so the companies need large facilities for handling the waste and that is very costly and consumes lots of energy. (Mayal, 6 Nov 2008) Sun Pharmaceutical’s basic idea is to avoid hazardous reactions and Reliance Life Science answered that this will not be as important initially but when the products become mature it might be more important to reduce energy. (Gupte & Hedao, 11 Nov 2008; Rehani 6 Nov 2008)

The fourth factor considered important for many companies is non-infringing processes. Companies such as Ipca, Lupin and Cadila Pharmaceuticals explained that because the patents cover certain reaction steps even after the patent goes off, the company needs to avoid those steps with different chemistries. (Chunodkar, 14 Nov 2008)

In addition, a number of companies explained that quality is extremely important; the challenge is to remain quality while improving the yield. *We can get reduced yield and slightly cost increases, which means we will make less money but if we get a bad name on one batch that is worse.* (Chunodkar, 14 Nov 2008)

An observation made during the interviews is that there is more pressure on old products or molecules (products that have been of patent for some years), in resemblance with the normal life cycle of any other product. The market is very competitive for old molecules and new products will be the main driver of the company’s growth. (Chunodkar, 14 Nov 2008) At Piramal Healthcare for instance, a large part of the business derives from CRAMS to innovator companies, and to avoid competing businesses the company has chosen not to do Para IV filings (being the first to file for a generic drug). Since the old molecules supplied to formulating companies are low price high volume, the customers are not keen to do any major changes. (Damodaran, 11 Nov 2008)

5.3.2 Areas of Priority when Choosing a New Process or Reactor

To gain knowledge about customer values the interviewed persons were asked to first grade a number of factors and then do a ranking. The results are presented in Figure 16 and Figure 17.
The interviewed person graded ten factors from 0 (not important) to 4 (very important). In addition the companies were asked to choose the three most important factors when choosing a reactor. The results are illustrated in Figure 16. There is a different order and different results for the average grade, as compared to the number of times the factor was said to be top three in importance. The average is high for most of the factors since the interviewed people explained that it were all important factors and many of them, such as traceability\textsuperscript{14} and ability to insert chemicals and do tests during the process\textsuperscript{15}, were requirements. The three factors that do not follow the order for “the top 3 ranking” are efficient mixing, traceability and reduced scale-up time. Explanations could be that mixing and traceability are considered threshold values and reduced scale-up time cannot be affected by the batch reactors used today. The figure furthermore illustrates that improved yield would by far make the most difference when choosing a reactor, followed by a reactor that can reduce waste and energy.

\textsuperscript{14} Traceability means the ability to trace a medicine back to a specific batch, including the day it was produced and what reactor that was used. This is required by FDA and can be a bottle neck if introducing continuous production.

\textsuperscript{15} For many reactions, chemicals are added during the process and tests are taken. The Product has been designed so that this is possible.
consumption and increase safety. Process intensification – during the interviews often referred to as smaller equipment generating the same efficiency – is the least important factor, and a few companies answered that this might be more important in the future. (Chaudhary & Kelkar, 3 Nov 2008; Mayal, 6 Nov 2008)

The next step was to let the interviewed companies rank the following six factors according to the importance when choosing a new reactor (1 is most prioritized and 6 is least prioritized): the reactor enables improved quality, the reactor gives less dangerous processes, the reactor facilitates cleaning and controlling the process, the reactor costs less, the reactor enables a shorter reaction time and finally, the reactor is smaller while being equally efficient. Figure 17 illustrates the average of the rankings from 17 interviews, i.e. improved quality has the lowest average at 1.6 meaning that many interviewed persons ranked this the highest. Comments related to the result are presented next.

To improve quality repeatability and consistency is important. (Thyagarajan & Bhadwaj, 3 Nov 2008) One person explained that improved quality is by far the most important since it is connected with the reputation of the company. (Chunodkar, 14 Nov 2008) However, another person believed that quality was not possible to improve; bad quality was simply not accepted. (Kumar, 13 Nov 2008)

A safer reactor was highly prioritized mostly because remaining a high level of safety makes some processes more complicated and expensive to manufacture and some processes cannot be done at all. *We do a lot of safety process work. For many reactions that are known to be hazardous we try to...*
develop alternative processes. (Rao, 13 Nov 2008) Typically when there is a highly exothermic reaction, it is controlled by more solvents and a longer reaction time, which increases the cost. (Sheth, 7 Nov 2008)

A reactor that costs less was generally not considered as important. One interviewed person explained that lower cost is not mandatory; improved quality is the most important followed by safety. (Chaudhary & Kelkar, 3 Nov 2008) The price for a reactor depends on the size and construction, a reactor of a few hundred liters cost up to 500,000 Rs, while a large reactor cost more than Rs 2 Mn or about USD 40-50,000. (Sheth, 7 Nov 2008; Pawar & Dorlikar, 12 Nov 2008; Kumar, 13 Nov 2008) In addition to the reactor, the company needs support equipment like drying, vessels, filtration equipment etc. (Chunodkar, 14 Nov 2008) One person at the Company in India explained that companies in India are sensitive to prices, which leads to short product life cycles. (Karandikar, 24 Nov 2008)

Both Figure 16 and Figure 17 illustrate that a shorter reaction time is not one of the most important factors when a company chooses a reactor or process. Several companies answered that reduced reaction time is important because it enables a higher productivity, but that it is not as important as increased yield. (Chakraborty, 5 Nov 2008; Mayal, 6 Nov 2008) Ipca and Dr. Reddy believed that a shorter reaction time was very important, especially for crystallization of solids. (Thyagarajan & Bhadwaj, 3 Nov 2008; Kumar, 13 Nov 2008) Lupin and Zydus Cadila explained that there was sufficient capacity, hardware was not a limiting factor and reduced time is more beneficial for reactions that have a very long reaction time. (Chunodkar, 14 Nov 2008; Sheth, 7 Nov 2008) Furthermore, Reliance highlighted that shorter reaction time was mostly important after a few years when competition gets tougher and margins decrease. (Gupte & Hedaoo, 11 Nov 2008)

5.3.3 Factors Influencing the Decision for Buying a New Process Technology
To obtain an understanding of how the decision process can be influenced when selling a product like the Product, the interviewed companies were asked to rank the importance from 0 (not important) to 4 (very important) for a number of factors. The result is illustrated in Figure 18, where the blue staples are the average of the answer from 16 interviews and the purple staples are the standard deviation. The factors, which are illustrated in decreasing importance, will be explained in more detail.
Triability of the product refers to the extent to which the decision will be influenced if the customer can rent or borrow the Product before using it. This was by far the factor that would influence the process the most, and Figure 18 shows that the standard deviation is significantly lower than for the other factors, meaning that there was little spread in the answers. Several companies said that to get confidence in the new technology, trying it is a requirement. (Pawar & Dorlikar, 12 Nov 2008)

The second most important factor is that the customers are provided with references to other companies that have used the Product. This is especially important when purchasing a new technology. (Chakraborty, 5 Nov 2008) The customers request relevant references, i.e. from a pharmaceutical company (some preferred that it was an Indian company) with a good reputation and similar processes. (Pawar & Dorlikar, 12 Nov 2008) The standard deviation was not among the highest but there was some spread. One company that did not consider it very important was Reliance, since their processes would not be identical to the processes of the referenced company, why it is better if the Company can say if it works for their processes or not. (Gupte & Hedaoo, 11 Nov 2008)

If the customer were provided with one or several case studies that describe the results of the Product, it would be helpful but not decision making. (Chaudhary & Kelkar, 3 Nov 2008) The case study should be from a pharmaceutical company, however it is not important that the name of the company is revealed. (Thyagarajan & Bhadwaj, 3 Nov 2008)
One part of the Company’s offering is to consult the customer when they try the Product. Because of a high degree of confidentiality in the pharmaceutical business, this is not always something that the customer prefers. It is therefore not surprising that there was a spread in the answers from the interviewed companies. Many companies, e.g. Dr. Reddy and Dishman, answered that there was an interest for sharing some data and getting some support. A few companies, e.g. Ipca, wanted more support and was willing to share data, whereas a few companies answered that data sharing was not an option.

The interviewed companies saw in general no constraints in purchasing a product from a new supplier. However, several companies highlighted that the relationship is very important, independently of if the supplier is new, because there is a need to get support and service if there would be any problems. (Chakraborty, 5 Nov 2008)

The two least important factors were the time it takes from contact to finalized purchase, and whether the purchased product that is protected by a patent. Several companies pointed out that the time to evaluate the Product is more important than closing the deal fast. (Bhatt & Patel, 7 Nov 2008)

Finally, one factor that could impact according to a manager within Life Science at the Company in India is that Indian people have more confidence in European people if informing about a technology than in other Indian people. (Shetty, 11 Nov 2008)

**5.3.4. Requested Support by the Customers**

Since the Product is an unfamiliar technology for the market and the customers, the Company needs to provide support and training to be able to establish the technology. One of the areas discussed during the interviews was what kind of support that the companies would want. The first thing that the Indian pharmaceutical companies require is to understand what kind of reactions it can be used for – to see that it works in theory. (Rao, 13 Nov 2008) A number of suggestions have been made on how this can be achieved: need to know design parameters and see a specification, a presentation of the Product for the company’s technical team, success stories, reference customers, describe the benefits and differences relative the batch reactor and the plug flow reactor because those are the two that customers would compare it with, or more data on the processes that the Company has tested. (Mayal, 6 Nov 2008; Pawar & Dorlikar, 12 Nov 2008; Bhoosmurmath, 8 Nov 2008; Gupte & Hedaoo, 11 Nov 2008)
Once the companies are convinced that the Product could be beneficial in some of their processes, the second thing that most of the companies would want is training and testing of the Product. Continuous production would be a paradigm shift and currently we are doing something that works. You have to train people in the new technology. (Chakraborty, 5 Nov 2008) One person explained that because the technology is new a dedicated technical team from the Company is needed and a prototype product that the customers can try. Because it is difficult to send chemicals to Europe the prototype should be kept in India, and preferably at the customer’s location since that facilitates for more people to try it. (Bhoosmurmath, 8 Nov 2008) Dr. Reddy answered that the company would like to do trials on their own with technical support from the Company, and when they have a better understanding support will not be needed that much. The company would furthermore find it difficult to share data. (Chaudhary & Kelkar, 3 Nov 2008) Reliance would primarily want the Company to do the trials for them. (Gupte & Hedao, 11 Nov 2008) Two companies emphasized that trials should not be too expensive. (Chakraborty, 5 Nov 2008; Naik & Roy, 12 Nov 2008)

Additional support is if there later on are any problems with the Product and initial support to complete documentation to get it approved by FDA. The basic documentation for FDA consists of four qualifications: design, installation, operational and performance. When it goes through all four steps it is ready for large scale. Generally the suppliers understand this process and support with the documents. (Chunodkar, 14 Nov 2008).

5.4 Summary of Company Case Studies

Chapter five presented three overall areas: results regarding segmentation and target group, buying behavior in the studied companies, and results regarding marketing activities. The first section presented the business and process characteristic of the companies, where it for instance was found that the larger companies seemed more interested in the Product. The next section involved the decision process and the buying unit, where process engineers were believed to create the interest for the Product, and the final decision will be made by top management. The last section presented the companies’ priorities when choosing a reactor: safety is a major concern when new processes are developed, and triability will influence the decision process the most.
6. ANALYSIS OF THE ASSIGNMENT

Chapter six presents an analysis that applies the theoretical framework on the empirical findings, which results in a number of recommendations, solutions, and theoretical contributions. The intent of the chapter is to address the four purposes that were formulated in chapter one.

As presented in Figure 19, the analysis of the master thesis was divided into four parts based on the purposes that were formulated in chapter one. The first part discusses the market potential based on theories in marketing planning by Lehman and Winer (2005), and the diffusion process by Webster (1979). The second part results in a segmentation of the market and a target group selection, which is mainly based on segmentation theory by Keller and Kotler (2006) and Lehman and Winer (2005). The third part discusses the buying behavior theories of Webster and Wind (1972), which leads to a recommendation of what decision unit The Company should approach when selling the Product. The last part of the analysis discusses the factors that influence the decision process, which were concluded to be the factors presented by Webster and Wind (1972), the sales concept, and the marketing activities. This section is also supported by the Critical Success Factor theory by Johnson et.al (2005), the launch tactic theories by Beard and Easingwood (1996), and sales force adoption by Atuahene-Gima and Hultink (2000).

Figure 19. Outline of chapter six.
6.1 Market Potential
The market potential is an important factor to include when deciding if a market should be entered and to what extent the market should be penetrated. The market potential will be discussed both in terms of opportunities and risks, and in terms of a calculated estimation of the market.

6.1.1 Opportunities
A number of opportunities can be distinguished on the Indian pharmaceutical market. Larger markets are more attractive since it offers more market potential and possibilities for segmentation compared to smaller markets. (Lehmann & Winer, 2005) Even though there is no market for the Product in India today, by looking at the size of the Indian pharmaceutical industry (including exports and domestic consumption) some conclusions can be made on the size of the market compared to in other countries. The Indian pharmaceutical market was estimated to USD 13 Bn in 2006-2007, of which exports compound more than half. In domestic drug consumption, India is the 14\textsuperscript{th} largest country and is projected to be the 10\textsuperscript{th} largest country in 2015.

In addition to the attractive size of the Indian pharmaceutical market, has had a strong growth and it is projected to have a continued strong growth. Domestic consumption has a CAGR of 13\%, which can be compared to the expected growth of 4-5\% in USA, which today is the largest market. India is moreover projected to be the 3\textsuperscript{rd} largest country in absolute growth by 2015. According to Lehmann and Winer (2005) growth is the other essential factor; both present growth and future growth are important when planning further or new investments. Once again, applying this theory on the Product would relate to the growth of the Product market in India, which would be zero. However, a strong growth on the pharmaceutical market indicates that the potential customers are growing, which usually means that there is a need to invest in new production capacity.

The final opportunity is that Indian pharmaceutical companies are stepping up regarding value-adding activities, which will likely increase the demand for premium, high technology products. Since The Company is selling premium products and the Product is a brand new technology, this opportunity is considered very important. The statement that Indian pharmaceutical companies are doing more value-adding activities is supported by several arguments. First, the Indian pharmaceutical companies are moving from being a subcontractor to the Big Pharma, to develop their
own drugs and collaborate in R&D with the Big Pharma. This makes the Indian pharmaceutical companies more exposed to how operations are carried out within these companies. If partner companies in Europe use The Product, the Indian companies might be influenced to implement the new product as well. Second, the largest growth is seen in the export of pharmaceuticals – particularly in exports to regulated markets – with a CAGR of 34%. In addition, 46% of all DMF filings (required in regulated markets) to US FDA in 2007 were from Indian companies, compared to 15% in 2000. Selling drugs to the regulated markets requires a higher priority on process quality to follow regulations. Finally, more Indian companies are exploring “difficult-to-produce” generics in areas such as steroids, hormones and oncology (where there are more liquid-liquid reactions).

6.1.2 Risks
When the Product is introduced on the Indian market it will start in the introduction phase in the product life cycle. This means that the size and the growth of the market are small, which makes the attractiveness low. A major concern is whether the Product will move to the next phase – the growth phase. Entering the growth phase requires sales to accelerate through diffusion of the Product. Absence of diffusion is believed to be the major concern when introducing the Product in India. To further investigate this, the diffusion process theory is applied to the empirical findings to understand what the underlying risks are. The identified risks will be presented in a risk-impact diagram in the end of this section. According to Webster (1979) there are five factors that affect the speed of the diffusion: the relative advantage compared to competing products, the Product’s compatibility with existing processes, the complexity of the Product, divisibility (if it can be tried before purchase), and communicability.

6.1.2.1 Relative Advantage Compared to Competing Products
Trials made by The Company shows that the advantages generated in some processes are significant relative the same process in a batch reactor. However, if the Product is advantageous in maybe 20% of the processes, one concern is that a customer considers the Product in a general perspective instead of looking at the advantages in each specific process. It is therefore important for The Company to set the reference frame in the discussion with the customer by being specific about what reactions it concerns.
Furthermore, a change from batch to continuous production involves a new way of thinking, which requires a certain level of technology maturity to be able to appreciate certain advantages. Process intensification\textsuperscript{16} was for instance not understood by all interviewed persons, and was not a high priority. The Company must therefore be very clear about the benefits and describe them in a pedagogic way. One disadvantage with the Product is that it is less flexible than the batch reactor – it works for fewer processes. Some companies believed that the relative advantage would be low because larger production volumes were needed if it would be justified to dedicate the Product to a process. Consequently, there is a risk that potential customers will evaluate the Product as a product that is purchased for one specific process. Since the interviewed companies explained that products sometimes are discontinued, purchasing equipment for only one process would be a risk for the customers. This means, that it is crucial for The Company to explain that the Product can be used for several processes, preferably by presenting a number of processes for which it works, and what changes that were required for the different processes.

6.1.2.2 Compatibility
The maybe most challenging factor that affects the diffusion process is compatibility. The mindset needed for the Product is not compatible with today’s mindset of batch production. The customers must be willing to think in a new way and train the employees to be able to realize the benefits of the Product. This risk is called \textit{Change of Mindset} and is presented in Figure 20. Furthermore, regulatory issues limit the compatibility of the Product in two ways. First, \textit{traceability} is an issue that was brought up during the interviews. This might be possible to solve, for instance by applying semi-batch production, but it will complicate the introduction of the Product in commercial production. The identified risk is therefore that the companies will consider traceability as a problem, and it is something The Company needs to proactively address. The second regulatory issue is that companies have to file for a new DMF for the process that the Product is used for. This takes time and cost money, and for APIs that are sold externally, the customer of the pharmaceutical companies might be reluctant to the change. This risk is further evaluated in Figure 20 and is called \textit{regulations}.

\textsuperscript{16} P.I. was originally developed for the bulk chemical industry to reduce the plant size and provide a chemical process with the precise environment needed, which included a shift from batch to continuous production (BHRGroup, Jan 2009)
6.1.2.3 Complexity

The third factor affecting the diffusion process is complexity. The overall design of the Product is not too complicated and the companies usually understood the general concept during the interviews. There are however two complex limitations of the Product. The first is reaction time: processes today are generally produced during several hours, which would not be possible with the Product. The reaction time can however be much shorter when produced in the Product, but the result varies from reaction to reaction. The second factor affecting the complexity is the extent to which The Product can handle reactions that contain *solids*. A large extent of the reactions carried out in the investigated companies involved solid. It is not possible to say for which reactions it works and not, which increase the complexity.

6.1.2.4 Divisibility and Communicability

The last two factors affecting the diffusion process are divisibility and communicability. In Europe, it is possible to let the customers try the Product before purchasing it, why divisibility can be a factor affecting the diffusion process positively. Furthermore, the extent to which companies can communicate the advantages with the Product – communicability – is not considered to have a strong influence on the diffusion of the Product. A positive aspect can be that people are changing positions and companies frequently in India, which boosts the spread of technology. A negative aspect is that the degree of confidentiality is high within the pharmaceutical industry. As a result, information about the processes a company is using the Product for will many times not be shared.

6.1.2.5 Risk-Impact diagram

Figure 20 illustrates the probability that a certain factor will be a major problem, and the impact the factor will have on the diffusion if it becomes a major problem. The identified risks are: traceability, flexibility, change of mindset, solids, and regulations.

*Traceability* will for certain affect the diffusion process, since regulations require that the Product be traced back to a certain batch. This is a risk that has to be proactively addressed by the Company by clarifying how it will be handled with The Product. In contrast to the probability, the impact of this risk is small, since some companies already have solved similar issues, why there likely exists a solution.
The probability that flexibility will limit the diffusion process is considered to be high, since many companies associate continuous production with large volumes, dedicated equipment and hence, a limited scope of use. The impact flexibility will have is on the other hand considered to be relative low, especially if The Company can clarify its possible areas of use to prevent false assumptions about the Product.

All others equal, the risk called change of mindset, which is that people will be reluctant to the Product despite advantages, is considered to have a medium to high probability to occur. Based on the interviews, it is believed to concern some of the organizations, while other organizations will be more open-minded. The impact is on the other hand relatively high since each company that is reluctant to the Product because it requires change of mindset, will limit sales.

The probability that solids will be a major problem is considered medium to high since solid is a limiting factor that has already been accounted for. There is however an uncertainty today regarding how much solids the Product can handle. If it turns out that the Product will not to be useful for the reactions which the companies referred to as “solids”, it will have a large impact on the diffusion process, since this number was many times 90-95 % of the reactions.
The impact from regulations will be high for the processes that require a new DMF filing, since this is costly for the customer. The probability that regulations will be a problem in the diffusion process is on the other hand considered to be fairly low, since The Company can choose to target new processes, why the risk only will affect a few processes.

6.1.3 Estimation of the Product’s Market in India

In accordance with the analysis-based method presented by Lehman and Winer (2005), the estimation of the Product market is based on three general steps. First, the possible users of the Product were estimated, followed by the number of potential buyers (step 1 and 2 in the analysis-based method). Second, the yearly usage rate of batch reactors among the potential buyers was appreciated (step 3 in the analysis-based method). Third, the market share that could be obtained by the Product was estimated. The difference between the estimation of the Indian market for the Product, and the analysis-based method is the third step – estimate the market share that could be obtained by the Product. Since the Product is a new technology the market potential comprises the estimated share that can be obtained from the batch reactor market. The market potential is furthermore calculated on a yearly basis based on growth numbers valid until 2011. Important to understand is that the market potential assumes a full market penetration of continuous reactors, either by The Company or a potential competitor. Complete calculations are presented in appendix D.

1. The possible buyers are all the companies in the pharmaceutical and fine chemistry industry in India; however, the first assumption was that the 30 largest companies are the potential buyers the first years. This assumption was based on a belief that the smaller companies are later in the diffusion process and that they don’t have enough financial resources. While 30 companies could be a high count, considering the ten largest companies have 36 % of the market, there could be potential buyers among the smaller companies as well. However, if only the 20 largest companies would be included, the decrease of the market potential would only be about 6%.

2. The first step that was made in order to appreciate the yearly usage rate of batch reactors was to estimate the number of batch reactors that the potential buyers have today. By plotting the estimated number of batch reactors operated by the interviewed companies as a function of the companies’ turnover, a linear model was created that could be applied to the list of the 30 largest companies and the turnover of each company. In addition to the trend line that seemed to give the most exact result, two other cases were
included in the calculations to observe the implications of variations in the assumption (see appendix).

\[
\begin{align*}
\text{for } i=(1\ldots30) & \quad \sum 0.011x \approx 5400 \text{ batch reactors} \\
\text{for } i=(1\ldots30) & \quad \sum 0.013x \approx 6400 \text{ batch reactors} \\
\text{for } i=(1\ldots30) & \quad \sum 0.015x \approx 7400 \text{ batch reactors}
\end{align*}
\]

The major assumption made by using this model is that the number of batch reactors operated by a company is proportional to the turnover of the company. In addition, the result assumed that the rough estimations made by the interviewed persons were correct and that the list of the 30 largest companies was exact.

The second step was to estimate the percentage of today’s batch reactors that are replaced each year. This number depends on the lifetime of the batch reactor and when the batch reactors were bought. The lifetime was assumed to be 20 years, but the timing of the purchases was not assumed to be equally distributed. Instead of assuming that 15% (3/20) would be replaced 2009-2011, the strong market growth over the last years lead to the assumption that half of the 15% would be replaced, which means that 1 of 40 existing reactors would be replaced.

The third step was to estimate the number of new batch reactors required to meet growth. The number was assumed to be proportional to the projected growth of the pharmaceutical industry, which according to chapter five was 21% until 2011. This assumption furthermore included an even yearly growth, which is probably not true in reality. Because the companies might not have full capacity today, and because of the recent financial crisis, calculations were also made for 15% and 10%, where 15% was believed to be most reasonable. Combining the three growth scenarios with the three functions determining the number of batch reactors on the market, gave nine different numbers of batch reactors needed per year by the potential buyers. Three of the nine were used for the final calculations: the worst case, the best case, and the case that is believed to be most reasonable.

<table>
<thead>
<tr>
<th>Scenarios:</th>
<th>Total No of batch reactors/year</th>
<th>Market share captured</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2 %</td>
</tr>
<tr>
<td>Worst case</td>
<td>679</td>
<td>14</td>
</tr>
<tr>
<td>Best case</td>
<td>1741</td>
<td>35</td>
</tr>
<tr>
<td>Supported case</td>
<td>1124</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 7. Twelve different market potential scenarios
3. Based on the answers from the interviews regarding the percentage of the company’s processes that could be operated with the Product, three different market shares were included in the calculations: 2 %, 5 %, and 10 %. The results are presented in Table 7. Since the interviewed people that estimated between 1-7% in general felt more reliant, and since the diffusion of the Product probably will take some time, the market share considered most likely is 5 %. The discussed assumptions lead to a market potential of 56 continuous reactors per year (based on numbers valid until 2011) but, as can be seen in Table 7, the result varies greatly depending in how different assumptions are made. The most beneficial market potential is more than ten times larger than the least beneficial, and looking only at a 5 % market share, the best case and the worse case are still about 50 % larger or smaller than the case that is believed to be most true.

6.1.4 Summary of Market Potential
The first part of the analysis discussed three overall areas: opportunities, risks and market size estimation. The size and growth of the Indian pharmaceutical market are believed to be major opportunities for the Indian market for the Product, which is estimated to more than 50 continuous reactors per year until 2011. The amount of solids that can be handled by the Product, together with regulatory issues, are the major risks of diffusion of the Product.

6.2 Market Segmentation and Target Group
The purpose of section 6.2 is to present different customer segments and identify the target group for The Product. The first step is to discuss the segmentation variables presented by Keller and Kotler (2006). Based on this, an analysis is made of the segments that comprise the market. Finally, the validity of the segments is discussed and the scope of the target group is established.

6.2.1 Possible Variables for Segmenting the Market
There are five overall segmentation variables to consider when segmenting a market: demographic, operating variables, purchasing approach, situational factors and personal characteristics. (Keller & Kotler, 2006) All but situational factors will be put in the context of The Product and the relevance of each will be discussed. Situational factors are not included since it was not discussed during the interviews.
6.2.1.1 Demographic

When segmenting according to demographics a company needs to decide what industry or industries that should be aimed at, if small, large or all companies should be targeted, and what geographic locations that should be chosen. (Keller & Kotler, 2006) Early empirical findings showed that the fine chemistry industry and pharmaceutical industry were not two distinct industries in India. To distinguish if a company is more into the fine chemical industry or more into the pharmaceutical industry one can look at what part of the turnover that originates from APIs verses what part of the turnover that originates from formulations or generics. Even if both types of companies produce APIs (for which the Product can be used) there are important differences between the companies that are relevant from a segmentation perspective. First, APIs that are sold to the market, instead of being formulated and sold as a pharmaceutical, depend on the requirements of the customers; several companies explained that customers were reluctant to process changes because the customer would have to refile the DMF and it might interrupt the supply. Second, it is more difficult to forecast the demand of an API that is sold to the open market, why production flexibility becomes more important for fine chemistry companies than for pharmaceutical companies. Finally, based on what has been observed while studying the companies in the master thesis, companies with a majority of turnover originating from APIs are generally smaller, have fewer products and are relying on CRAMS to a larger extent. Process development time within CRAMS is only about two months, which gives little room for introducing a new technology. Despite that the Product can be used for a larger part of the operations of companies focused on APIs, companies with most of the turnover originating from pharmaceuticals are considered more attractive and more receptive to new process technology.

Another demographic segmentation variable presented in the theory is the size of the company. This segmentation variable is believed to be of great relevance for The Product and a tendency that larger companies were more interested during the interviews could be distinguished. First, the largest Indian pharmaceutical companies are significantly smaller than the Big Pharma. Since larger companies have more financial resources, the Product will probably not be an option for the smaller Indian pharmaceutical companies. At the most 25-30 companies are believed to be large enough to be potential customers. This argumentation is aligned with the diffusion process theory: large firms generally have more financial resources, which make them less risk avert towards new technology. In addition, the larger companies have a wider range of possible use of a new product, which is an
explanation why large firms usually are early adopters. (Webster, 1979) This supports the second argument; the larger Indian companies are more attractive since those companies have a wider product range, which increases the probability that the company will have matching processes with The Product. Third, the larger Indian pharmaceutical companies have more global operations, which likely push those companies to higher levels concerning production complexity and value adding activities. Finally, Table 4 shows that larger companies are more active in R&D, which will be further discussed under personal characteristics.

The last demographic segmentation variable presented in the theory is geography. As discussed in section 4.3 there are a few manufacturing and R&D clusters in India. However, The Company is not recommended to segment according to geography since it is more critical to target companies with matching processes than to target customers that are located close to each other.

6.2.1.2 Operating variables
Keller and Kotler (2006) suggest that operating variables include the technologies that the customers have, the customers’ user status, and the extent to which the customer requires service. “The technologies that the companies have” is translated to the type of processes that the customer has, since that affects the customer’s choice of reactor and attitude towards continuous production. Three operating variables, that could be relevant as segmentation variables, are: amount of solid reactions, amount of highly exothermic reactions and production volume. There is however a challenge involved with all three variables since they require a lot of information about the company in order to do the segmentation. This challenge will however be addressed in section 6.2.2.

Since the Product is best used for liquid-to-liquid reactions, the percentage of the companies’ processes that are of this kind could be considered as highly relevant. However, this number will probably not give much information since the companies’ answered that almost all reactions contain solids. Instead this is one of the variables The Company and the customer mutually needs to discuss for each considered reaction. Bringing solid up as a segmentation variable – or as a question to the customer at an early stage – might create an unjustified reluctance towards the Product, both from the potential customer and from the sales person of The Company that approaches the customer.
The second variable is whether the companies have many highly exothermic reactions or not, since the interviews showed that companies with more highly exothermic reactions were slightly more interested in the Product. The perspective that is considered relevant to look at in this variable is if the company tries to produce as much as possible in-house or if the company prefers to outsource reactions that are considered to be more dangerous.

Another observation made during the interviews is that companies that produce more intermediates in-house have shown a greater interest for the Product. This seems to be connected to the production volume; intermediates are in general produced in-house when the volume of a product is large, whereas intermediates are sourced for products that are produced in small scale. In-house production and production volume are furthermore connected to the number of dedicated facilities that the company is using, which is a logical finding based on economies of scale. As a result, production volume is considered an interesting variable to look at, which can be understood by looking at the number of dedicated facilities used and the extent to which intermediates are produced in-house.

6.2.1.3 Purchasing approach

The third variable presented in theory is the purchasing approach of the potential customers. The buying decision process is something that was studied in the master thesis, but is however not a variable that is of significance in the segmentation. The reason is that the purchasing process within the companies did not have clear differences. One of the investigated factors was if the companies preferred to purchase from a supplier with which there already had a relationship. The result presented in chapter five showed that while the companies valued a good relationship, buying from a new supplier would not be an issue. Consequently, The Company should not limit the target group to existing customers. This might have other positive outcomes since The Company can establish new relationships, which could lead to increased cross selling.

6.2.1.4 Personal Characteristics

The last segmentation variable is personal characteristics — a wide expression that for instance involves cultural similarities between the buyer and the seller and the customer’s attitude towards risk. (Keller & Kotler, 2006) One factor that could be related to personal characteristics is the companies innovativeness, which is a segmentation variable to consider in technology oriented industries according to Lehman and Winer. (2005) Similarly, Webster (1979) explains that early adopters are the one investing
most money in R&D. Because the Product is a new technology and because requires a change of mindset for the customers, targeting innovators and early adopters is very important for The Company. In line with Webster’s arguments, R&D spending and whether the company is doing discovery research, are factors that were evaluated already when choosing companies to interview. As presented in chapter five, the companies that are doing discovery research were slightly more interested than the companies not doing discovery research. R&D is considered to be of high relevance as a segmentation variable, either looking at R&D spending or discovery research since the two sub-factors are linked together. The Company is recommended to primarily look at whether the company is doing discovery research or not, since this is easier to find on the company’s home page, and because discovery research indicates that the company has a high R&D spending.

Another factor to evaluate the innovativeness of a company is to look at the extent to which a company is, or has been, thinking about continuous processes. As presented in chapter five, three of the four companies that were considered most interested have some experience from continuous processes and/or have considered trying continuous production. It could therefore be relevant to evaluate this factor, but it should not be used as a standalone segmentation variable since it requires information and since it could exclude potential customers. Furthermore, there was no relationship between the company’s interest and whether micro reactors were used, why use of micro reactors is an irrelevant variable for evaluating a company’s potential to become a customer.

6.2.2 Segmentation

Based on the argumentation in section 6.2.1 the Company is recommended to segment the pharmaceutical and fine chemistry industry in India according to the size of the company, if the company’s turnover is generated from formulations or APIs (off course assuming that the company produces APIs), and the companies R&D activities. Combining these results, three segments on the market were identified, called Pharma, Generics, and CRAMS.

6.2.2.1 Pharma

The pharma segment consists of the companies that conduct discovery research and produces APIs, which are 10-15 companies. With a few exceptions, the companies in this segment are also the largest companies in the industry. The main business is generics and the majority of the turnover
originates from formulations. In addition, the companies sell APIs, and most of the companies do CRAMS, which is either included in the API turnover or as a separate business area. Interviewed companies that belong to the pharma segment are Cipla, Lupin, Zydus Cadila, Dr. Reddy and Sun Pharmaceuticals. Examples of other companies that belong to this segment are Jubilant Organosys, Wockhardt, Torrent Pharma and Orchid Pharmaceuticals. Piramal Life Science and Glenmark Pharmaceuticals are the demerged, research based units of Nicholas Piramal and Glenmark. Since the two companies either doesn’t produce APIs or produces very little, they should not be included in the target group of The Product.

6.2.2.2 Generics
The generics segment consists of all companies that do formulations, except the companies that conduct discovery research since they belong to the pharma segment. The characteristics of the companies are similar to the companies in the pharma segment but the companies are in general smaller. The main business is generics in most companies, however there could be a few companies that focus more on CRAMS or API sales and have formulations as the side business. Interviewed companies that belong to the generics segment are Ipca, Piramal Healthcare, Cadila Pharmaceuticals, Reliance Life Science and Glenmark Generics. Examples of other companies that belong to this segment are Aurobindo Pharma, Matrix Laboratories, and Strides Arcolab.

6.2.2.3 CRAMS
The CRAMS segment consists of all companies that are not doing formulations, i.e. fine chemistry companies that sell APIs or intermediates. The name CRAMS can be misleading in two ways. First, CRAMS stands for contract research and manufacturing services, and not all companies conduct contract research. Second, some companies could sell the majority of APIs or intermediates to the open market, i.e. not on a contract. However, the fine chemistry industry is dominated by CRAMS, why most companies likely have the majority of their turnover originating from CRAMS while they sell some APIs and intermediates to the open market, and parts of the turnover might come from fine chemicals that are not sold to the pharmaceutical industry. Interviewed companies that belong to the CRAMS segment are Hikal and Dishman. Examples of other companies that belong to this segment are Divi’s Laboratories and Atul Ltd.
6.2.2.4 Validity of the segments

There are five criteria that segments must fulfill to be effective: measurable, substantial, accessible, differentiable, and actionable. (Keller & Kotler, 2006) These criteria are applied to the three segments to assure that the segmentation is effective. The first criterion, measurable, means that the size of the segment or the purchasing power should be possible to measure. It would be fairly easy to measure the size of the segments in total turnover, by adding each company’s turnover. Estimating the resources that would be dedicated to the Product is however much more difficult, since a similar product does not exist on the market today. The second criterion, substantial, is whether each segment is sufficiently large. Both the CRAMS segment and the generics segment are comprised by a large number of companies that compound a large part of the fine chemistry industry and the pharmaceutical industry respectively. The pharma segment is comprised by a small number of companies, but the size of the companies justifies the smaller number. Consequently, all three segments are substantial. The third criterion is accessible. Independent of which of the segments that is evaluated, a number of the companies are already customers of The Company, and establishing new contacts should not be a problem. The fourth criterion, differentiable, can be evaluated by looking at the interest and the responses from the three segments during the interviews. As was presented in chapter five, the responses from the CRAMS companies differed from the responses of the other companies in many ways. Furthermore, the responses of the pharma companies differed somewhat from the responses of the generics companies. There were however a few exceptions, why the differentiability could be questioned. Despite this, the companies in the pharma segment should generally respond differently to the companies in the generics segment, because of the difference in size and R&D focus. This is supported by Webster (1979) who says that large companies usually are early adopters and early adopters spend more money on R&D. One conclusion made from this is that reality involves a grey zone that is not presented by Keller & Kotler (2006). This means that there will be some companies in the generics segment that respond in accordance to the pharma segment, and the other way around.

The last criterion, actionable, is considered to be more relevant when looking at consumer markets, since business-to-business involves more direct contact, which makes it easy to catch the attention of the customer and communicate a message. The conclusions from the discussion are that the five criteria can be applied to the identified segments, but need to be justified to fit the actual context.
6.2.3 Target Group Selection
The next step is to decide what segments The Company should target, and how many and what companies that should be approached initially.

6.2.3.1 Model for selecting the target group
Lehmann and Winer (2005) highlight three aspects when choosing target customers: size or growth of a segment, possibility to gain competitive advantage, and available resources. If these factors are applied to the Product, they are not considered to provide a complete picture for selecting a target group. Surely, size and growth are important, but all segments have a substantial size and are facing a strong growth. Because no other company sells the Product, competition would be in comparison to the batch reactor. To gain competitive advantage, The Company would need to target a segment that has more matching processes than other segments, since this would give an advantage compared to the batch reactor. This is an important aspect related to operating segmentation variables that will be integrated in the selection criteria. Finally, “resources available” is also a relevant selection criterion, which supports targeting the pharma segment, since it comprises larger companies.

A complementary target factor, not presented in theory, is a segment’s innovativeness. Since the segmentation is done partly based on R&D and the customers’ flexibility for introducing new process technology, this factor would again support targeting the pharma segment initially, followed by the generics segment and the CRAMS segment last. Targeting one segment at a time might however exclude companies that are interested in the other segments. As was discussed regarding differentiability between the segments, there are some companies in the other segments that respond in accordance to the pharma segment, and there are companies in the pharma segment that respond in accordance to the generics segment. This grey zone can be addressed by an additional selection criterion, also a factor that complements theory, which will be called “company interest”. The three segments have been combined with “company interest” in a model for selecting the target group, presented in Figure 21.

“Company interest” for the companies that are placed in the model, is based on the graded interest made after the interviews, which has also been used in various tables in chapter five. However, to be able to grade the interest of other companies in the future, a few questions have been formulated to address the operating segmentation variables, together with a personal characteristic segmentation variable: “the extent to which the company is, or
has been, thinking about continuous processes”. The questions can be seen in Table 8. Question 1-4 address if the company has matching process.

Table 8. Questions and answers for grading “company interest”.

<table>
<thead>
<tr>
<th>Questions to grade “company interest”</th>
<th>Positive Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are highly exothermic reactions outsourced or operated within the company?</td>
<td>Operated within the company</td>
</tr>
<tr>
<td>2. Are intermediates usually produced or purchased?</td>
<td>Usually produced in-house</td>
</tr>
<tr>
<td>3. How many of the company’s reactors are multiple-purpose?</td>
<td>Maximum 95 %, meaning that it has some dedicated reactors</td>
</tr>
<tr>
<td>4. How many products are produced at less than 5-10 tons per month and how many are produced at more than 5-10 tons per month?</td>
<td>A great part of the Products are produced at more than 5-10 tons per month</td>
</tr>
<tr>
<td>5. Are any primary or supporting processes handled continuously in the company?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The purpose of the questions is to understand the characteristic of the company, which is believed to influence company’s interest for the Product. The questions are not connected to the capacity or limitation of the Product, why it is important to obtain the answer without communicating a misleading picture. Several positive answers mean that the company has a high interest, whereas none or one positive answer means that the company has a low interest.

Figure 25. An analysis based model that illustrates the primary, secondary and tertiary target group.

Figure 21 illustrates three different groups, which are colored green, orange and red, and refer to the primary, secondary and tertiary target group. As can be understood from the model and previous discussions, “pharma” is initially the most attractive segment, followed by “generics” and then “CRAMS”. Still, there are differences within the segments regarding the
interest for the Product, why the companies that show a high interest e.g. in the secondary segment should be prioritized over the companies that show a low interest in the primary segment. All three groups could be included in the target group in full market penetration. However, the groups are considered to be important at different stages in the diffusion process because the segmentation have been based on variables that usually separate innovators and early adopters from companies that purchase a product later.

6.2.3.2 Three alternatives for the size of the launch

The target group selection model enables The Company to choose the width of the Product launch. One alternative is to approach all segments from the start. While this would include the largest number of potential customers, there is a risk that a lot of resources are spent on companies that decide not to purchase the Product; especially since some companies are considered to be more “ready” for the Product than other companies. A second alternative is to approach all companies in the green group, which is probably more than ten companies, but could be more than the double. This would include a large number of potential customers and it requires The Company to be prepared to support testing and training of all companies. A third alternative is to approach a few companies in the green group. While this does not include the largest number of potential customers, it would allow The Company to try the market and give full attention to those companies. The Company is recommended to follow the last alternative since the risks involved are small, and it is easy to expand the target group after some time. One suggestion is to start with the interviewed companies in the green group since that would give a quick start.

6.2.4 Summary of Segmentation and Target Group

The second part of the analysis discussed segmentation variables according to Keller and Kotler (2006), which resulted in a segmentation consisting of three segments: CRAMS, generics and pharma. Combining the segments with a selection criterion called “company interest” a model was created for selecting the target group. The green group presented in the model is the primary target group, for which The Company is recommended to begin with the six companies presented in Figure 21.

6.3 The Buying Center: Who should be approached?

The purpose of the following section is to clarify which part of a company The Company should turn to when introducing The Product. The contacts the Company has at the companies today will likely not be the persons to
6.3.1 The Different Roles in the Buying Center

Webster and Wind (1972) present different roles that take part in the decision process: user, influencer, buyer, decider and gatekeeper. Their thoughts were used as a starting point for analyzing the different roles in the interviewed companies. Some differences compared to theory were observed, probably because theory presents a simplified and generalized picture. To better reflect the situation when buying a technology like the Product, an additional role and stage of the decision process were added. The adjusted model can be seen in Figure 22.

Figure 26. An adjusted version of Webster and Wind’s buying center

<table>
<thead>
<tr>
<th>Role</th>
<th>User</th>
<th>Influencer</th>
<th>Buyer</th>
<th>Decider</th>
<th>Gatekeeper</th>
<th>Initiator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of need</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Establishing specifications and scheduling the purchase</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Identifying buying alternatives</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Evaluate alternative buying actions</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting the supplier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Execution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

One difference is that Webster and Wind (1972) say that the user plays an important role in the decision process, which is not the case for the Product. The user of the Product is manufacturing, and according to chapter five manufacturing will only influence to the decision process to some extent, for instance through the technical team\(^\text{17}\). The technical team was mentioned by a number of companies and can be involved in the decision process e.g. through refining the specifications, and evaluating alternatives. Given that

\(^{17}\text{A cross functional team consisting of senior persons from functions such as R&D, production, quality and engineering}\)
the user is less involved compared to theory, another role was added to the model, the *initiator*, which identifies the need and establishes specifications. The initiator, as described during the interviews, is often process engineering. Another difference in Figure 22, compared to the model of Webster and Wind, is an additional stage in the decision process, called *execution*. The different roles and how they affect the decision process are further explained in the following sections.

### 6.3.1.1 User

The Product will be used in the production of APIs, intermediates, other fine chemicals or specialty chemicals. However, the Product will probably be introduced at lab level, before it can progress to pilot plant and later commercial production. The user, which according to Webster and Wind (1972), plays an important role and can affect all five stages, is not very involved when purchasing a new reactor. Manufacturing, i.e. the user, is influencing to some extent, for instance through the technical team. The technical team takes part in establishing specifications, identifying buying alternatives and evaluating different alternatives, where focus seemed to be evaluating alternatives. In contrast to Webster & Wind’s model, the user is usually not the one identifying the need.

### 6.3.1.2 Influencer

When buying process technology, especially a completely new technology, there will be a high degree of influence exerted by people possessing technical knowledge, according to Webster and Wind (1972). That was also found for the interviewed companies. To a small or large extent, influence can come from R&D, technical team, production and the projects organization, which all possess some technical knowledge. In one company the technical team refined the specifications, and developed and evaluated different alternatives, which is the foundation for the final decision. R&D can also influence the specifications of the purchase. R&D’s influence depends on if the technology is tested at lab level. Some companies said that R&D will have an important role when buying this kind of technology while a few said that R&D will not be involved at all. R&D is furthermore a part of the technical team. The projects organization, which handles design, purchase and implementation of new plants, is another function that could influence the decision, since focus of The Product is on new processes.

### 6.3.1.3 Buyer

The buyer in an organization can be the person negotiating and having the authority to choose a certain supplier. Based on the interviews, these two
areas would be handled by two different roles for the Product. The function handling negotiations and all administrative around the purchase is called the commercial team, purchasing team or procurement. Since The Company is the only supplier of the Product, selecting a supplier is the same as selecting a purchasing alternative or making the final decision, which is not handled by the buying unit. Instead, the buying unit executes the purchase once the decision has been made.

6.3.1.4 Decider
The final decision regarding the Product will generally be taken high up in the organization, either by top management or even the managing director. Cost and risks are the two factors that determine where the decision is taken. The size and hierarchy of the Indian companies can likely explain why the decision is taken further up in the organization than for instance in Europe.

6.3.1.5 Gatekeeper
The gatekeepers control the flow of information into the buying centre and can help to identify different buying alternatives. (Webster and Wind, 1972) An example of a gatekeeper for the Product is the Company’s current contact persons in the customers’ organizations. This person might be informed about the Product in order to help the Company find new contacts, and can thereby influence how the Product is communicated into the organization. As a result, The Company should pay attention to the attitude of that gatekeeper – if the person appears to be a “negative gatekeeper” the Company could identify further contacts independently. Other types of gatekeepers could be the people within the organizations that scan the market for new technologies. To assure that these people become “positive gatekeepers”, the Company should have a customer interface that provides good information and is easy to find, i.e. through the webpage, during exhibitions, and in articles released about the Product.

6.3.1.6 Initiator
The initiator is not covered by Webster and Wind, but since it identifies the need and takes part in developing the specification, it is considered to be the most important when introducing the Product. The person, or unit, that will initiate the decision process for the Product, can differ from case to case. However, based on the results in chapter five, the initiator will often be process engineering. Other functions that candidate as the initiator is R&D and project, and even sales & marketing was mentioned.
6.3.2 Approaching the Right Unit

Following the previous discussion, the initiator is considered important since they both identify the need and take part in developing the specifications. The interviews showed the process engineering often is the initiator, why The Company primarily should approach this unit.

One observation made in India and heard from other Swedish people working in India, is that more people are involved in meetings and decisions compared to in Sweden. The Company can take advantage of this cultural difference by involving other functions during meetings. One advantage of meeting several functions is that the discussion is raised in one or several of the functions that will have an impact later in the decision process, for instance through the technical team. Another advantage of meeting several functions is to decrease the risk identified as “change of mind set” in the risk analysis, i.e. people that rejects the Product because it requires learning and change. Functions that could be important to involve are R&D, since they take part in the technical team and are sometimes the initiator, or the projects organization, since they construct new plants.

Another aspect to consider if process engineering is placed at several locations is what geographical location to approach. If process engineering is placed somewhere central – either close to central R&D or at a central plant – this unit should be prioritized. This way, it is easier to raise the question to management, and a central function might have a better overview of the processes at all plants.

6.3.3 Summary of the Buying Center: Who should be approached?

The third part of the analysis discussed the decision process of the Product and the people that would take part in it. Webster and Wind’s (1972) model was complemented with a role called initiator and a stage of the decision process called execution. The initiator will many times be process engineering, why The Company primarily should approach this part. Procurement, or purchase team, will only execute the decision and it is therefore not efficient to approach them.

6.4 Key Factors Influencing the Decision Process

As was presented in theory, Figure 23, the model of Webster and Wind includes four factors that influence the decision process: environmental, organizational, interpersonal, and individual characteristics. In addition to
the four factors, marketing stimuli influences the buying behavior. Based on Webster and Wind’s thoughts, a similar model was developed to suit the context of the Product. Unlike the three other factors that influence the decision process, the buying center comprises people. Because of this, the buying center is addressed separately from the other factors, which is illustrated in Figure 23. In addition, marketing stimuli is considered to be of great importance and is described by two separate factors: marketing activities, which is the way that The Company should approach a customer, and Sales Concept, which mainly involves the critical success factors that The Company needs to address with the Product to be competitive compared to the batch reactor. The buying center has already been discussed, but the three other areas will be discussed in section 6.4.1-6.4.3.

6.4.1 Three Additional Factors presented by Webster & Wind
Webster and Wind (1972) present six types of environmental factors – technological, physical, economical, political, legal and cultural – of which the most relevant are discussed. One result from the company case studies was that regulatory issues makes it more complicated to buy the Product than to buy a batch reactor. This is a legal factor that will have a negative impact when a company evaluates different purchasing alternatives. To minimize the negative impact from regulatory issues The Company should focus on new processes instead of established processes, and address the traceability issue proactively in order to convince the customer that it is not complicated to integrate the Product. One cultural aspect described in chapter five is that Indian people have more confidence in European people when presenting new technology. Involving some person from the Swedish support organization when approaching the customers may therefore have a positive effect on the decision process. One suggestion that addresses this factor is to use the Swedish sales and support organization in the first phase of the launch.

Figure 27. Four areas that influence the decision process.
Examples of factors within the organization that affect the decision process are objectives, policies, reward systems and communication. Based on the results from the company case studies, a company’s strategies and objectives can have a positive or negative influence on the decision process, especially for a new product that leads to changes. For instance, producing more complex molecules was one trend highlighted during the interviews, which could have a positive effect on the decision process since there might be a demand for advanced technology. Safer and more environmental friendly processes were other trends that could have a positive impact. Greater focus on multiple purpose plants is an example of a strategy that could have a negative impact on the decision process, since the Product is less flexible than the batch reactor. These factors might be difficult to address, however The Company should be tentative to the direction in which a customer’s business is moving. Another organizational factor is the communication between the different plants of a company. Even though one company said that the results from a project is circulated to other units of the company, a general impression from the interviews was that a plant is run like a company in the company with little communication with other plants. That could have a negative impact on the decision process since there is a risk that the Product is rejected based on the suitability of the processes at that plant, instead of in the entire company. Aware of this The Company could, if possible, approach a function that has a central location or contact several plants to see which one is most suitable.

Individual characteristics can possibly have a significant impact on the decision since the Product requires the customer to be open to learning and be prepared to change the traditional way of production.

6.4.2 Sales Concept

6.4.2.1 Aim at New Processes

As was discussed in section 6.4.1, regulatory issues are factors that will have a negative influence on the decision process. Furthermore, chapter five explained that a company’s growth is believed to come from new products. To avoid regulatory issues, The Company is recommended to focus on new processes when selling the Product.

6.4.2.2 Critical Success Factors

The critical success factors are the factors that the Company should stress in the interface with the customers, i.e. during presentations, on the home page etc. Chapter five presented the results from responses regarding the
companies’ main concerns when developing new processes, and factors of priority when purchasing a new reactor. The factors that are considered to be the Product’s critical success factors on the pharmaceutical market in India are presented next.

The most important critical success factor is improved yield. Raw material constitutes the largest cost and standard yield today is about 80 %, why an improvement in yield becomes cumulative for each reaction step. Improved yield is most important for products that are produced in large volumes, why the Company should relate to large volume products when presenting the Product. Compared to the batch reactor, the Product can generate greater advantages in terms of yield. To take advantage of this, the Company should assure that the first thing that a potential customer understands about the Product should be that it provides higher yield. This should have a clear focus on the home page, when presenting the Product, if providing a customer with case studies etc.

The second most important critical success factor is safety, which was brought up as the main concern when developing a new process, and the third most important factor when choosing a new reactor. This is important for the companies because they sometimes need to avoid hazardous reactions and because it is very costly to use large amounts of solvents in a process. Safety is furthermore most important for reactions that are highly exothermic, which is usually only a small part of the total reactions. Compared to the batch reactor, the Product can generate greater advantages in terms of safety, which again is important for The Company to be competitive. Safety through efficient heat transfer is therefore a feature that the Company needs to stress, and not only regarding highly exothermic reactions. If the discussion is limited to highly exothermic reactions, there is a risk that the company gets a limited view of the Product.

The third critical success factor is environmental friendly processes. This was brought up as one of the main concerns when developing new processes and was ranked second when choosing a new reactor. Environmental friendly processes means a process that reduces waste material and energy consumption. The companies consider this important both because of environmental trends and regulations, and because it constitutes a large cost. Once again, this is one of the areas where the Product is beneficial compared to the batch reactor, and should therefore be one of the first messages that reaches the customer. India today has regulations for the environment, but one interviewed person said that they were not always followed, but that this was likely to change. One suggestion is therefore to
highlight that costs connected to waste management are likely to increase, why reducing waste will be increasingly important.

Finally, when the companies had to choose an order of six important factors, improved quality was in general ranked higher than safety, cost, etc. While a few companies said that the quality was difficult to improve, a few other companies mentioned that repeatability and consistency was important and that there was too much manual intervention today. Another company mentioned that the challenge was to increase the yield while remaining the quality. Quality should be included in the sales concept since this is one of the advantages with continuous production. Quality is however not considered to be as important as the other three critical success factors. One suggestion is to highlight remained or improved quality while presenting improved yield or environmental friendly processes.

6.4.2.3 Factors that are less important to stress

The result presented in chapter five showed that there were a few factors that were not valued as highly by the customers. These factors should not be stressed to the same extent as the critical success factors. A distinction can be made between threshold factors and factors that are less valued. Threshold factors, which refer to the features that the companies take for granted in a batch reactor, are the ability to insert chemicals and take tests during the process, efficient mixing, and traceability. This is based on the ratings presented in Figure 16, together with the explanations the interviewed persons had when they did the rating. The ability to insert chemicals and take tests during the process, efficient mixing, and traceability are all factors that had a high average (important) but a low rating in “the top three important factors” (not top priority). While it is important that the Company clearly communicates that the threshold factors are achieved with the Product, these factors should not be highlighted as “selling features”. Factors that are less valued compared to the critical success factors are process intensification, reduced scale-up time, shorter reaction time, and facilitation of developing new processes. Shorter reaction time was expected to be highly valued, but the companies responded that it was not as important as improved yield, capacity was not an issue, and shorter reaction time was mostly important for processes that had a very long reaction time. The Company is recommended to emphasize the factors that are less valued first after the customer has absorbed how the Product responds to the critical success factors, or if a customer shows a certain interest for some of the other features.
6.4.2.4 Price
While pricing is an important part of a sales concept, it was decided not to be a major focus of the master thesis since factors unrelated to a market study would need to be investigated. Still, there are a few results from the interviews that are related to price and in addition, Beard and Easingwood (1996) present a few positioning tactics that involve pricing. One of them is to position a product in the upper pricing segment by emphasizing exclusivity by focusing on the quality and engineering of the product. While the Company could stimulate the diffusion process with a low price, this is believed to have a small impact compared to other variables affecting the diffusion process, e.g. flexibility or regulatory issues. Instead there are several arguments for positioning the Product in the upper pricing segment compared to a batch reactor. First, the interviews showed that choosing a reactor that cost less was generally not considered as important. One interviewed person explained that while improved quality and safety were important, lower cost was not mandatory. Second, in chapter five it was described that India is a price conscious country with short product life cycles. Combining a short product life cycle with a product initially sold in small volumes (compared to a standardized product) it becomes more important to generate good profits from the first products. Third, the Company has no competitors with a similar product – competition is derived from the batch reactor, and possibly other types of plug flow reactors. From the discussion regarding the critical success factors, the Product has potential to be highly competitive compared to the batch reactor. As can be understood from the argumentations, the Company is recommended to position the Product in the upper pricing segment compared to the batch reactor, which costs about USD 40-50 thousands, excluding support equipment. This is supported by a study made by Beard and Easingwood (1996) that shows that a new technology introduced on a new market is usually positioned to focus on exclusivity, technology lead, or certain areas of use.

6.4.3 Marketing Activities
The fourth factor that influence the decision process according to Figure 23 presented in the beginning of 6.4, is marketing activities, which refers to initiatives aimed at the entire market or the target group, and support activities offered to individual companies in their decision process. As was described in chapter five, the interviewed companies were asked to rank different factors that influence the decision process and explain what support they would want if purchasing a product like the Product. These
results will, together with the theories of Beard and Easingwood (1996), lay
the foundation for the final section in the discussion.

Chapter three explained that Beard and Easingwood (1996) have identified
four steps that marketers usually follow when developing launch tactics:
market preparation, targeting, positioning and attack, which can be seen in
Figure 24. Since targeting and positioning have been addressed in section
6.2 and 6.4.2 respectively, this section will concentrate on how the
Company should prepare the market and how the Company should
implement the launch, according to the empirical findings and the theories
of Beard and Easingwood.

![Figure 28. Four steps that marketers usually follow when developing launch
tactics. (Beard & Easingwood, 1996)](image)

### 6.4.3.1 Activities for preparing the market

Market preparation is something that takes place simultaneously, or right
before, targeting is carried out. Two tactics that can be used to prepare the
market is licensing the Product or selling it to other equipment
manufacturers. Even though an advantage with these tactics involves
reaching a larger market, it might not be a good option for the Company,
since the interviewed companies did not mind purchasing a reactor from a
new supplier and because the Company already has an established network
in India. Furthermore, as was discussed in section 6.2 only 25-30 companies
are believed to be large enough to become customers of the Product – a
number that should be manageable to reach without licensing or selling
through other equipment manufacturers.

A third tactic for preparing the market is to release information about the
product before the launch by giving technical information to media and
support industries, do demonstrations of the product, or have seminars
regarding future technology trends. Even though this tactic is mainly used to
create technology awareness and interest, it could also be a way for the
Company to try the market and get valuable feedback before the official
launch. According to Beard and Easingwood (1996), introducing a
revolutionary innovation often involves educating the market and using
references, and to increase the knowledge about this kind of innovation the
product should be marketed to a small group of well informed customers.
One suggested alternative is therefore to prepare the market by doing a pilot
launch of the Product on the Indian market. A pilot launch would mean
approaching a few potential customers and demonstrating the Product to them before the Product is officially launched and before any information is released specifically to the Indian market. Once a few companies have tried the Product, the Company could provide the market with pre-launch information and announce the timing of the official launch.

There are several arguments why the Company should do a pilot launch. First, Beard and Easingwood (1996) state that revolutionary innovations require expensive tactics since early adopters want proof of the product’s advantages, and if the product is positioned based on exclusivity, the promotion needs to be exclusive and the sales people handling the seminars and conference have to be well educated engineers or specialists. Testing the Product on a small group of customers enables an exclusive focus without substantial investments. Second, the Company could explain that there are not yet capacity enough for a full scale launch and emphasize that the customers are a part of a small group that have the opportunity to try the Product before the official launch. Making the Product available only for those customers during a limited time period, could add a dimension to the exclusivity of the Product. Third, one purpose with the pilot launch should be to obtain references for the official launch. As presented in chapter five, references have a relatively high impact on the companies’ decision processes and Beard and Easingwood (1996) say that reference sites are important for revolutionary innovations. Fourth, a pilot launch would probably be manageable with resources from the Swedish support organization, which would enable a faster market entry. Finally, one of the main purposes with the pilot launch should be to try the market since that will decrease the risk of dedicating large resources to activities that are not profitable.

Alternatives to doing a pilot launch are either to dismiss market preparation or to prepare the market in another way. The Company could for instance provide the market with pre-launch information and announce the timing of the official launch, without doing any product demonstrations in advance. Even though a pilot launch is recommended, there are advantages of preparing the market without it as well. First, Beard and Easingwood (1996) argue that it is important to make the market aware of the new technology and its advantages, and a pilot launch will initially only create awareness and increase knowledge in a small group of companies. Second, there is a risk that none of the companies that are a part of the pilot launch are interested in trying the Product, which would result in a delayed market entry without the advantages obtained from having established the technology, e.g. references. This could furthermore result in a decision not
to launch the Product in India because of lack of market potential, which would not necessarily be the right assumption. Last, one of the purposes with a pilot launch would be to do a fast market entry. However, if the Company instead chooses to do a pilot launch at the time the official launch was supposed to take place, this will result in a loss of time instead of a gain.

6.4.3.2 Implementing the market preparation
As was discussed in section 6.2, the Company is suggested to start with the six interviewed companies in the green group since that would give a quick start. Thus, these are also the companies that are recommended to be a part of the pilot launch.

Since one of the purposes with a pilot launch is to do a fast market entry and to try the market, the pilot launch should preferably be handled by the Swedish support organization. Another advantage by using the Swedish support organization is the cultural aspect (which was discussed in 6.4.1). Indian people were said to have more confidence in European people when presenting a new technology. Therefore, the decision process may be positively influenced if someone from the Swedish support organization is involved when the customers are approached. Sales people from the Company’s organization in India should also take an active part of the pilot launch in addition to learn the Product. This is supported by Atuahene-Gima and Hultink (2000) who say that to enable diffusion of a new technology it is important that the sales force adopt the new technology, since the sales force can be seen as the initial set of customers. How well the sales force is trained is a factor influencing a new product’s success.

As was presented in chapter five, the first support that the Indian pharmaceutical companies require is to understand what kind of reactions it can be used for. Except for a demonstration of the Product, the potential customers will look for a specification including design parameters, reference customers, data on the processes that the Company has tested, and advantages relative the batch reactor and other types of plug flow reactors. During the pilot launch, references could be from European companies; however, the Company should try to obtain an Indian reference for the official launch since the interviews revealed that some companies preferred that.

The next support that most of the interviewed companies wanted was training and testing. By the time a few of the companies in the pilot launch request to try the Product, the Company should start preparing the market
for the official launch. As suggested by Beard and Easingwood (1996), this could be done by giving technical information to media or having a seminar about future technology trends. The master thesis did not cover specific media that could be used for spreading such information. However, from the discussions during the interviews it was apparent that technology updates were absorbed, e.g. through Internet or exhibitions. Therefore, one suggested marketing activity is to publish an article or an advertisement in a technical media for the pharmaceutical industry in India. In addition, the Company could demonstrate the Product at an exhibition short before it will be launched. On top of that, the Company is recommended to use its existing customer interface to release pre-launch information: announce on the homepage when the Product will be launched in India, and identify and prepare new contacts in the target group companies, for instance by an introductory email to all new contacts to inform about the launch and homepage. The intention of these activities is to raise the expectations and create a curiosity for continuous production prior to the launch. The purpose of the entire market preparation – first getting some companies to try the Product, then release pre-launch information and finally launch the Product – is that by the time of the launch the Company should have obtained some experience from the Indian market, maybe have an Indian company as a reference, and there should be some product awareness.

6.4.3.3 Activities for attacking the market
According to Beard and Easingwood (1996), the tactics used for attacking the market depends on the goals of the launch, which are based upon the market’s knowledge about the Product. When it involves a revolutionary innovation, which is the case of the Product, it is essential to make the market aware of the technology and its advantages, why educating the market is an important tactic. The purpose of this tactic is to communicate the vision of the technology, which is mostly done by focusing on activities such as road shows, lectures and seminars. Because the Product involves large changes for the customer, educating the market is, in accordance with Beard and Easingwood’s study, also considered to be important for the Company. In the case of the Product however, “educating the market” is regarded as a very wide expression that to a large extent involves activities that are presented separately by Beard and Easingwood. For instance, the objective of releasing technical information or doing demonstrations of the Product would be to educate the customers, whereas Beard and Easingwood say it is part of the tactic “pre-launch information”. Consequently, “educating the market” will in this master thesis be treated as an overall purpose of several activities, and not as a specific tactic. One of the important activities for educating the market is the sales meeting that should
be held with each company in the target group. This simply means that the Company sets up a meeting to demonstrate the Product and present it in accordance to the sales concept discussed in previous section. The sales people handling these seminars should be well-educated engineers or specialists. (Beard & Easingwood, 1996)

Another tactic that, like “educating the market”, aims at generating awareness and building image is to dedicate large resources to a big launch to create a winner image, as large PR events create a word-of-mouth affect among users and media. (Beard & Easingwood, 1996) Since this is a costly alternative and since the Company is recommended to target a small group of companies initially, a better way of stimulating word-of-mouth could be through using references, which is another important attack tactic for a revolutionary innovation revealed by the study of Beard and Easingwood. (1996) Furthermore, the interviews showed that the second most important factor when purchasing new technology was that the companies could get references to similar companies with a good reputation that had used the Product. The Company should therefore provide potential customers with references from European pharmaceutical companies to begin with, and find references from Indian pharmaceutical companies as soon as possible. The better reputation the company has regarding advanced operations, the more reliable will it be considered. To begin with, it might be difficult to be too restrictive when choosing a reference. However, if there are more alternatives later on, the Company should update the reference list so that it contains the customers with best reputation.

One activity, which was not a part of Beard and Easingwood’s study, but is linked with the tactic of using references, is to present case studies that describe the results from processes, which have been tried in the Product. As was presented in chapter five, case studies was a factor considered helpful but not decision making by the interviewed companies. Furthermore, the case studies should come from a pharmaceutical company, which could be anonymous. This activity is believed to be useful for the Company since it costs little and since it adds to the pool of information that will help the customers understand what processes it can be used for and what results it can generate.

One attack tactic used for a new market is lending or leasing the product. Leasing can be beneficial when a new technology calls for a new way of doing things. (Beard & Easingwood, 1996) This result of Beard and Easingwood’s study is well aligned with the results of the master thesis, since triability was by far the factor that the customers said would influence
the decision process the most. It is therefore essential that the Company offer the customers the possibility to lease or lend the Product. Two negative aspects of lending or leasing are that it is associated with high administrative costs and that decision times can be longer. (Beard & Easingwood, 1996) As was presented in chapter five, having a short process from contact to final deal was in general not important to the companies, why there is a risk that the companies would take their time in trying and deciding about the Product. One way for the Company to restrain this is to raise the price of leasing. However, there are a few arguments against a high leasing price. First, if more companies try the Product, it improves communicability and divisibility – two of five factors that stimulate diffusion according to Webster (1979). Second, the Product has a high conversion rate in Europe, meaning that a great part of the companies that have tried the Product have decided to purchase it as well. Finally, chapter five explained that Indian companies in general are more price sensitive than their counterparts in Europe, and two of the interviewed companies emphasized that the Product should be lent or leased at a low price. One suggestion that addresses the decision time, but only partly the administrative costs concerned with leasing, is to choose a pricing model that changes with the length of the leasing period. With this pricing model, the Company is recommended to lease the Product at a very low price for a short period of time, e.g. a month, and the companies that wish to lease it longer will have to pay for additional weeks at a significantly higher price.

Trying the Product is a way for the customers to educate themselves. In addition, the Company can provide support during and after the trials to optimize the customers’ processes – an activity aimed at educating the customer, which was highlighted as something important in the beginning of this section. Just as in Europe, there is a high degree of confidentiality in the Indian pharmaceutical companies, why some customers will prefer not to be supported. Even if the customers only might want support initially and share a limited amount of data, the Company should still offer this activity to be able to transfer knowledge that reveals the Product’s relative advantage compared to a batch reactor, and to decrease the complexity of the Product. (Webster, 1979)

Finally, the interviews revealed that a detailed product specification was something that in general was considered important, but was also the factor with the highest standard deviation. Beard and Easingwood (1996) say that emphasizing technological superiority is a positioning tactic that highlights the technical specifications more than the benefits, and requires the market to have a certain level of technology knowledge. As discussed in a previous
section, the Company is recommended to primarily approach process engineers, which might be unfamiliar with the Product’s technology but who will still have a profound technical understanding. Despite the findings of Beard and Easingwood, the Company is recommended to have a thorough specification, which can be provided to technical people that asks for it. However, during product demonstrations, the Company should focus on presenting the benefits and keep the technical details at a pedagogic level.

In addition to the Product specification, the Company should provide the customers with initial support to complete documentation to get it approved by FDA. The basic documentation for FDA consists of four qualifications: design, installation, operational and performance. This support was highlighted by one of the interviewed companies, and the purpose for the Company would be to show the customers that the Company takes responsibility in making the Product more compatible with current operations. (Webster, 1979)

6.4.3.4 Implementing the market attack

The activities that will require most resources when attacking the market will likely be the sales meetings, administration of leasing the Product and the support that the companies might require initially. The focus of this master thesis has been on the customer side more than on the organization of the Company, why this analysis will be brief.

Following the discussion of implementing the market preparation, the Company was recommended to use the Swedish support organization for the pilot launch, while including people from the Indian sales organization to learn more about the Product. The Swedish support organization might however not have resources enough to serve the Indian market when the launch is fully implemented. Since the success of a new technology is influenced by how well the sales force is trained, and how well the sales force adapt to the new technology, it is important that the Company trains the Indian organization. One suggestion is that the Indian person (or persons) that took part in the pilot launch will be further trained to be able to take responsibility for the Product’s sales in India. As long as the market is unfamiliar with the technology, someone from the Swedish support organization should take part in the sales meetings and give the initial support when a company leases the Product. However, when the Indian person has sufficient knowledge to give the companies the initial support that is needed, the Swedish support organization could take the role of an assisting function and the Indian person will have to devote more of its time
to the Product and probably involve additional persons in India. (Atuahene-
Gima & Hultink, 2000) Since the customers in general wanted to try the Product on their own and not at the Company’s location, a lab for the Product in India might not be needed. One aspect that could be advantageous to consider when deciding upon the timing of the launch, is to introduce the Product so that the companies have time to include it in the budget for the following year. Since most companies have fiscal year that begins in April, a suggested time of introduction is in October.

6.4.4 Summary of Key Factors Influencing the Decision Process
The last part of the analysis discussed the impact of environmental, organizational and individual factors on the decision process, as well as the sales concept that should be used in India, and the marketing activities that the Company should pursue when launching the Product. Important parts of the sales concept are to stress how the Product improves the yield and safety, and how it decreases waste and energy consumption. Process intensification and reduced scale-up time are factors that are less important to stress. The Company is furthermore suggested to do a pilot launch on six companies before the official launch. When a couple of companies in the pilot launch request to try the Product, the Company should release more information about the Product and about the official launch. Leasing the Product at a low price and using reference sites are two activities that should be pursued both for the pilot launch and the official launch.
7. CONCLUSIONS

The outline of the conclusions follows the purposes formulated in chapter one, and intends to highlight the key contributions to the Company and Academy.

7.1 Opportunities and Challenges on the Market

The relation between the size and the growth of the market are important factors determining the market attractiveness according to Lehmann and Winer (2005). Even though this is not directly applicable to the Product’s market in India (since there is no market today), the attractiveness of the pharmaceutical industry in India is considered to be a major opportunity. In domestic drug consumption, India is today the 14th largest market, and is projected to be the 3rd largest country in absolute growth by 2015. This indicates that there are many potential customers that are growing, which usually means that there is a need to invest in new production capacity.

In an attempt to understand the direct attractiveness of the Product’s market in India, an estimation of the market was made. The calculations were made with a method presented by Lehmann and Winer, and the calculations were based on numbers valid until 2011. The yearly market potential, assuming a full market penetration either by the Company or a potential competitor, measured more than 50 pieces of the Product.

The major concern when introducing the Product in India is believed to be absence of diffusion. Challenges or risks for introducing the Product were identified by analyzing the five factors that influence diffusion. The conclusion was that compatibility, relative advantage, and complexity were the challenges to consider.

Three risks associated with compatibility with existing operations were identified. First, there is a risk named Change of Mindset, which occurs if the customers are not willing to think in a new way and train their employees. Second, there is a high probability that the companies will consider traceability as a problem, why the Company needs to proactively address this issue. Third, the cost and money associated with meeting regulatory requirements is believed to have a high impact on established processes, but have little impact on new processes. One risk associated with the relative advantage was identified. The Product is less flexible than the
batch reactor, but there is a risk that the potential customers will make the assumption that it should be used for one purpose only. To address this, the Company needs to clearly communicate that the Product can be used for several processes, preferably by presenting a number of processes for which it works. Finally one risk associated with complexity was identified. There is an uncertainty today regarding how much solids a reaction operated in the Product can contain. This risk is somewhat accounted for already since it makes the Product less flexible. However, if it turns out that the Product will not to be useful for any of the reactions that the companies referred to as “solids”, it will have a large impact, since this generally was 90-95 % of the reactions.

7.2 Market Segmentation and Target Group Selection

The conclusions of the discussion regarding segmentation variables were that the fine chemistry and pharmaceutical industry in India should be segmented according to the size of the company, if the company’s turnover is generated from formulations or API, and the companies R&D activities. Combining these factors resulted in three segments that were named pharma, generics and CRAMS. The pharma segment consists of the companies that are doing discovery research and have API production, which are 10-15 companies. The generics segment consists of all companies that are doing formulations, except the companies that are doing discovery research since they belong to the pharma segment. The CRAMS segment consists of all companies that are not doing formulations, i.e. fine chemistry companies selling API or intermediates. The conclusions furthermore included that the Company should neither limit the target group to existing customers, nor to a geographical region. While the number of reactions containing solids is relevant as a criterion, it is too complex, why bringing it up at an early stage could create an unjustified reluctance towards the Product.

The selection of the target group involved what companies that should be included and how many. Lehmann and Winer (2005) highlight three aspects when choosing which customers to target: size or growth of a segment, possibility to gain competitive advantage, and resources available. While these were considered and the result pointed at a selection of the pharma segment, they needed to be complemented with two additional target group criteria: the innovativeness of the segment and the interest of the company. The innovativeness includes the R&D level, why this criterion supports the pharma segment initially, followed by the generics segment and the
The Company is recommended to approach a few companies in the green group initially, since that would allow the Company to try the market and give full attention to those companies. The Company is suggested to start with the six companies in the model, since that would give a quick start, and since that probably is the maximum capacity for one prototype of the Product.

### 7.3 The Buying Center in the Target Group Companies

Webster and Wind (1972) present five different roles that influence the buying decision process: *user, influencer, buyer, decider and gatekeeper*. A number of differences compared to theory were found when the framework was applied to the Product. One difference is that the user of the Product –
manufacturing – will influence the decision process to a smaller extent than presented by theory; manufacturing will generally not be the unit identifying the need for selecting the supplier, but might take part in establishing the specifications or evaluating purchasing alternatives. Another role less involved compared to theory is the buyer: instead of being the unit that chooses the supplier and handles the negotiations, the buyer – often called purchasing team or procurement – would only execute the decision in the case of the Product. Finally, a difference is that the decider regarding the Product would only be involved by giving the final approval, which will usually be taken high up in the organization, either by top management or even the managing director.

To meet the difference of the buyer and user described above, an additional role in the buying unit – the initiator – and an additional step in the decision process – execution – were created. From the Company’s perspective, the initiator is considered to be most important since it identifies the need and takes part in developing the specification. Process engineering will likely be the initiator in many cases with the Product. Other functions that candidate as the initiator are R&D and the projects organization.

The Company is recommended to primarily approach process engineering. In India however, more people are generally involved in meetings and decisions compared to in Sweden. The Company can take advantage of this cultural difference by involving several functions during meetings. This would in turn raise the question to more people, which decreases the risk identified as “Change of Mindset”, i.e. people that rejects the Product because it requires learning and change. Functions that could be important to involve is R&D, since they take part in the technical team and are sometimes the initiator, or the projects organization, since they construct new plants.

7.4 Marketing Approach to influence the Decision Process

7.4.1 Sales Concept
One environmental factor that affects the decision process is the regulations that control the pharmaceutical and fine chemistry industry. To avoid regulatory issues, the Company is recommended to focus on new processes when selling the Product. To further know what factors the Company should stress in the interface with the customers – i.e. during presentations, on the
home page etc. – the critical success factors are used. The factors that the companies in the target group would consider most important when choosing a reactor or process, is that the yield is improved, that less money and efforts have to be made to make the process safe, and that waste material and energy consumption is decreased. Improved yield is more important for products that are produced in large volumes, why the Company should relate to large volume products within the pharmaceutical industry when presenting the Product. While safety through efficient heat transfer is most important for highly exothermic reactions, the Company is recommended to stress this factor for all processes to assure that the companies do not get a limited view of the Product.

There are furthermore a few factors that the Company not should stress to the same extent as the critical success factors. A distinction was made between threshold factors and factors that are less valued. Threshold factors, which refer to the features that the companies take for granted in a batch reactor, are the ability to insert chemicals and take tests during the process, efficient mixing, and traceability. While it is important that the Company clearly communicates that the threshold factors are achieved with the Product, these factors should not be highlighted as “selling features”. Factors that are less valued compared to the critical success factors are process intensification, reduced scale-up time, shorter reaction time, and facilitation of developing new processes. Furthermore, the Company is recommended to position the Product in the upper pricing segment compared to the batch reactor, which is aligned with the result of a study made by Beard and Easingwood showing that a revolutionary innovation usually is positioned to focus on exclusivity, technology lead, or certain areas of use.

7.4.2 Marketing Activities

The marketing activities that the Company is recommended to pursue follow what Beard and Easingwood (1996) call market preparation and market attack. Their study shows that a revolutionary innovation often involves educating the market and using references, and should be marketed to a small group of well-informed customers to increase the knowledge. The Company is therefore recommended to do a thorough market preparation. The first part of the market preparation is to do a pilot launch, which means that the Company can try the market by approaching a few potential customers to demonstrate the Product and establish a relationship. One advantage of a pilot launch is that the companies included might feel “chosen”, which adds a dimension to the exclusivity. Another advantage is that it can be managed with existing resources in Sweden, which enables a
fast entry. Even if the Swedish support organization is recommended to handle the pilot launch, sales peoples in India should also take an active part in addition to learn so that the responsibility later can be moved to the Indian organization, which is supported by the sales adoption theory. (Atuahene-Gima and Hultink, 2000) Once a few companies have tried the Product, the Company could begin the second part of the market preparation, which includes publishing information in a technical media in India, demonstrating it at an exhibition, and announcing the official launch date on the home page.

One of the purposes of the market preparation is to obtain references from Indian pharmaceutical companies prior to the official launch. This should be combined with a presentation of the sales concept for the companies, which aims at creating an understanding for the customers. The next step, which is the factor that influences the decision process the most, is to let the customers try the Product. The Company is recommended to let the customers lease-buy the Product at a low price for a shorter period. Customers that wish to lease it longer will have to pay a substantially higher price. Even if the customers only might want support initially, and share a limited amount of data, the Company is recommended to offer support when the customers lease the Product, to be able to transfer as much knowledge as possible.

7.5 Contributions to The Company

The main contribution of this master thesis was to provide the Company with a customer focused analysis of the Indian market for the Product. Through interviews with potential customers, a few external persons, and a few persons within the Company, a detailed description of the market and the customers was developed. This has been used to highlight the opportunities and risks of the Product’s market in India, and to make a segmentation of the market. It has furthermore been analyzed to suggest the target group for the Product and develop a sales concept and marketing activities tailored for the Indian market. In addition to the overall conclusions, the Company can find a number of facts and recommendations, both in the empirical chapters and the analysis, which will be useful when planning the launch and when preparing for the meetings with potential customers.
7.6 Theoretical Contributions and Areas for further Research

The theoretical framework of this master thesis was primarily used to support hypotheses derived from the empirical study, and to help distinguish new aspects for the analysis. Even though the purpose has not been to question the theoretical framework, a few areas of discrepancy were revealed that could be further looked into.

One of the results of the master thesis was the segmentation into pharma, generics and CRAMS – a result that responded to the empirical material and felt as a natural approach. However, when the segments were measured against the five criteria presented by Keller and Kotler (2006), one finding was that the segments were not fully differentiable – there are likely companies in one segment that respond as the companies in another segment. Since it felt important to reach as many of the potential customers as possible, an additional segmentation criterion was added called “company interest”. This would enable the Company to target a group that excludes the companies in the first segment that are less interested, and include the companies in the second segment that are interested, which saves marketing and sales resources. One reason for the discrepancy between theory and empirical result could be that theory is a generalization, which assumes that it is possible to find criteria that completely separate two groups.

Another aspect that was revealed when working with the target group selection was that the three aspects that Lehmann and Winer (2005) highlight for choosing the target group – size or growth of a segment, possibility to gain competitive advantage, and resources available – did not give a complete picture. The reason was probably that the Product is a new technology without any direct competitors, why the possibilities to gain competitive advantage could be difficult to distinguish prior to the introduction. Instead an additional selection criterion was added called innovativeness, which included R&D and flexibility regarding new process technology. This selection criteria is however not applicable for all situations, but was useful for the Product.

To meet the discussion above, an advice for marketers who wish to make a segmentation and target group selection prior to the introduction of a revolutionary innovation, is to first get some understanding of what the characteristic of an interested customer could be and try to integrate the
result in the criteria for choosing the target group, even if it does not match the natural segments.

Another advice when introducing a revolutionary innovation is to study the buying behavior and formulate a hypothesis about this. It becomes more important to identify the unit or person within the buying center that is most efficient to approach when a revolutionary innovation is introduced than if another type of innovation is introduced. One of the results of the master thesis was that the buyer and user, as presented by Webster and Wind (1972), had a less important role for the Product, why the role “initiator” was added. For the Product, the user or buyer are not believed to be the units to approach, which would not have been discovered if relying only on theory. Webster and Wine (1972) explains that the decision process differs between organizations and they have developed a model, which we consider to be relatively “accepting” or generalized. For instance, the table illustrates that the user can influence all decision steps. It would be useful to develop that model by breaking it down to different situations, and for each situation have a more specific model.

7.7 Methodology criticism
This thesis is mostly based on qualitative data and the conclusions will be evaluated against three aspects: validity, reliability and the extent to which the results can be generalized.

7.7.1 Validity
A research is valid if it measures what it intends to measure, and in a qualitative study the goal is to describe, interpret and understand something. (Höst et al., 2006, p. 41; Davidson & Patel, 2003, p. 102-103) To make sure that the case studies in India addressed the right phenomenon, a literature study was conducted to find relevant theories. These theories have been used to find the right focus areas for the material. Furthermore, the general market study was made in order to have a better understanding of the industry before selecting companies to interview and before formulating the questions. When the questions had been formulated the questionnaire was circulated to the people that had given us the assignment, other people within the Company with a better understanding of the subject, our academic mentor, and one external person with insight in the technology and the pharmaceutical industry. Taking the feedback of the questionnaire into account, an additional adjustment was made. These activities were all
made in order to assure that relevant information for the master thesis was collected.

Finally, twelve case studies were made in order to minimize the risk of influence from our own ideas and previous knowledge, but of course this factor can never be completely disregarded.

7.7.2 Reliability
Reliability involves the consistency of the measurements regarding random variations in data collections and analysis. The selection of companies to interview was based on established criteria that would indicate if the company was a potential customer of the Product. The criteria was established by conducting the General market study and by discussing the results with people working at the Company in Lund and in India. Still, there is a risk that the selection criteria do not respond to reality, i.e. that we focused on “wrong companies” when selecting the material. One way to decrease this risk, and increase the reliability was to interview a couple of companies that were initially evaluated as belonging to the “wrong segment”; Dishman and Hikal belong to the CRAMS segment, but we wanted to assure that false assumptions were not made at an early stage. Even though the selection process was rather thorough, it does not respond to the level of reliability obtained if all segments would be interviewed to the same extent.

Another way to increase the reliability was the ambition to interview two people at each company from two different parts of the company – one working close to R&D and one working close to manufacturing, to be able to ensure a more complete picture. This was however not achieved at all companies since there were difficulties in reaching the right person or scheduling an appointment that suited both parties. Instead, there were variations concerning how many people that were present during the interviews, which part of the company they represented, and if one or two interviews were made at the company. This has probably caused some variations in the answers, e.g. the question on who would create the interest for the Product, where there was a tendency that the answer was the part of the company that the interviewed person represented.

Another aspect is the degree of standardization of the questionnaire; all interviewed persons in the Company case studies were asked the same questions, in the same order, which simplifies the analysis and increases the reliability. Some questions were furthermore very specific since the companies were asked to grade different factors, which further increase the
reliability. However, even if the same questions were asked, the impression was that there was a variation in how much responsibility the interviewed persons took for their answers, i.e. some appeared to be guessing more than others.

The collected data is based on the opinions of the interviewed persons, which could be subjective. The impression was that some companies were more willing than others to answer all questions, which affects the quality of the data. Another factor to consider is if the company has an interest in the new technology and how that interest affects the objectivity of their answers. A few of the interviewed companies had already prior to the interviews showed a strong interest in the Product, why those companies might have had a more positive attitude. To minimize loss of information during the interviews one of us wrote down as complete answers as possible on the computers, while the other person managed the interview. If there were important uncertainties in the answer of a question, contact was made with the interviewed person to clarify the question.

7.5.3 Ability to Generalize

How well conclusions can be generalized depends to a large extent on the selection. A drawback with case studies is the difficulty to generalize. (Davidson & Patel, 2003, p. 106) Therefore, the result presented in chapter four and five, and the analysis of this master thesis, intend to identify trends in the answers that can be generalized for all companies in the target group. To be able to generalize the result from the interviews, the questionnaire was the same for all the interviews with companies in India, and the selection of companies was made in order to cover all of the studied industries. The generalization of the CRAMS segment is however less reliant, since only two companies were interviewed.
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Dhotre, Dr. Himani S.; Vice President, Research & Development, Dishman; personal interview 6 Nov 2008

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Hedaoo, Rajesh C.; Head of API projects and Manufacturing, Reliance Life Science; personal interview 11 Nov 2008

Iyer, Ashok S.; General Manager, API Manufacturing, Glenmark; personal interview 14 Nov 2008

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Kumar, Dr. Ashok; President, Research & Development, IPCA; personal interview 13 Nov 2008

Mayal, R. S.; General Manager, Production; personal interview 6 Nov 2008

Naik, Ph D Rajesh; Vice President, Process Development Group, Piramal Healthcare; personal interview 12 Nov 2008
Patel, R.L.; Dy. General Manager, Environment & Process Engineering, Lupin; personal interview 7 Nov 2008

Pawar, Sanjay J.; Cipla; personal interview 12 Nov 2008

Rao, Dr.; Director of R&D, Cipla; personal interview 13 Nov 2008

Rehani, Dr. Rajeev; General Manager Research & Development (Organic Synthesis), Sun Pharmaceuticals; personal interview 6 Nov 2008

Roy, Dr. Mita; Associate Director, Innovation, Piramal Healthcare; personal interview 12 Nov 2008

Sheth, Pinakin P.; Senior Manager, Projects, Zydus Cadila; personal interview 7 Nov 2008

Srivastava, Saurabh; General Manager, Projects, Glenmark.; personal interview 14 Nov 2008

Thyagarajan, Natarajan; Senior Director, Projects, Dr. Reddy; personal interview 3 Nov 2008

8.2 Secondary Sources

8.2.1 Books


### 8.2.2 Articles


### 8.2.3 Reports

8.2.3.1 Company reports
Abbot India Limited, Annual report 2007

Atul Limited, Annual report 2007-2008

Aurobindo Pharma Limited Annual report 2007-2008

Cipla, Annual report 2007-2008,
Dishman Pharmaceuticals and Chemicals Limited, Annual report 2007-2008

Divi’s Laboratories Limited, Annual report 2007-2008
Wockhardt, Annual report 2007

Zydus Cadila, Audited Consolidated Financial Results 2007-2008

8.2.3.1 Other reports
Ernest & Young for IBEF; Pharmaceuticals – Market & Opportunities; July 2008

KPMG & Confederation of Indian Industry; Pharma Summit 2008 “India Pharma Inc – An Emerging Global hub”; 10 Sept 2008, Mumbai


8.2.4 Internet sources

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BHRGroup; http://www.bhrgroup.co.uk/pi/aboutpi.htm; 4 Jan 2009


Cadila Pharmaceuticals; http://www.cadilapharma.com; 10 Oct 2008
APPENDIX

Appendix A – Questionnaire

Background questions

1. Could you describe the value chain of your company?

2. How many pharmaceuticals does the company produce?

3. What types of R&D activities are conducted within the company?

4. What future trends do you see in operations within the company?

5. Does the company develop the process for producing API and intermediates?
   If no, who does it?
   If yes, could you describe how the processes are developed in your company?

Questions for evaluating the need for continuous production

6. Approximately how many APIs does the company produce? Compared to competitors, is that a low, equal or large number?

7. How much do you, in general, produce of one API annually?

8. On average, how many reaction steps are there in each API manufactured?

9. How many batch reactors do you have today?

10. Does the company have equipment dedicated to individual reaction steps or is the equipment used for multiple products? If both are used, what is used most?

11. Do you have reactions where high rates of heat output (exothermic reactions) are a challenge?

12. Do you have reactions where mixing is a challenge?
13. What is the reaction time in a normal reaction? Do you have very fast reactions?

14. Approximately what percentage of the reactions does not have solids?

15. Are there reactions, or reagents, you would use if you had a safer reactor? (e.g. energetic reagents or high exothermic reactions)

16. To what extent have your company considered, or used, continuous production until now?

17. Could you estimate the percentage of reactions in your company that would benefit from continuous production?

**Company specific factors**

18. Can an established production process in your company be changed from a traditional reactor to the Product? If no: why? If yes, what steps are needed?

19. What are the main concerns for your company when developing new processes?

20. What is it that you would like to change in your current processes?

21. What factor in the current process constitutes the largest cost?
22. Below are a number of factors to consider when choosing a process or reactor. For each factor could you please indicate the importance on a scale 1-5 and motivate you answer.

Ability to insert chemicals during the process and to do tests during the process
1 2 3 4 5

Safety through efficient heat transfer
1 2 3 4 5

Reaction completed in less time
1 2 3 4 5

Improved yield
1 2 3 4 5

A cleaner process: less waste material and less energy consumption
1 2 3 4 5

Process intensification
1 2 3 4 5

Ability to develop new processes & products
1 2 3 4 5

Reduce scale-up time
1 2 3 4 5

Efficient mixing during the reaction
1 2 3 4 5

Traceability
23. Could you please rank the importance (in general) of the following six factors when choosing a process.

   Improved quality
   Shorter reaction time
   Smaller equipment
   Lower cost
   Easier to control and clean
   Less dangerous

24. What support would the company need before buying a new product like the Product?

**Questions for analyzing the decision process within the company**

25. When in the process is a decision on reactor technology made?

26. What is the investment level of current reactor equipment?

27. Could you describe the purchase process from contact to closed deal for a new process technology within your company?

28. If there would be an investment in the Product, which units/persons would be involved in the decision?

   Who creates an interest?
   Who makes the final decision?
   Who else influence the decision?
29. How important are the following factors when deciding upon new process technology?  
For each factor could you please indicate the importance on a scale 1-5 and motivate you answer.

Triability of the product

1  
2  
3  
4  
5

A case study describing the result

1  
2  
3  
4  
5

A thorough product specification

1  
2  
3  
4  
5

An established relationship with the supplier

1  
2  
3  
4  
5

The product is patented

1  
2  
3  
4  
5

References from previous customers

1  
2  
3  
4  
5

Support to optimize process by sharing information

1  
2  
3  
4  
5

Short process from contact to final deal

1  
2  
3  
4  
5

30. Do you think the Product is of interest for your company?
If no:
What type of company do you think has the largest need for the Product?

If yes:
In what type of processes within your company do you think the Product would be most useful? What part of the company would be the first to use continuous production?
Appendix B – Drug development pipeline

Table. Drug development pipeline for some key R&D companies in India (Ernest & Young, July 2008; KPMG, Sept 2008)

<table>
<thead>
<tr>
<th>Company</th>
<th>Pre-clinical phase</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Year of starting discovery research</th>
<th>R&amp;D spend 07/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranbaxy</td>
<td>4-6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1994</td>
<td>7,0 %</td>
</tr>
<tr>
<td>Dr. Reddy</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1993</td>
<td>7,0 %</td>
</tr>
<tr>
<td>Glenmark</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Wockhardt</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
<td>5,7 %</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2000</td>
<td>8,8 %</td>
</tr>
<tr>
<td>Piramal L.S.</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lupin</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>7,5 %</td>
</tr>
<tr>
<td>Orchid</td>
<td>12</td>
<td>2*</td>
<td>1*</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Sun</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1993</td>
<td>9 %</td>
</tr>
<tr>
<td>Torrent</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Appendix C – Company interest

*Table. Interest for the Product among the interviewed companies (Company Case Studies)*.

<table>
<thead>
<tr>
<th>Company</th>
<th>Reactions that could benefit from cont. Product</th>
<th>Company interest</th>
<th>Product interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Reddy</td>
<td>- Theoretically 30-40 %</td>
<td>&quot;No b/c knowledge is limited about. Traceability is a major bottleneck.&quot;</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>- No reactions</td>
<td>&quot;Yes, for products more than 1 ton/month&quot;</td>
<td></td>
</tr>
<tr>
<td>Cipla</td>
<td>A very rough estimation is 5-7%</td>
<td>&quot;The interest has to be created. We need to see that it works.&quot;</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;We are surely interested&quot;</td>
<td></td>
</tr>
<tr>
<td>Sun Pharma.</td>
<td>Don't see much utility.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Maybe 1-2 intermediates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piramal Healthcare</td>
<td>1-2 %. Try it for 5-6 cases</td>
<td>&quot;Definately. For sure. But we need to know if it really works&quot;</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Yes. At lab scale to begin with&quot;</td>
<td></td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>&quot;Maybe 10-15 %&quot;</td>
<td>&quot;Yes. Applicable in most hazardous processes&quot;</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>&quot;Maybe 3-4 products for volumes of 50 tons/month&quot;</td>
<td>&quot;Yes (sounds sceptical). Maybe for 1-2 reactions.&quot;</td>
<td></td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>2-3 high volume products.</td>
<td>&quot;Yes, for one or two products that are high volume and highly exothermic. Sodium, Hydrad and Grignard could be considered.&quot;</td>
<td>4</td>
</tr>
<tr>
<td>Ipca</td>
<td>Roughly 10 % (rough guess!)</td>
<td>&quot;Yes! Production but R&amp;D will study it first!&quot;</td>
<td>5</td>
</tr>
<tr>
<td>Cadila Pharma.</td>
<td>Less than 30-40 %</td>
<td>&quot;Maybe! Interested in finding out more and trying it.&quot;</td>
<td>3</td>
</tr>
<tr>
<td>Glenmark Generics</td>
<td>Don't know</td>
<td>&quot;Yes definitely introduce it in R&amp;D (expressed in a sceptical way)!&quot;</td>
<td>2</td>
</tr>
<tr>
<td>Reliance L.S.</td>
<td>Have no idea, but probably not many.</td>
<td>&quot;Maybe. Maybe not. Depends on when it works.&quot;</td>
<td>3</td>
</tr>
<tr>
<td>Dishman</td>
<td>I see no reactions where it can be used</td>
<td>&quot;Currently we have no processes. But we would like to look into it.&quot;</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Frankly no.&quot;</td>
<td></td>
</tr>
<tr>
<td>Hikal</td>
<td>35-40 % (rough guess!)</td>
<td>&quot;Yes. Because you can expand without building a new plant&quot;</td>
<td>3</td>
</tr>
</tbody>
</table>
Appendix D – Market estimation

**MARKET SIZING**

**STEP 1: HOW MANY BATCHES ARE THERE ON THE MARKET?**

<table>
<thead>
<tr>
<th>Company</th>
<th>Answer on &quot;No of batch reactors&quot;</th>
<th>Global Sales</th>
<th>Rounded &quot;no of batch reactors&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr.Reddy</td>
<td>500 (maybe 1000)</td>
<td>50006</td>
<td>750</td>
</tr>
<tr>
<td>Cipla</td>
<td>500 (Around)</td>
<td>44290</td>
<td>500</td>
</tr>
<tr>
<td>Sun Pharma.</td>
<td>200 (At least)</td>
<td>34606</td>
<td>250</td>
</tr>
<tr>
<td>Piramal Hlth.care</td>
<td>500 (Maybe around)</td>
<td>28728</td>
<td>500</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>300 (Maybe)</td>
<td>27730</td>
<td>300</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>300 (Maybe)</td>
<td>22660</td>
<td>300</td>
</tr>
<tr>
<td>Ipca</td>
<td>200 (More than)</td>
<td>10419</td>
<td>220</td>
</tr>
<tr>
<td>Cadila Pharma</td>
<td>100 (More than)</td>
<td>10000</td>
<td>110</td>
</tr>
<tr>
<td>Glenmark Generics</td>
<td>140 (About)</td>
<td>7903</td>
<td>140</td>
</tr>
<tr>
<td>Dishman</td>
<td>400 (Maybe)</td>
<td>3592</td>
<td>400</td>
</tr>
<tr>
<td>Hikal</td>
<td>32</td>
<td>3117</td>
<td>32</td>
</tr>
</tbody>
</table>

\[
Y(x) \text{ from diagram} = Y = 0.015X \\
Y = 0.013X \\
Y = 0.011X
\]

\(Y\) = No of batch reactors  \(X\) = Turnover

![Graph showing No of Batches vs Turnover](image-url)
<table>
<thead>
<tr>
<th>Company</th>
<th>Global Sales (MRs)</th>
<th>No of batches Y=0.015*X</th>
<th>No of batches Y=0.013*X</th>
<th>No of batches Y=0.011*X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranbaxy Laboratories Limited</td>
<td>66927</td>
<td>1004</td>
<td>870</td>
<td>736</td>
</tr>
<tr>
<td>Dr. Reddy's Laboratories</td>
<td>50006</td>
<td>750</td>
<td>650</td>
<td>550</td>
</tr>
<tr>
<td>Cipla</td>
<td>44290</td>
<td>664</td>
<td>576</td>
<td>487</td>
</tr>
<tr>
<td>Sun Pharmaceuticals</td>
<td>34606</td>
<td>519</td>
<td>450</td>
<td>381</td>
</tr>
<tr>
<td>Lupin Ltd</td>
<td>27730</td>
<td>416</td>
<td>360</td>
<td>305</td>
</tr>
<tr>
<td>Wockhardt</td>
<td>26532</td>
<td>398</td>
<td>345</td>
<td>292</td>
</tr>
<tr>
<td>Jubilant Organosys</td>
<td>24889</td>
<td>373</td>
<td>324</td>
<td>274</td>
</tr>
<tr>
<td>Zydus Cadila</td>
<td>22660</td>
<td>340</td>
<td>295</td>
<td>249</td>
</tr>
<tr>
<td>Aurobindo Pharma Ltd</td>
<td>22347</td>
<td>335</td>
<td>291</td>
<td>246</td>
</tr>
<tr>
<td>Glenmark Pharma Ltd[3]</td>
<td>20092</td>
<td>301</td>
<td>261</td>
<td>221</td>
</tr>
<tr>
<td>GlaxoSmithKline Pharma, Ltd</td>
<td>17128</td>
<td>257</td>
<td>223</td>
<td>188</td>
</tr>
<tr>
<td>Torrent Pharma</td>
<td>13123</td>
<td>197</td>
<td>171</td>
<td>144</td>
</tr>
<tr>
<td>Orchid Pharmaceuticals</td>
<td>12389</td>
<td>186</td>
<td>161</td>
<td>136</td>
</tr>
<tr>
<td>IPCA Labs</td>
<td>10419</td>
<td>156</td>
<td>135</td>
<td>115</td>
</tr>
<tr>
<td>Divi's Laboratories</td>
<td>10332</td>
<td>155</td>
<td>134</td>
<td>114</td>
</tr>
<tr>
<td>Atul Limited</td>
<td>10137</td>
<td>152</td>
<td>132</td>
<td>112</td>
</tr>
<tr>
<td>Cadila Pharmaceuticals</td>
<td>10000</td>
<td>150</td>
<td>130</td>
<td>110</td>
</tr>
<tr>
<td>Matrix Laboratories</td>
<td>7495</td>
<td>112</td>
<td>97</td>
<td>82</td>
</tr>
<tr>
<td>Abbott</td>
<td>5943</td>
<td>89</td>
<td>77</td>
<td>65</td>
</tr>
<tr>
<td>Elder Pharmaceuticals</td>
<td>5512</td>
<td>83</td>
<td>72</td>
<td>61</td>
</tr>
<tr>
<td>Shasun Chemicals and Drugs Ltd.</td>
<td>4318</td>
<td>65</td>
<td>56</td>
<td>47</td>
</tr>
<tr>
<td>Strides Arcolab</td>
<td>4031</td>
<td>60</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td>Dishman Pharma. &amp; Chemicals Ltd.</td>
<td>3592</td>
<td>54</td>
<td>47</td>
<td>40</td>
</tr>
<tr>
<td>Hikal Ltd.</td>
<td>3117</td>
<td>47</td>
<td>41</td>
<td>34</td>
</tr>
<tr>
<td>Wanbury Ltd.</td>
<td>2200</td>
<td>33</td>
<td>29</td>
<td>24</td>
</tr>
<tr>
<td>TTK Healthcare Ltd</td>
<td>1990</td>
<td>30</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>RPG Life Sciences</td>
<td>1277</td>
<td>19</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Suven Life Science</td>
<td>1200</td>
<td>18</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Qualigens Fine Chemicals</td>
<td>1000</td>
<td>15</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total no of batches</strong></td>
<td><strong>7410</strong></td>
<td><strong>6422</strong></td>
<td><strong>5434</strong></td>
<td></td>
</tr>
</tbody>
</table>
STEP 2: HOW MANY BATCHES ARE BOUGHT EVERY YEAR?

<table>
<thead>
<tr>
<th></th>
<th>Years/Growth</th>
<th>No of batches Y=0.015*X</th>
<th>No of batches Y=0.013*X</th>
<th>No of batches Y=0.011*X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total batches today</td>
<td></td>
<td>7410</td>
<td>6422</td>
<td>5434</td>
</tr>
<tr>
<td>No of replaced batches</td>
<td>40</td>
<td>185</td>
<td>161</td>
<td>136</td>
</tr>
<tr>
<td>New batches to meet growth</td>
<td>0.21</td>
<td>1556</td>
<td>1349</td>
<td>1141</td>
</tr>
<tr>
<td>New batches to meet growth</td>
<td>0.15</td>
<td>1112</td>
<td>963</td>
<td>815</td>
</tr>
<tr>
<td>New batches to meet growth</td>
<td>0.10</td>
<td>741</td>
<td>642</td>
<td>543</td>
</tr>
</tbody>
</table>

TOTAL NO OF BATCHES/YEAR

<table>
<thead>
<tr>
<th>Batches per turnover</th>
<th>Industry growth</th>
<th>0.015</th>
<th>0.013</th>
<th>0.011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21%</td>
<td>1741</td>
<td>1509</td>
<td>1277</td>
</tr>
<tr>
<td></td>
<td>15%</td>
<td>1297</td>
<td>1124</td>
<td>951</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>926</td>
<td>803</td>
<td>679</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Batches sold per year</th>
<th>Average no of batches per company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worst case</td>
<td>679</td>
<td>23</td>
</tr>
<tr>
<td>Best case</td>
<td>1741</td>
<td>58</td>
</tr>
<tr>
<td>Supported case</td>
<td>1124</td>
<td>37</td>
</tr>
</tbody>
</table>

STEP 3: WHAT SHARE COULD THE PRODUCT TAKE?

<table>
<thead>
<tr>
<th>Scenarios:</th>
<th>Total no of batches/ year</th>
<th>2%</th>
<th>5%</th>
<th>10%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worst case</td>
<td>679</td>
<td>14</td>
<td>34</td>
<td>68</td>
<td>204</td>
</tr>
<tr>
<td>Best case</td>
<td>1741</td>
<td>35</td>
<td>87</td>
<td>174</td>
<td>522</td>
</tr>
<tr>
<td>Supported case</td>
<td>1124</td>
<td>22</td>
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