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Assessment of Market Potential of 3D Body Scanners within the Target Group of 3D Print Stores

- Master Thesis -

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Declaration:

I hereby declare that I am the sole author of the thesis entitled "Assessment of Market Potential of 3D Body Scanners within the Target Group of 3D Print Stores". I duly marked out all quotations. The used literature and sources are stated in the attached list of references.

In Prague on: 20.05.2014 Signature

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Abstract

The world has recently witnessed the widespread of 3D printing technology. In the shadow of this development a new means of freezing time was born: 3D figurines. A 3D figurine is a mini version of oneself; a little sculpture manufactured by 3D Printers. These 3D figurines are sold for a profit by so called 3D Print Stores to consumers. For the production of such a 3D figurine one needs 3D Body Scanners. It is from the perspective of a producer of 3D Body Scanners that this master thesis was written. The objective was to establish whether or not the company should tap into that new market segment of 3D Print Stores. Furthermore a market entry strategy was to be developed. Thus a marketing research study was performed. For the analysis of the market segment primary and secondary data was scrutinized, which was gathered through expert interviews and desktop research. The primary scope of the study was limited to Germany. Overall the market segment proved to be promising, as consumers regard 3D figurines as a more sophisticated alternative to a digital photo. Competition is currently low, but the threat of new players entering the segment is high. Thus a market entry strategy was elaborated that suggests tapping into the market as fast as possible; thereby obtaining a first mover advantage and pre-empting market space. Furthermore a differentiation strategy was proposed to shield against growing competition.

Abstract – Czech Version

Technologie třírozměrného tisku se ve světě rozšířila teprve nedávno. Jednou z aplikací, které tato technologie s sebou přinesla jsou 3D figuríny. 3D figurína je mini verze nás samotných, malá soška vyrobená třírozměrnou tiskárnou. Tyto sošky jsou prodávány za účelem zisku 3D tiskárnou (3D print stores) konečným zákazníkům. Pro výrobu této figurýny je nezbytný třírozměrný scanner. A právě z perspektivy výrobce 3D scannerů je zpracována tato diplomová práce. Cílem mé práce bylo zjistit, jestli má segment 3D maloobchodů (3D print stores) pro tohoto výrobce potenciál pro vstup. Dále bylo cílem vytvoření marketingové strategie pro tento segment. Z tohoto důvodu jsem zpracoval marketingový výzkum. V rámci analýzy trhu jsem pracoval s primárními i sekundárními dat, která jsem nashromáždil v rámci výzkumu od stolu i hloubkových rozhovorů s experty z oboru. Předmětem mého zájmu byl primárně Německý trh. Celkově se segment ukázal jako perspektivní, především proto, že koncoví zákazníci považují 3D figuríny za sofistikovanější alternativu k digitální fotografii. Konkurence je zatím nízká, ale s vysokým rizikem vstupu nových hráčů do tohoto segmentu. Proto strategie navrhuje co nejrychlejší vstup, aby firma získala výhody z brzkého vstupu. Dále navrhuji zvolit strategii diferenciace, které firmě lépe umožní bránit se přicházející konkurenci.

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1 Introduction

1.1 Importance and objectives of the study

This master thesis is about a marketing research study which examines a distinct target group within the market for 3D body scanners. A 3D body scanner as such is a technical device that creates a digital, three dimensional image of an individual (Refer to Step 2 in Figure 1: The 3D scanning process). 3D scanners are used for various purposes. In medicine for instance they are used to plan plastic surgeries based on the obtained 3D scans (= 3D images) of patients. In the fashion industry tailors use 3D scans to obtain body measurements which are necessary to produce customized cloth. The movie industry frequently uses 3D scans of actors to digitally animate certain scenes of a movie or to create special effects. Automobile manufactures strive to optimize the ergonomic design of their cars by letting the 3D scans of people take a seat in digital car models in the design phase.

Figure 1: The 3D scanning process

Step 1: 3D Scan
The whole individual is scanned by a 3D scanner within a couple of seconds.

Step 2: Processing
The computer converts the data obtained into a 3D image of the scanned individual

Step 3: Usage
Once the 3D image has been computed it can be uses for various purposes

Source: *Internal*

Another application for 3D body scanners, which evolved only recently, is the production of 3D printed figurines via so called 3D printers (Refer to Figure 2: Simplified production process of 3D printed "Mini Mes"/figurines/sculptures). A 3D printer builds up complex objects layer by layer from scratch. It is a technical device to manufacture physical objects based on digital models. Such a digital model might be created by a 3D scanner. The output of a 3D scanner, the 3D scan (or 3D image), is nothing but a digital model of an object or

person. A 3D printed figurine is a little sculpture of an individual and is often referred to as "Mini Me". For an example of a "Mini Me" please refer to the picture named "The output" in Figure 2.

Figure 2: Simplified production process of 3D printed "Mini Mes"/figurines/sculptures

Step 1:3D Scan Creation of a 3D image of an individual

Step 2: 3D Printing The 3D printer produces the figurine based on the 3D Scan

The output: 3D Figurine – a Mini Me of an individual

Source: *Internal except for pictures: On3D Printing. (06/2012). $300 3D Printer Printxel shows at the Kansas City Maker Fair. Retrieved from: http://on3dprinting.com/2012/06/25/300-3d-printer-printxel-shows-kansas-city-maker-faire/*
Reißmann, O. (07/2013). Klon aus dem 3D Drucker: Huch, das bin ja ich. Spiegel Online. Retrieved from: http://www.spiegel.de/netzwelt/gadgets/klon-aus-dem-3-d-drucker-huch-das-bin-ja-ich-a-913190.html

The target group under scrutiny in this market research study consists of so called "3D Print Stores". A "3D Print Store" is a business that produces on demand the 3D printed figurines of individuals described above and sells them for a profit. To that end they need to create the already mentioned 3D images (3D scans) of their customers which are subsequently used to produce a figurine using 3D printing technology. In order to create 3D images of individuals one can employ different kinds of 3D body scanners.

One of the companies that develop, produce and market 3D body scanners is the company from whose perspective this market research project was conducted. For reasons of confidentiality the real name of the company is not disclosed in this study and shall henceforth be referred to as company "Z".

Over the course of the last two years (2013 and 2012) company "Z" received inquiries from businesses and entrepreneurs that were interested in "Z's" 3D body scanners for the purpose of opening up "3D Print Stores". The share of inquiries for that kind of application increased

from 0% to over 20%[1] of the overall amount of requests for information (RFI) received for its 3D body scanners. This development however didn't entail a proportional increase in orders of the 3d body scanners. Internal sales statistics revealed that not a single 3D body scanner was ordered by members of this emerging target group. The reason for this gap in between number of requests for information and orders was unknown to the management of "Z". Furthermore the question arose whether these 3D print stores were rather a short lived hype than a solid, sustainable target group, worthy of investment. Subsequently the decision was taken to run a market study in order to analyze and understand this new target group of 3D print stores. The objective of this research was defined as follows: Find out if "Z" should tap into the emerging market segment of 3D print stores with its 3D body scanning technology and if yes, what needs to be done? This market research question can be split in two parts, the actual assessment of the attractiveness of the market segment for company "Z" on the one hand side and the development of a market segment entry strategy on the other hand side. The first part takes priority over the second one. In fact emphasis was to be laid on a due diligence analysis of the market segment rather than the development of the entry strategy.

1.2 Description of the study

This study consists of two major parts. The first part consist of chapter two and three and contains the theoretical framework as well as an explanation of terms and notions crucial to the understanding of the whole study. Furthermore it provides the reader with a profile of the company "Z". In addition to that the methodology applied by the researcher to conduct the marketing researchstudy is explained.

The second part of the study starts with chapter four which contains the results of this market research project. To be more specific this chapter is about the analysis of the external and internal environment of company "Z" for the market segment of 3D Print Shops. In the beginning of the chapter the internal environment of company "Z" is assessed in terms of the marketing strategy and mix for 3d body scanners. Subsequently the microeconomic environment of "Z" for the above mentioned market segment is analyzed in terms of customers, competitors, substitutes, market entry barriers and suppliers. After that an even broader perspective is taken, by scrutinizing the relevant macro environment (political, social, technological as well as economic factors). At the end of chapter four the results of the

[1] Source: Internal sales statistics of company „Z"

external and internal analysis are related to each other in order to answer the question if company "Z" should enter the market segment. Based on the results of chapter four, a market segment entry strategy is developed throughout chapter five, which marks the end of this study.

1.3 Limitations

This study has the purpose to provide the management of company "Z" with a deeper insight in the market segment of "3D Print Stores" for its 3D Body scanners. Hence the study is rather concerned with understanding the target group which points to its qualitative character in terms of marketing research. Qualitative studies come with drawbacks which are explained more thoroughly in chapter three. Generally speaking one can say that this kind of study doesn't deliver representative results. This means that its results can't be projected on the general population of the target group of 3D print stores.

The insights this study is supposed to deliver should help company "Z" to decide whether to tap into this market segment or not. Furthermore it should deliver guidance on how to enter the market segment.

2 Framework

2.1 Theoretical basis

At its very core this thesis can be classified as marketing research study. Hence a definition of marketing research as such needs to be established that builds upon the vast body of literature in this field of study. One can find many different definitions throughout the literature. All of them have certain points in common which have been combined in the following definition. Marketing research is the systematic and objective search for information that is needed to take decisions on how to market products and services. It has been established as an incremental part of modern companies' marketing departments. It defines the methodology of data collection, manages the data collection process, analyses data and communicates its results with implications for the decision makers (Sontakki, C.N., 2010). In order to deliver implications of relevance to the management of a certain company one must take the distinct characteristics of its business into consideration.

The company from whose perspective this marketing research study was written (Company "Z") is purely operating in a so called "Business to Business" (B2B) and "Business to Administration" (B2A) environment. Hence it is selling its products only to other businesses or administrations. The marketing of products in such an environment is significantly different from the marketing in the business to consumer (B2C) environment. As a consequence the information needed to take sound marketing decisions in a B2B or B2A context differs. Moreover the market characteristics of B2B and B2A environments have important implications for the conduct marketing research[2] (Pelsmacker, Van den Bergh, Geuens, 2007), (Cateora et al, 2011). It is for that reason that the characteristics of the B2B marketing shall be discussed hereinafter.

First of all a definition of "Business to business marketing" is given. Business to business marketing comprises all activities within businesses related to marketing products to commercial organizations. These commercial organizations (companies) use these products to resell or use them in the production of consumer or industrial goods, or to facilitate the activities of a company (Pelsmacker, Van den Bergh, 2007).

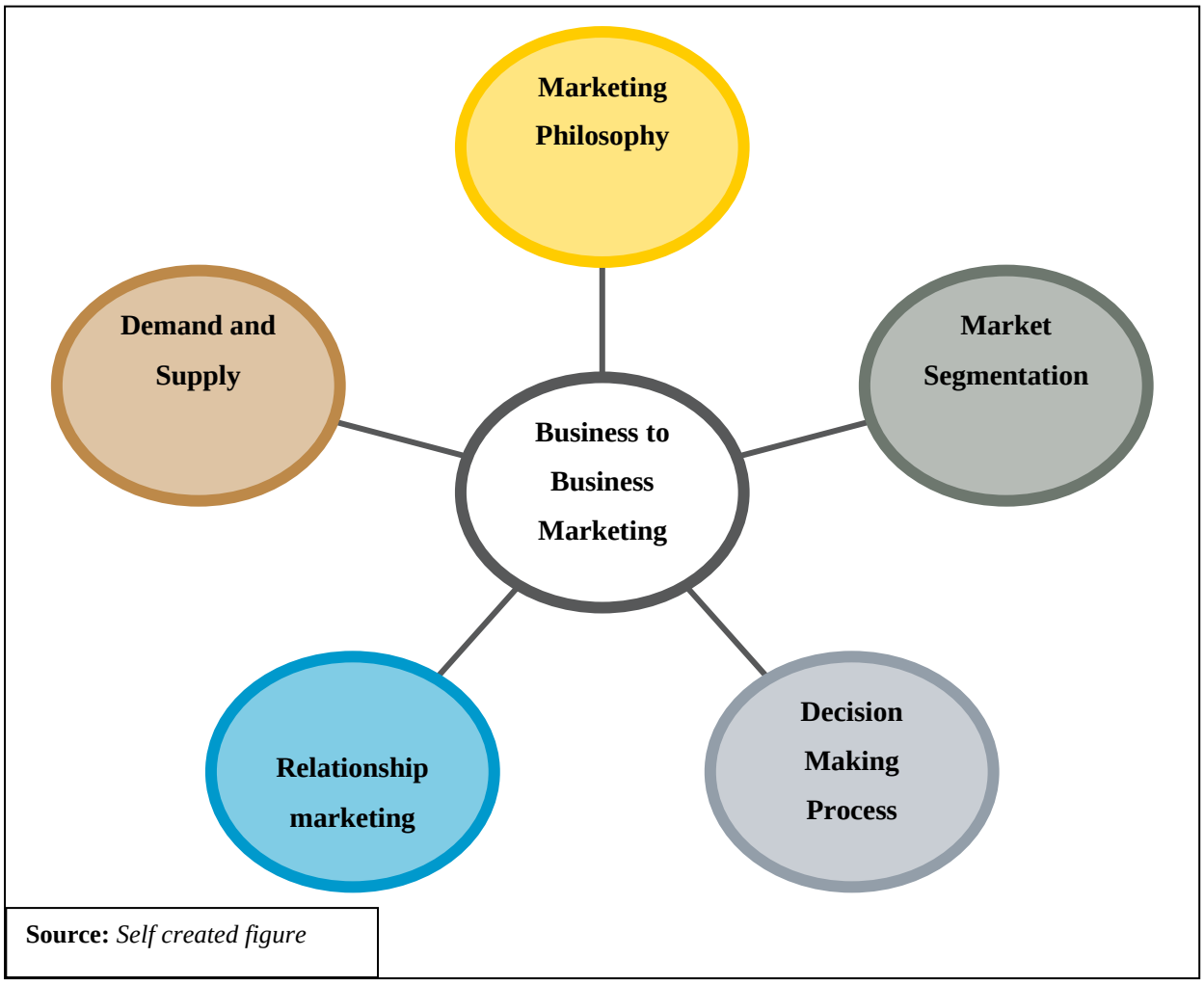
The important characteristics of B2B marketing to be discussed in this chapter are depicted in Figure 3: Important aspects of "Business to Business" Marketing. The first characteristic to be explained is the distinct nature of **"Demand and Supply"** in a B2B environment. The supply side in a B2B environment is usually oligopolistic and the demand side is oligopsonistic. Hence there is only a limited amount of market participants on both sides (Pelsmacker, Van den Bergh, 2007). Moreover demand as such is derived from the B2C market. This means that demand on a B2B market only exists because there is consumer demand at the end of the line (Cateora et al, 2011). For example the sales of Airbus, the European manufacturer of commercial aircrafts, directly depends on the development of its customers' business. The more consumers travel by plane the higher the sales of airlines like Lufthansa or Air France, which subsequently order more planes from Airbus.

This dependency on the B2C market also comes with a higher volatility of demand for B2B companies (Cateora et al, 2011), (Brennan et al, 2007) (Pelsmacker, Van den Bergh, 2007). This volatility can be explained by the so called "Bullwhip effect", which is depicted in

[2] The implications for B2B marketing research are described throughout chapter three.

Figure 4: The impact of surges or drops in demand on different steps in the value chain. The bullwhip effect refers to the phenomena of larger and larger swings in inventory response to changes in customer demand, as one looks at firms further back in the supply chain for a product (Werner, 2010). This bullwhip effect is also referred to as accelerator effect (Brennan, 2007).

Figure 3: Important aspects of "Business to Business" Marketing



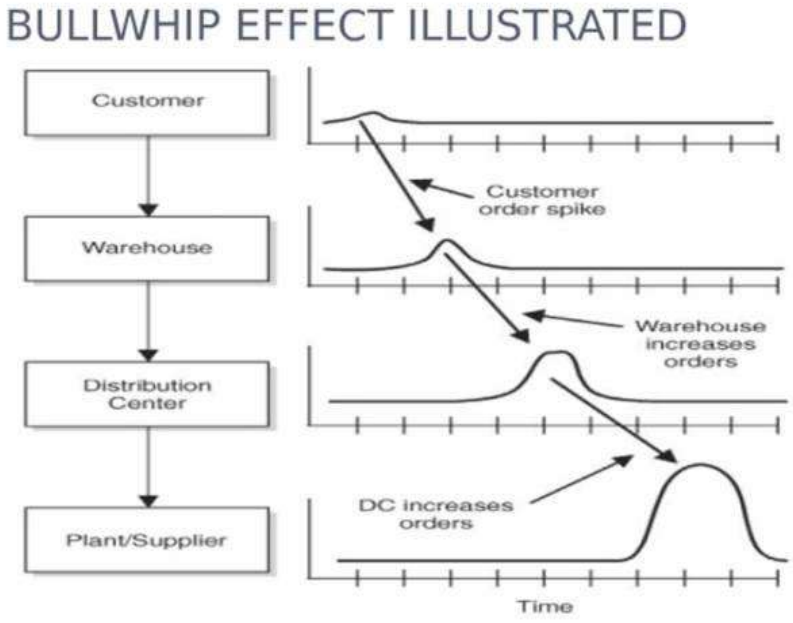
Source: *Self created figure*

The characteristics of supply and demand in the B2B are having certain implications for the B2B marketing. Firstly, since demand is derived, B2B companies can't influence their demand as B2C companies can. Price cuts, sales promotions and advertisement campaigns for their industrial goods don't have the same impact on B2B as they do on B2C customers. In fact it has been reported throughout literature that discounts and price reductions have a negative impact on demand in the B2B area. Hence there is reversed price elasticity on B2B markets. Derived demand also implies that B2B marketers must be aware of „developments both up- and downstream that may affect their marketing strategy"(Brennan et al., 2007). In

particular „downstream demand drives the level of derived demand in specific business markets“(Brennan et al., 2007).

Secondly B2B companies need to cope with the high volatility of demand, as it implies a high level of risk for businesses. The strategic response to this is the reduction of risk through diversification and broad, international market coverage (Cateora et al, 2011). Thirdly the oligopolistic and oligopsonistic market structure implies that the market participants know each other better than the market participants on a B2C market. Subsequently marketers in the B2B area can take a more individualized approach when addressing its target group (Pelsmacker, Van den Bergh, 2007).

Figure 4: The impact of surges or drops in demand on different steps in the value chain



Source: *Supply Chain Management. (February 17, 2012). Taming that bullwhip effect. Retrieved from: http://romeshgupta.wordpress.com/2012/02/17/taming-that-bullwhip-effectchallenge-to-a-supply-chain-professional/*

Another aspect to be discussed is the applied **marketing philosophy** in the B2B area. On a B2C market customers seek personal satisfaction, whereas companies in a B2B environment seek profit. The achievement of consumer satisfaction is as complex as humanity and requires companies to gain an in depth understanding of a lot of hard to quantify subjective factors such as the socio cultural background, habits and tastes of a the target group. In the B2B environment however subjective factors usually don't play a decisive role. What corporate purchasers are interested in is whether or not an acquired product fulfills its purpose in the

process of value creation within the company. In other words economic objectives dominate the purchasing decision (Cherunilam, 2008). Hence the need for B2B marketers to adopt their marketing mix to socio cultural differences is limited. The similarities across countries and cultures outweigh the differences. Subsequently marketers tend to go for a standardization strategy of their marketing mix. If a certain machine tool for example is customized for the domestic market it is usually also customized for the international market (Cateora et al, 2011), (Pelsmacker, Van den Bergh, 2007).

Purchasing decisions driven by economic objectives also suggest a different approach to **market segmentation** in the B2B area as compared to the B2C area. Market segmentation in B2B is not based on demography or psychographic characteristics but on type of industry, fields of applications, institutional characteristics, level of technology as well as characteristics of decision making within the target group (Pelsmacker, Van den Bergh, 2007). This list is neither exclusive nor does it comprise all possible criteria for market segmentation in the B2B area. It is rather a list of commonly found segmentation criteria. In fact marketing segmentation criteria differ significantly across and within B2B industries (Brennan et al., 2007).

Another important factor to consider is the **purchasing decision process** in a B2B environment. The purchasing decision process is commonly divided into five steps (Fill, McKee, 2011):

1. **Need Problem recognition:** Internally and or externally trigged identification of a gap between the benefits an organization has now and the benefits it would like to have. The first decision is therefore about how to close this gap. The classical make or buy question needs to be answered.
2. **Establishment of product specifications:** Once a business has decided to buy, instead of make, the process of establishing the product specifications is underway. This may take the form of a functional or general description or a detailed technical specification, based upon in depth research. This phase is of significance for B2B marketing, given the fact that the established specifications narrow down the possible choice of suppliers.
3. **Supplier and product research**: At this point of the decision making process the buyer actively searches potential suppliers for its desired products. Besides being able to offer a product in accordance with product specifications it is of the utmost

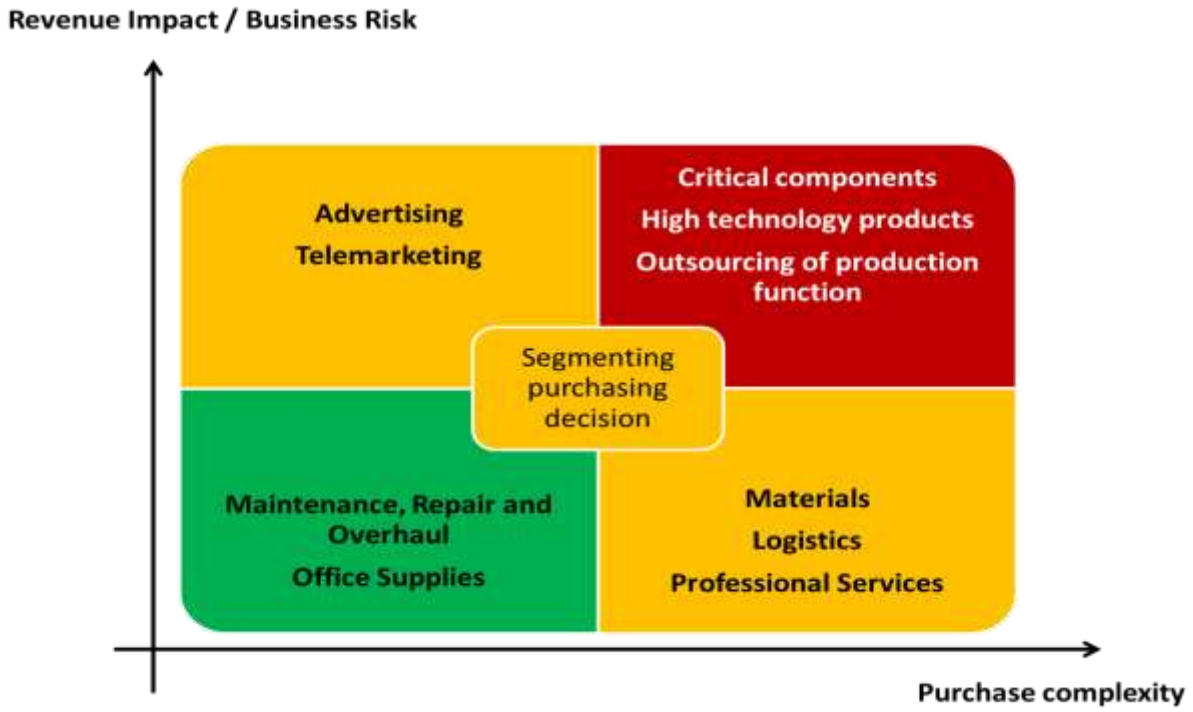
importance at this stage for B2B marketers to establish trust. Why this is important is explained later in this chapter.

4. **Evaluation of proposals:** At this point the buyer reviews the offers and evaluates them. For new suppliers which are unknown to the buyer, the review process is of particular importance. Suppliers which have already delivered products to the buyer in the past are likely to have a competitive advantage at this stage. The implication for suppliers unknown to the buyer from a B2B marketing point of view is the build-up of trust via references, public relations and personal selling.
5. **Ex-post evaluation of purchase**: After the purchase decision has been taken the buyer will evaluate and track the performance of the acquired product or service. A high after sales service of quality is the key at this point to customer retention.

First and foremost one can state that purchasing decisions in the corporate world usually involve more than one individual (Pelsmacker, Van den Bergh, 2007). The higher the strategic importance and complexity of the purchase to be executed the more stakeholders from different corporate functions are involved (Refer to Figure 5: Segmenting Purchasing Decision in B2B market).

Figure 5: Segmenting Purchasing Decision in B2B market

Source: *Brenan, R.C., Louise, E. , McDowell, R. (2007). Business to Business Marketing. Chapter 2, p. 33*. SAGE.



The strategic importance of a purchase can be gauged by the impact of a purchase on the company's budget. The complexity of a purchase usually increases with the level of technology and degree of customization (Brenan et al., 2007). The implications for B2B marketers are obvious. It is absolutely necessary to take the interests of different corporate functions of your target group into consideration when designing the marketing mix and strategy for products that belong to yellow or red quadrants of Figure 5: Segmenting Purchasing Decision in B2B market.

For the target group of interest in this paper, 3D print stores, 3D body scanners are a crucial component of their value chain, as they cannot operate without them (Refer to Chapter 2.2 for further explanations). Furthermore, in terms of value, they represent a major investment and are technologically complex. Hence, from the perspective of the target group, 3D scanners belong to the red area (Refer to Figure 5: Segmenting Purchasing Decision in B2B market). It is for this reason that the further theoretical discussion of the B2B purchasing process will focus on this kind of goods (technological complex and crucial to business), which shall be referred to hereinafter as strategic equipment.

With increasing complexity of the procurement decision at hand usually come another typical characteristic of the B2B purchasing decision process: time intensity. Time intensity in this case is twofold. Firstly the decision process as such takes significant more time as compared to B2C market. Secondly the purchase decision usually entails a long term relationship between the supplier and the customer in terms of after sales service (e.g. technical support, maintenance contracts) (Pelsmacker, Van den Bergh, 2007).

As mentioned earlier a purchasing decision in B2B is usually driven by economic factors. Besides the right price-quality relationship this usually also includes two other factors, namely reliability of supply as well as after sales service. After Sales Service plays a major role, because if businesses do not receive efficient and effective after sales service, they may suffer significant losses. An example would be a malfunctioning assembly line of a car manufacturer that can't be fixed within 24 hours by the company hired to maintain the equipment. Reliability of supply is also of significance as switching costs between suppliers of strategic equipment are significant. It is therefore of the utmost importance that the supplier is a reliable partner in the long run. An unforeseen bankruptcy of the supplier of jet engines to AIRBUS for example is likely to bring the company's whole production line of planes to a

halt, as there are very few manufacturers of jet engines in the world and their production capacities are limited. Moreover the jet engines are highly customized to the plane models of AIRBUS and they are technologically complex. Finding a new supplier would be a lengthy and cost intensive process.

Given the fact that strategic equipment is integrated into the customer's value chain, compatibility is another decisive factor to consider for corporate purchasers. Compatibility refers to the question whether or not a specific product can be integrated into a company's process of value creation. As literature indicates, there are rarely standard solutions when it comes to strategic equipment in the field of B2B. In fact it is common practice to customize a product to the client's need in order to make it fit into its value chain. (Pelsmacker, Van den Bergh, 2007).

As B2B business transactions are time consuming, cost intensive and usually entail a long term relationship, there is another important factor which has a significant impact on the purchasing decision, namely mutual trust. Mutual trust is built on an interpersonal level which brings us to the next characteristic of B2B marketing to be discussed, namely the importance of relationships. The pivotal role of relationships has found its way into marketing theory via the approach of "Relationship Marketing" (Pelsmacker, Van den Bergh, 2007).

Relationship marketing as such is the successor of the so called 4Ps[3] approach (Product, price, place and distribution) and nowadays the contemporary basis of B2B marketing (Fill, McKee, 2011),(Grönroos, 1994). In this new relationship centered paradigm of marketing the four Ps of old still have their place, but do not dominate marketing any more. It is argued throughout the literature that the 4Ps are still variables to be considered but they need to be adjusted to incorporate an orientation towards the market. To that end the 4Ps are transferred to 4Cs as depicted in Figure 6: From 4Ps to 4Cs(Pelsmacker, Van den Bergh, 2007).

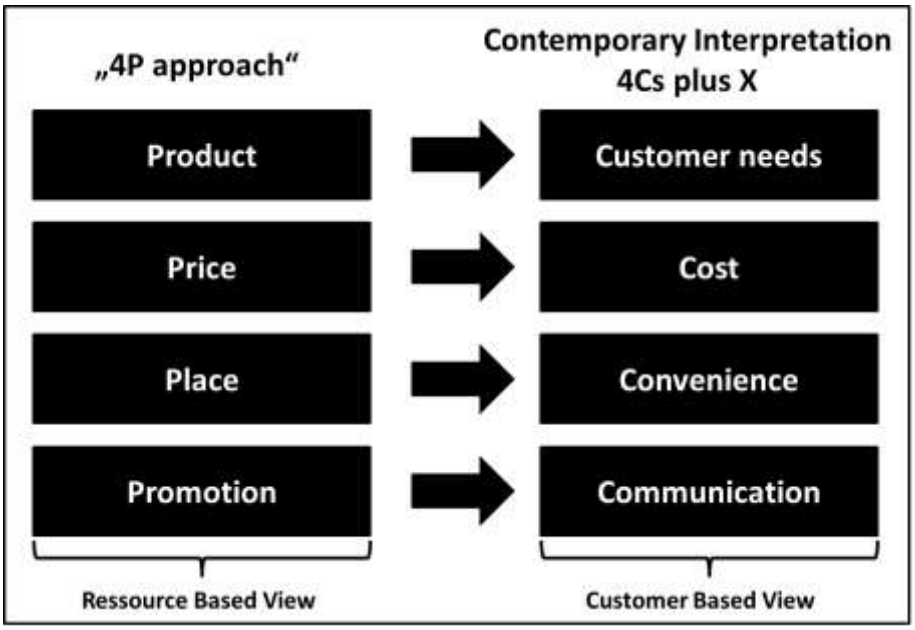
[3] The 4Ps approach (Product, Place, Promotion, Price) was introduced by Neil Bordon in the 1950s. The 4Ps were considered to be different means of competition for marketers. The 4Ps are also referred to as marketing mix as the marketer "plans various means of competition and blends them together in a marketing mix, so that the profit function is optimized (Grönroos, 1994). The 4P model is based on the basic assumption that the "buyer is passive and the vendor active. It stems from the stimulus-organism-response model, which assumes that passive buyers to offers of suppliers in a more or less subservient and unquestioning manner." (Fill, McKee, 2011).

Moreover other variables need to be added, which are neglected by the 4 P approach. The variables to be added depend on the concrete context (Grönroos, 1994).

As opposed to the 4Ps approach the relationship marketing approach acknowledges the fundamental importance of interaction within the B2B environment. It regards "the development of collaborative and mutually rewarding relationships between buyers and sellers as fundamentally more appealing and an intuitively appropriate interpretation of business to business marketing" (Fill, McKee, 2011). Furthermore this new approach stresses the merits from developing partnerships with other organizations. By doing so it clearly contradicts the former opposing ideas "based only on competition and where the sole focus is on the customer". (Fill, McKee, 2011). The relationship marketing approach takes, besides customers, all the stakeholders of a business into consideration, e.g. suppliers, employees, shareholders etc.

Figure 6: From 4Ps to 4Cs

Source: *Self created figure based on textbook: Pelsmacker, Van den Bergh, 2007*



The 4Cs depicted in Figure 6: From 4Ps to 4Cs shall be explained more thoroughly and put into the context of B2B marketing. The first one „Customer needs" is an expression of the central role of customers' needs for the development of products. It is also testimony to the ultimate customer orientation and acknowledges the uniqueness of each customer in the B2B environment (Pelsmacker, Van den Bergh, 2007).

Cost refers to the former price policy which is supposed to be determined by the marketers by taking the point of view of their target group. The change of perspective is the reason for the label cost instead of price. Moreover cost refers to the total cost of ownership of the product for the customer. Thus its long term impacts on the customer's business need to be taken into account (Pelsmacker, Van den Bergh, 2007). For instance the impact on the customer's profitability plays a major role. Another aspect of the cost dimension in B2B marketing is that prices usually only have an indicative nature and are subject to negotiations (Cherunilam, 2008).

Convienience in B2B marketing is related to the former place but takes a broader perspective. It is not limited to mere physical distribution of the product. Convienience translates into a strong emphasis on after sales service, personnel selling, reliability of supply and anything else which makes the access to the company's products and services as easy and uncomplicated as possible. The complexity of strategic equipment as such dictates short distribution channels. Direct distribution is in fact common practice within B2B markets (Pelsmacker, Van den Bergh, 2007).

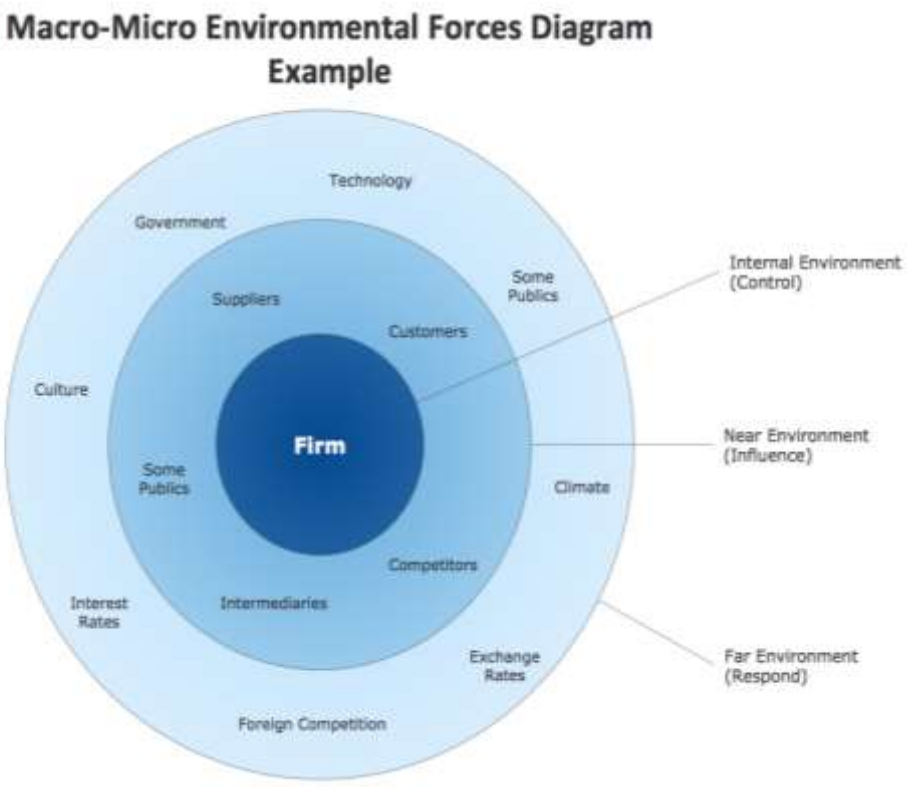
The shift from promotion to communication mirrors the interactive role marketing communication usually takes in the B2B area. Moreover the communication is usually highly individualized and tailor made. Most of it takes place on a face to face level via the company's sales force. The messages transposed are highly rational and free from emotions. It is argued throughout literature that brands usually don't play a central role in the B2B area (Pelsmacker, Van den Bergh, 2007). Nevertheless there are examples where B2B companies successfully managed to establish their brand and use it as a means of differentiation within their respective markets. Examples for successful branding are IBM, Cisco, Oracle or Intel. These multinational companies were faced with the prospect of commoditization of their products and therefore deployed a brand development strategy (Leek, Christodoulides, 26/10/2011).

Besides personal selling trade fairs and public relations are the most important instruments of marketing communication within B2B markets. Moreover direct mailings and advertisement in carefully selected magazines for professionals usually pave the way for the sales staff.
Mass media like radio, TV or billboards on the other hand are usually not part of a B2B company's communication mix, as they don't fulfill the requirement of a two way

communication and they are not precise enough in terms of targeting (Pelsmacker, Van den Bergh, 2007).

As indicated in the introduction, the objective of this study also consists of developing an entry strategy for the market segment of 3D print stores, if the market potential proves to be promising. Therefore a definition of the term market entry strategy is in order.
A strategy as such in the sphere of business is a plan that "integrates major goals, policies, decisions and sequences of action into a cohesive whole. Strategy as such is concerned with effectiveness rather than efficiency and is the process of analyzing the environment and designing the strategic fit between the organization, its resources and objectives and the environment" (Proctor, 2000).

Figure 7: The Macro, Micro and internal environment of a company



Source: *ConceptDraw. (13/04/2014). Marketing – Target and circular diagrams. Retrieved from:http://www.conceptdraw.com/samples/marketing-sale-diagrams-target-circular-diagrams*

The emphasis here lies on creating strategic fit between the external and internal environment, no matter if the strategy has been formulized just for a function of a business, like marketing or human resources, or if it is a corporate strategy, that is a strategy for the entire business. In

order to be able to develop a strategy that creates a strategic fit one must analyze an in depth the external as well as the internal environment (Grant, 2013). Hence the analysis part of this marketing research project must take a broad perspective and cannot limit itself to the analysis of the target group only. Instead it must incorporate the entire micro environment (e.g. Suppliers, Substitutes, Customers, Competitors) as well as the macro environment (Political, Economic, Social and Technological developments) that affects the industry environment in the long run (Refer to Figure 7). The micro environment is also referred to as industry.

In addition to that the internal strength and weaknesses of company "Z" vis-à-vis this external environment must be identified in order to derive a strategy (Grant, 2013).
The objective of a strategy is to establish a competitive advantage, which allows the company to persistently earn a higher rate of profit relative to its competitors (Grant, 2013). Thus strategy is a quest for profit. A market entry strategy subsequently describes how a business should enter a specific market and establish a competitive advantage.

2.2 Definition and explanation of fundamental terms

The purpose of this sub chapter is to define and explain crucial terms and notions that are frequently used throughout this master thesis.

Firstly the notion of "3D Printing" needs to be explained, as it constitutes an incremental part of the target group's (3D Print Stores) value chain. 3D printing refers to a production process that builds up objects from scratch layer by layer (Refer to Figure 2: Simplified production process of 3D printed "Mini Mes"/figurines/sculptures in chapter 1.1). The objects may take any shape and are based on digital models. These digital models can be designed digitally by using Computer Aided Desing (CAD) software or by scanning objects with 3D Scanners (EXCELL et al, 05/2010).

Due to the fact that „3D printing" means building objects up layer by layer it is often referred to as additive manufacturing. Additive manufacturing is different from traditional subtractive manufacturing processes, which mostly rely on the removal of material by methods such as cutting or drilling. One of the main advantages of additive manufacturing is the significant reduction of waste which might be as high as 95%. In addition to that it increases the freedom of desingers as it frees them from the constraints of substractive manufacturing processes. The

additive manufacturing allows to produce different kinds of products and it alters the way products can be designed. For instance the geometries can be much more complicated. (EXCELL et al, 05/2010).

"3D Printing" as such emerged for the first time in the 1980's. In the beginning 3D Printers have been "too large, expensive and too difficult to use machines with enormous costs" (3DPrinterPrices.net, 07/2013). This has been limiting their use to applications within industrial companies and research facilities. Over the course of the last three years however ways have been found to produce these 3D printers more efficiently, such that they are nowadays available for sale on the business to consumer market (3DPrinterPrices.net, 07/2013). Even Hewlett & Packard, a multinational company which specialized in personal computers and printers decided to tap into the market of 3D printers for consumers (Sharwood, 2013). Besides the ever growing consumer market for 3D printers there are numerous other applications which are depicted in the Figure 8: Global Opportunities for 3D Printing.. The reason behind this broad field of application can also be explained by the broad number of different materials a 3D printer can potentially use to build up objects. Recent development in this field even made the mixture of different materials in a single build up possible. Whereas most commercially available 3D printers for consumers only use one material, typically ABS plastic, professional 3D printers can mix up to 14 (Filice, 06/2012).

Figure 8: Global Opportunities for 3D Printing.

Needs lots more R&D		- Organ replacement	- Furniture - Consumer Electronics
Nearing commercial use	- Prepared food	- Science Education - Bicycles - Guns and Ammo - Apparel	- Life Sciences R&D - Home Building & Improvement - Power Tools
In use	-Craft and Hobby -Animation and Gaming	- Medical Prosthetics - Retail Hardware - Auto Spare Parts - Toys	- Industrial R&D - Aircraft & Defense
	3D printed figurines		
	Consumers	Small to middle sized Business	Corporations

Source: *Faktor, S. (10/15/2012). How Could HP reinvent 3D Printing and Itsself. Forbes.*

3D printed sculptures of individuals are to be placed between small and middle sized businesses on the one hand side and consumers on the other side (Refer to Figure 8). Moreover they belong to the field "In Use" as there are already 3D Print Shops and consumers who use 3D printers for that purpose. The rationale behind is that 3D printers for consumers, as well as their more sophisticated counterparts for professionals, are capable of producing 3D figurines. The differences in quality however can be significant depending on the quality of the 3D printer as such as well as the used 3D scan. For instance consumer 3D printers are usually not capable of printing colorful 3D sculptures.

Figure 9: Example of 3D printed sculpture often refered to as "Mini Me",

Source: *Sher, D. (27/11/2013). Kinect yourself a 3D printed Mini Me with Shapify. 3D printing Industry.*

Moreover consumer 3D printers are limited when it comes to the maximum size of objects that might be printed. According to "10TopTenReviews" an American Webpage that compared the best ten 3D printers available for sale and conceived for consumers, the maximum volume of objects to be printed is 20.3 cm in width, 30.5 cm in height and 30.5 cm in length (10TopReviews, 2014). In addition to that, as mentioned earlier, they are usually limited to one single material, namely ABS plastics (Filice, 06/2012).

The limitations of consumer printers in quality make the use of professional equipment for the production of high quality 3D sculptures necessary. The professional 3D printers however come at a greater cost. Whereas consumer 3D printers cost between $999 and $2,999 (10TopReviews, 2014), professional 3D printers require a budget that easily exceed 60,000€[4]. This is where 3D print shops enter the equation. As a business they can afford the cost of the equipment and offer the production of 3D sculptures for a profit to consumers. The existence

[4] Price information stems from expert interviews. Refer to Chapter 4 for more information

of 3D print stores in various countries of the world is a case in point for this conclusion (Refer to Annex A).

Another critical input for 3D printing is the 3D Scan. 3D Scans are the output of so called 3D scanners. For the purpose of this study 3D scanners shall be defined as follows. This definition of 3D scanners has been taken from a webpage dedicated to 3D scanning only:

> *„**3D Scanner** come in many forms, but the purpose of every one of them is to capture the shape, and sometimes color, of real-world physical objects or environments. This captured data is typically stored as a list of xyz-coordinates in a point cloud file.*
> *(3D Scanning Glossary, 2014).*

Hence a 3D scan as such is nothing but a list of xyz-coordinates in a point cloud file. The quality of that file is determined by the number of points (xyz-coordinates) per cm^2 that have been captured by the 3d scanner. The number of points per cm^2 captured is also referred to as resolution. Besides the number of points captures there are other aspects of quality, one of which is precision. Precision is the accuracy by which the geometric shape of an object has been captured. This is usually measured in mm and expressed as standard deviation by which the shape of the 3D scan differs on average from the real physical object. Another aspect of quality is whether color textures have been captured, that is whether or not the 3D scan is colorful or just shows one color only. Without color textures a colorful 3D sculpture can't be printed. Other than that the time it takes to create a 3D scan is also a criterion of quality.
Besides these basic parameters of quality there are others which shall not be explained here. The important point in this context is that the relevance of the different criteria of quality depends on the final use of the 3D scan.

In the area of medical research, precision and speed are of the utmost importance, whereas colors of the 3D scans are of little use for physicians (Hilger, Twardowski, 2004). When it comes to industrial engineering and design, precision is crucial but time is of lesser importance, since objects to be scanned don't move. Moreover color textures are not important but versatility in the objects that can be scanned is usually a prerequisite (Bernadini, 2002). Which of the factors of quality are important to 3D print stores is to be established by this study.

In the context of 3D scanning, one should take into account that there are different types of physical techniques to capture 3D data. In general one can distinguish three basic technologies, namely laser scanning, photogrammetry as well as Millimeter wave (Treleaven, Wells, 2007). On the market for 3D body scanners, all of them are in use. It is for that reason that a brief definition of each of them shall be given. The following definitions stem from an academic paper about "3d body scanning and healthcare applications" published by the University College London in 2007.

*"**Photogrammetry**. These 3D scanners project patternsof light on the body. A video projector produces the patternand the cameras record the distorted pattern" (Treleaven, Wells, 2007).*

*„**Laser scanning**. This type of 3D scanner uses harmless,invisible lasers to measure the body. They work on the principle of triangulation, projecting a single point, line, or multiple lines onto the subject, and using a video camera offset from the laser source to view the laser light on the subjectbeing scanned" (Treleaven, Wells, 2007).*

*„**Millimeter wave**. These 3D scanners use linear-array radio-wave technology to scan a subject's body, and they can scan through clothing." (Treleaven, Wells, 2007).*

Different technical approaches come with different advantages and disadvantages. The millimeter wave is lacking accuracy and contrast but allows for real time scanning. Photogrammetry is used in different forms but has been found to deliver poor results when precise measurements and surface are important. Laser scanning is the most precise and efficient technology for 3D scanning. Moreover multiple laser scanner systems can be used simultaneously as opposed to photogrammetry where the simultaneous use would lead to light projection interference. In other words this means that several laser scanners can be used at the same time to speed up the scanning process of the whole object. This would not be possible with photogrammetry (Rodriguez-Quinonez et al, 2011).

Similar to the market for 3D printers, the market for 3D scanners has undergone a development within the last couple of years that lead to a widespread of the technology. This development was fostered by decrease in prices and widespread of computers with sophisticated hardware graphic display capabilities. The latter are needed for displaying and

processing 3D images (Bernardini, 2002). For instance Businesses like **Artec** or **3DSystems** have developed 3D scanners for consumers (3DSystems, 08/11/2013),(Artec, 2014).

Regardless to the technical approach, the actual scanning process follows the same basic logic (Bernardini, 2002) and is therefore defined as follows:

> *„3D Scaning is the process of capturing the shape, and sometimes color, of real-world physical objects or environments the result of which is a list of xyz-coordinates in a point cloud file.“*

For 3D print stores it is of the essence to have 3d scanners capable of obtaining 3d scans of the entire human body, in order to be able to print a full sculpture of an individual. Hence it is necessary to make a differentiation between the notion of 3D scanner and 3D body scanner. Only the latter can perform a whole 3d body scan. The rest of the 3D scanners out there are of no interest for this study which is why the differentiation between 3D scanners and 3D body scanners is stressed.

Another notion that requires precise definition is the one of “3D Print Stores”. As indicated in the introduction, a “3D Print Store” is a business that produces on demand little sculptures of individuals, using 3D printers, and sells these sculptures for a profit. A 3D sculpture as such is often referred to as “Mini Me” which reflects the fact that it looks like a small version of the person that has been scanned (Refer to Figure 10: Example of 3D sculpture/"Mini Me" produced by a German Print Store located in Hamburg, Germany.).

Figure 10: Example of 3D sculpture/"Mini Me" produced by a German Print Store located in Hamburg, Germany.

Source: *Reißman*, O. (29/07/2013). Klon aus dem 3D Drucker: Huch, das bin ja ich. Spiegel Online. Retrieved from: http://www.spiegel.de/netzwelt/gadgets/klon-aus-dem-3-d-drucker-huch-das-bin-ja-ich-a-913190.html

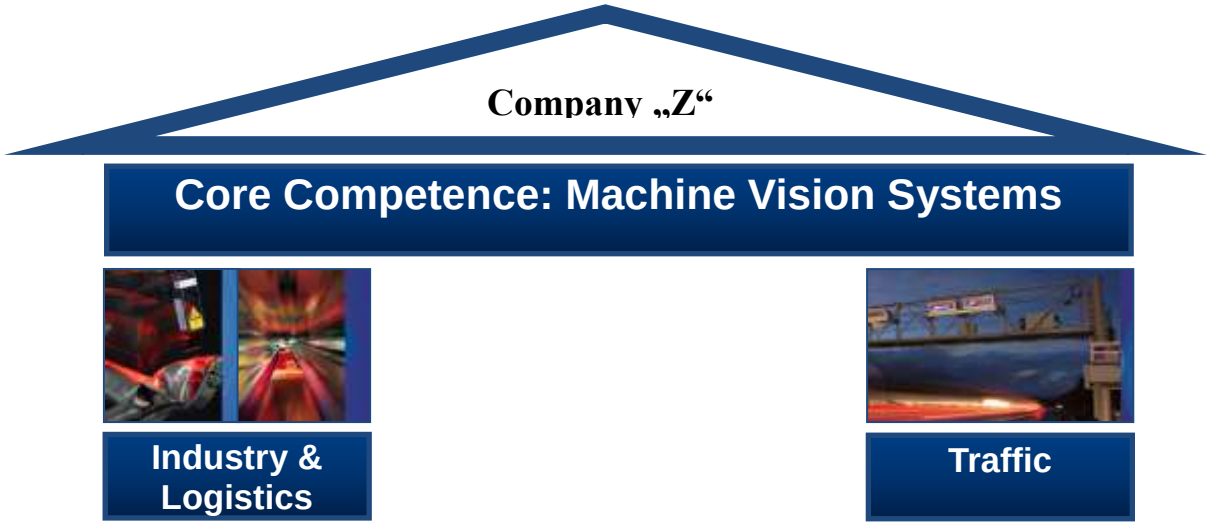
The definition of 3D print stores has been developed based on the requests for information that company "Z" received over time for this kind of application of 3D body scanners.

2.3 Company "Z" at a glance

As this study is written from the perspective of company "Z", a short profile of the company shall be given in this subchapter to complete the framework.

Company "Z" is a middle sized, German industrial company whose core competency lays in the development, production and distribution of so called machine vision solutions. "Machine Vision Solutions" are the technology and methods used to provide imaging-based automatic inspection and analysis for such applications as automatic inspection, process control, and robot guidance in industry (Graves, Batchelor, 2003).

Figure 11: Structure of Company „Z"



Source: *Internal*

Based on this core competency "Z" has developed different products for different target groups. For instance it offers optical systems to assess the quality of weld steams within production processes of cars. Moreover the company developed optical systems which are part of Germany's highway toll system. These systems automatically recognize the size as well as the number plate of a truck, thereby registering with precision where trucks enter and leave the highway for tolling purposes. Another product line is concerned with the automation

of warehouse systems. Its systems automatically recognize all relevant parameters of a package entering a warehouse (shape, weight, provenance of the package, content, state of the package, etc.). Around these three product lines the company's main divisions have been formed, namely: "Industry & Logistics" and "Traffic". The "Industry & Logistics" Division is composed of two subdivisions, named "Industry" and "Logistics".

The "3d Bodyscanners" which are of interest for this study are a product line of the Industry subdivision. It is from the perspective of this subdivision that this marketing research project is conducted. Overall the 3D Bodyscanners only represent 1% of the company's overall turnover of roughly 75 million Euros in 2012. The general divisional structure of company "Z" is depicted in Figure 11: Structure of Company „Z".

Although company "Z" employs the vast majority of its 500 employees in Germany, it is active on a global scale. The company is running subsidiaries in the United States, in China, Australia, Dubai, Great Britain as well as France. Moreover the company is engaged in several contracts with distribution partners around the globe. All in all the company generates more than 50% of its revenues abroad. Nevertheless all core functions are still localized at its headquarters in Germany (e.g. Research and Development, Marketing, Back Office, Logistics, Production, Procurement). Only the functions of sales and after sales support have been internationalized, in order to tab into the most promising markets around the world.

3 Methodology

3.1 Definition of the marketing research problem

Defining the marketing research problem is the most important step within a market research project. The problem needs to be defined by the researcher on the one hand side and the client on the other hand. If executed inappropriately it is highly likely that the results won't satisfy the client's needs. Marketing research literature unanimously points to the finding, that this first crucial step is the major source of failure for marketing research projects (MALHOTRA at al., 2006).

So far the research problem of this study has been roughly outlined in the introduction. It is the researcher's task to find if the company "Z" should tap into the emerging market segment of 3D print stores with its 3D body scanning technology and if yes, what needs to be done.

This rough outline needs to be specified if one seeks to run marketing research effectively and efficiently (MALHOTRA at al., 2006).

To that end the research problem mentioned above is split into two major questions. The first part is concerned with the question if "Z" should enter the market segment. The second deals with questions how to tap the market segment.

The first question can be broken down into three sub questions:

1. In how far does company "Z" currently meet the need of the target group and what are areas of improvement?
2. How attractive is the market segment of 3D print shops for "Z" in terms of size and industry environment now and in the long run?
3. How is the macro environment of the 3d scanning industry affecting the micro environment of the market segment of 3d print shops in the long run?

These three sub questions reflect the necessity of analyzing the company's internal as well as external environment, which was derived from marketing research theory in chapter 2.1. Based on the results of that analysis, the second major question of how to tap into the market is answered.

3.2 Research design and tools

As no literature exists in the field of business about the market of 3d body scanning technology and its segment of 3d print shops, an explorative approach is necessary (Saunders, Lewis, Thornhill, 2009). Therefore a combination of field research and desktop research has been chosen. More precisely field research consists of expert interviews, whilst desktop research focused on screening secondary sources. This is reported to be a standard approach for business to business research projects like the one at hand (Malhotra, 2010).

The research method of expert interviews belongs to the realm of qualitative market research (Chrzanaowska, 2002). Qualitative market research methods provide the researcher with in depth, firsthand information. They are applied to understand a target group. Hence they are rather concerned with the basic question of "why", as opposed to quantitative research method that seek to answer "how many" or "which ones" (Melanson, 2004), (Imms, 2002, p.5). This ultimately implies that the outcome of qualitative research is nonstatistical. This

fact is in line with the commonly small sample size of this kind of market research approach. (Malhotra, 2010).

Qualitative approaches are often used as a preliminary phase for quantitative approaches (Naderer, 2007), (Malhotra, 2010). But in this case a subsequent quantitative approach makes little sense. The reason for this is twofold. Firstly one must consider the size of the general population of 3d Print Stores. The desktop research revealed (Refer to Chapter 4) that such businesses emerged only recently and their number is limited. Although they can be found around the globe in the big cities of high income countries it would not be possible to obtain a sufficiently big sample size that would allow running reasonable statistical analysis. Especially if one takes into consideration that only the owners of these 3D Print shops are targeted (hence staff is excluded), which limits the general population even further. Secondly there have been budget and time constraints which made a two phase research process impossible. Professionals in the field of qualitative market research report that they also tend to opt for stand-alone qualitative approaches when confronted with similar circumstances (Melanson, 2004), (Malhotra, 2010).

Expert interviews deliver information about future developments and needs of target groups. Experts in this context should be individuals who are capable of giving comments on possible future developments based on their knowledge and experience. It is for that reason that only owners of 3D Print Stores have been chosen as eligible for expert interviews. Nevertheless the experts' opinions can only point into a certain direction, as they might be highly subjective (Koch, 2009) (Berekoven, 2009).

All experts that have been interviewed had been picked consciously from a list of 3D print shops (Refer to Annex A). The latter list has been established during the desktop research phase and only contains businesses that fit to the description of 3D print shops laid out in chapter two. In all cases only the owners of 3D print stores have been interviewed, to ensure a certain level of expertise and insights. Hence the interviewees have been chosen consciously and not according to any principle of chance. This is common practice in qualitative market research, in particular when using expert interviews as methodology (Naderer, 2007).

There are several ways to conduct expert interviews. For reasons of feasibility (e.g. global spread of general population, budget and time constraints), it was decided to conduct the

interviews via telephone. This interview technique comes with certain advantages and drawbacks, which will be put in the following into context of this study.
Firstly respondents are more likely to give frank answers as "telephone conversations are considered to be a private affair" (Sontakki, 2010, p. 161). Secondly the respondants (individuals that own and run 3D print shops) belong to group of people, as indicated earlier, whose number is very limited and who belong to a so called „higher socio-economic class". Hence it is difficult to get personal appointments. Under such circumstances literature supposes that telephone interviews are more suited as they command more respect than door bells and are most importantly less time consuming than other techiques such as questionnaires (Sontakki, 2010, p. 161).

Despite the merits there are some drawbacks reported throughout litereratue such as the limited use due to the fact that not all members of the target group might be equiped with a phone. This point can be neglected in the context of this study as the target group of interest is located in high income countries and is running businesses which usually comes with telephone connectivity. Antoher problable drawback inherent in the telephone interviewing methodology is the possibility of „no reply". Respondants are reported to be more prown to deny any useful answer and simply hang up (Sontakki, 2010). The risk of this happening was minimized by offering the respondents to receive the results of this target group analysis as a compensation and incentive for their input. Rising the motivation of the target group by providing them with compensation is a recommanded by market research specialists (Naderer, 2007).

Sontakki (2010) also points to the fact that telephone interviews make observation of the respondents and visual aids impossible. Given the fact based, business only nature of the questions asked, observation of the respondant was considered to be of little value for the conduct of the study. Moreover the questions asked did not require any visual aids as support. In such a scenario negligance of visual information is reported to be acceptable (Naderer, 2007). The forth and last issue Sontakki (2010) reports is concerned with validity of the information obtained by the interviewer. That is, the interviewer's inability to confirm the information given by the respondant. To tackle this drawback the responses of all interviewed people were compared to each other in order to indentify potentially invalid information.

The expert interviews were held in an informal and unstructured form, given the exploratory, qualitative nature of this approach. Nevertheless a rough guideline was established, to ensure comparability of the results. The guideline did not determine the order in which question were asked. It was rather used as a check-list of question to be asked. Interviewees were given the opportunity to answer freely to these open questions about their expectations and opinions. This was of conceiving interviews is consistent with the findings and suggestions of experts in the field of qualitative market research (Naderer, 2007).

All expert interviews were conducted by one interviewer. By doing so potential inter-observer errors[5] are taken out of the equation (Bryman & Bell, 2007). In addition to that the intra-observer error had to be taken into consideration. Intra observer errors might occur, when untrained individuals conduct expert interviews. This could lead to results of poor quality; given the fact that interviewing in a scientific correct manner is reported to be demanding (Malhotra, 2010). According to literature, interviewers should be open-minded and curious. Nonetheless they have to hold back their personal opinion in order to ensure that they don't influence the interviewee's responses. In addition to that they should remain authentic to create a comfortable and credible atmosphere. To that end they have to adapt questions to the course of the conversation, without tainting them. Generally speaking interviewers have to find the balance between upholding a natural course of communication and conducting research. This is in particular difficult given the artificial nature of science (Naderer, 2007). In order to tackle this issue an extensive study of how to undertake interviews was conducted upfront by the interviewer (Bryman & Bell, 2007).

Each conducted expert interview was recorded by a tape recorder. Additionally notes have been taken. This in turn made a transcription process necessary. The recordings were therefore reproduced as a written (word-processed) account using the actual words. The notes taken during the interviews helped to complete the gathered information. Each subscribed interview was saved as a separate word processed file on a personal computer. File names were chosen that ensure confidentiality and preserve anonymity of the interviewed experts. Moreover, to guarantee an ethical correct approach, each interviewee was asked to give his consent, before using audio recording as method to collect data.

[5] Vvariability of the results obtained by different individuals when interviewing the same subject

The analysis of the interviews was done by an inductive approach, by categorizing the answers given by the interviewees. The categories were derived from the research question. They provided the necessary insight into the target group of 3D print stores (Refer to Chapt. 4).

The desktop research will provide additional secondary quantitative and qualitative data about the market segment. Internal and external secondary sources of information will also be used. This data will be incorporated into the analysis of the macro and micro environment. The combination of the data gathered via desktop research and qualitative interviews should allow inferring whether company "Z" should enter the market segment or not.

3.3 Significance of the research

The paper will provide entrepreneurs and companies active in the field of 3D body scanning technology with a point of reference when it comes to the market segment of 3D Print Shops. Nevertheless businesses considering developing and producing 3D Body scanners for this market segment can't solely base their decision upon the results of this paper. The underlying reason is the limited generalizability. The exploratory and qualitative nature of this study requires a verification of its results by a quantitative, large scale study, capable of delivering statistically significant results (Koch, 2009) (Berekoven, 2009).

Nonetheless one should keep in mind that the criteria to assess the quality of the results of this research (Validity, objectivity, reliability and representative results) must be interpreted differently in the light of qualitative market research. This is in particular of importance when it comes to the conducted expert interviews.

In quantitative research **objectivity** is reached by a maximum degree of standardization. Nonetheless it can't be excluded that the process of standardization is subject to the researcher's social and cultural background as well as interests. Standardization implies the intentional ignorance of context. This fallacy is tackled by qualitative research as it allows taking context into consideration in an objective way, thereby breaking through the limitation of a too rigid quantitative approach (Naderer, 2007). It is even argued throughout literature that qualitative approaches have been designed to "bring out elements of emotion, intensity and inflection that provide nuance and valuable insight" (Melanson, 2004, p.1).

Validity of qualitative market research is given by its open and communicative character in the absence of operationalization. Hence variables are not defined into measurable factors. On the contrary qualitative market research identifies variables that might subsequently be measured by additional quantitative research. Hence one might argue that validity is the immanent result of qualitative market research (Naderer, 2007).

Reliability in the context of quantitative market research requires that studies lead to the same results when conducted again. This implies that the context remains the same. As indicated earlier, qualitative market research is context sensitive. Thus reliability is connoted differently: Reliability in this case dictates, that research results must provide an explanation of their process of creation within the respective context. This is achieved by gathering a maximum of information (Naderer, 2007).

Another crucial criterion of quantitative research is whether or not the results are **representative**. This criterion doesn't apply for qualitative research results as the inherent goal of qualitative market research is to identify relevant characteristics of the general population that are unknown. Hence representative results are not the objective of qualitative research methods (Naderer, 2007) (Melanson, 2004).

4 Analysis of the market segment

4.1 Structure of the analysis

As mentioned in the introduction, chapter four is about the analysis of the market segment of 3D Print stores from the perspective of company "Z". The objective was to establish whether or not 3D Print stores are an attractive target group for company "Z" now and in the long run. Furthermore the analysis should provide the reader with an in depth profile of the target group and its needs. In addition to that it should scrutinize company "Z's" current offer in terms of 3D body scanning and oppose it to the findings about the target group's needs. Hence this chapter will answer the three sub research questions defined in chapter 3.1:

1. In how far does company "Z" currently meet the needs of the target group and what are areas of improvement?
2. How attractive is the market segment of 3D print shops for "Z" in terms of size and industry environment now and in the long run?

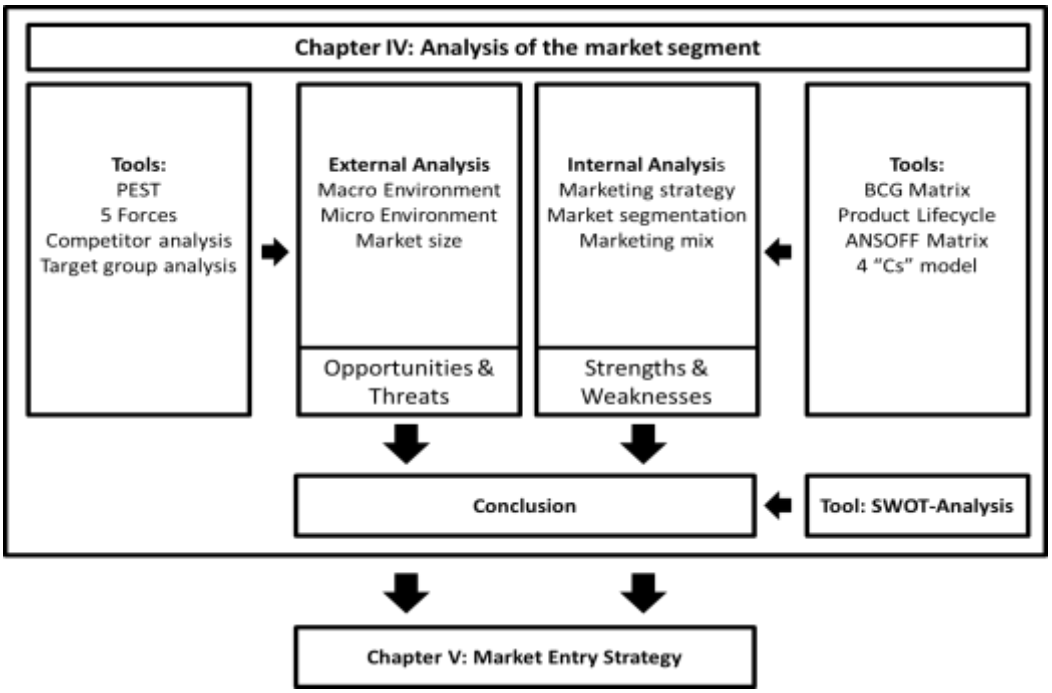
3. How is the macro environment of the 3d scanning industry affecting the micro environment of the market segment of 3d print shops in the long run?

In order to do so the external and internal environment of company "Z" for the market segment in question was analyzed. The structure of the analysis is depicted in figure 12. On the one hand the external analysis is supposed to identify the opportunities and threats inherent in company "Z's" macro and micro environment. On the other hand the internal analysis strives to detect the strengths and weaknesses of the company. To that end different well establish analysis tools have been used, which are listed in figure 12.

The results of the external an internal analysis are summarized in the conclusion which is based on a SWOT (Strength, Weaknesses, Opportunities, Threats) analysis (Grant, 2013). The conclusion in turn is the starting point for the market entry strategy, which will be developed in chapter five. The analysis as such follows an inductive approach. Thus the starting point of this analysis is the internal environment, which will be followed by the external environment (Refer to Chapter 2.1, Figure 7).

Figure 12: Structure of the analysis

Source: *Self-created figure*



4.2 Internal analysis

4.2.1 Marketing strategy

The marketing strategy company "Z" deploys for its 3D body scanners is in line with the marketing strategies of the company's other divisions (Refer to chapter 2.3, Figure 11). It follows, in terms of Michael E. Porter, a so called differentiation strategy (Barrow, 2006). It is trying to establish a competitive advantage by offering above average quality for which it charges a premium. As it is a technology driven company that only operates in the "Business to Business" and "Business to Administration" environment, differentiation means first in foremost product quality and constant innovation. It also means quality in all aspects of the value chain, right from the sales department to the after sales service. Differentiation in this context does not mean branding, the reason for which has been explained in the theoretical framework (Refer to Chapter 2.1).

Figure 13: Company "Z" within the Ansoff Matrix,

Source: *Ansoff, I.H. (1986) Corporate Strategy. Sidgwick an Jackson. Retrieved from Barrow, C. Et al. (2006). The Successful Entrepreneur's Guidebook.*

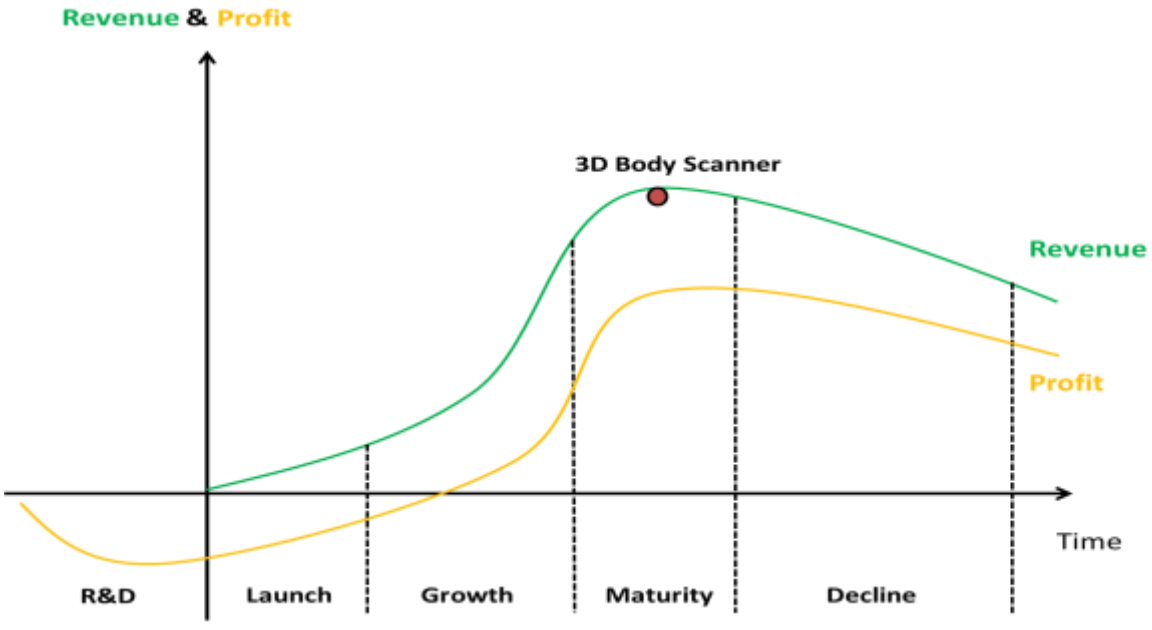
Company "Z" also constantly strives to engage in diversification (Refer to Figure 13: Company "Z" within the Ansoff Matrix,), as it is investing significant sums on a continuous basis in innovation as well as entrance of new markets. Nevertheless it should be noted that "Z" only invests in related diversification, hence products that fit to the core competency of machine vision solutions (Refer to chapter 2.3 for a definition). However this does not hold

for its 3D Bodyscanners. In fact investments in this product line, since its launch in 1996, have been negligible, relative to the efforts undertaken in other divisions of the company.

For its "3D Bodyscanners" the company was rather running a "Market Development" strategy (Refer to Figure 13), using its existing product to enter new markets. This was done partly by offering its 3D body scanners abroad and partly by tapping into new market segments. The success of this approach is questionable since the product's share of the company's overall turnover has been only one percent in 2013.

In terms of the product life cycle company "Z's" 3D body scanners have reached the phase of maturity (Refer to Figure 14). Hence, ceteris paribus, there is no growth to be expected in terms of turnover. From a strategic point of view this leaves the company with three options. Firstly it could re-launch the product by developing it further. Secondly it could try to tap into new markets or market segments. Thirdly it could divest, which means discontinuing the product. It should be noted, that option one and two are not mutually exclusive. The outcome of this study should help to find out which is the right option.

Figure 14: Company "Z's" 3D Bodyscanners on the Product lifecycle
Source: *Self-Created figure based on the Product Life Cycle concept retrieved from Grant (2013)*



4.2.2 Structure of the marketing department

The marketing communication efforts at company "Z" as such are taken care of by the company's own marketing department. For each of the company's divisions (Refer Figure 15: Structure Marketing & Sales department of company "Z") there is a marketing professional

who elaborates together with the respective product manager the marketing communication strategy and budget. For the “Industry and Logistics” division there are two marketing professionals since the division is composed of two subdivisions, namely “Industry” on the one hand side and “Logistics” on the other hand side. These marketing professionals are also in charge of the execution of the communication strategy. For the execution they are supported by additional marketing professionals within company “Z” who are only responsible for trade fairs and online marketing. Furthermore he draws upon the support of external marketing agencies.

In general the marketing department’s responsibilities are limited to execution and planning of the communication strategy. The responsibility for all other aspects of the marketing strategy (e.g. Price, Distribution, Product development) lies with the product manager who is part of the sales department. The reason for this is that product managers need to be closer to the market in the B2B environment, as they should integrate the customer in the product development process (Refer to chapter 2.1). Being part of the sales department means direct customer interaction which facilitates a customer oriented product management and marketing.

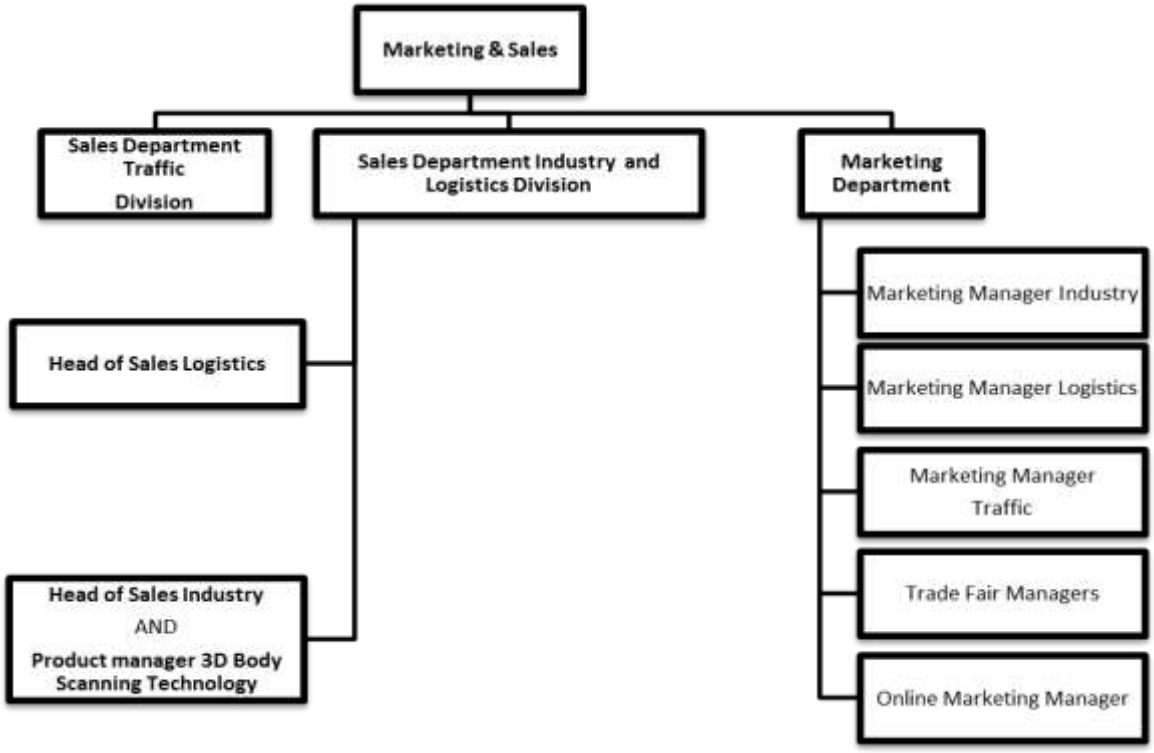
Moreover the product manager for the “3D Body Scanners” is also “Head of the Sales” for the “Industry” subdivision (Refer to Figure 15: Structure Marketing & Sales department of company "Z"). As such he is responsible for managing the sales force of the subdivision. On top of that he is the only sales representative at the company for “3D Bodyscanners” worldwide. Hence he is personally handling all inquiries for them. In addition to that he takes care of customer requests for other products of the “Industry” subdivision. Thus the manager’s time budget for working on actual product management is limited.

The marketing manager of “Industry” subdivision also takes care of the “3D Bodyscanners”, since they constitute one of the subdivision’s product lines. Hence there is no marketing manager that is only responsible for the 3D Body Scanner product line. Moreover the “Industry” marketing manager allocates most time and effort on the other products of the subdivision.

This in turn has led to a situation, where the marketing for “3D Body Scanners” was rather neglected. This argument is supported by the relatively small marketing expenditure for the

product line during the last years. It is also an explanation for the stagnation of sales over time. From this situation one can infer that there is a lack of human resources and budget for the marketing and sales of the company's 3D Bodyscanners.

Figure 15: Structure Marketing & Sales department of company "Z"



Source: Self-created figure based on *internal data of company "z"*

4.2.3 Market segmentation

The "Industry division" segments its market for 3D Bodyscanners in terms of the final usage of the product, which is referred to as "Field of Application". Overall the division distinguishes five fields of applications (market segments), which shall be explained briefly hereinafter:

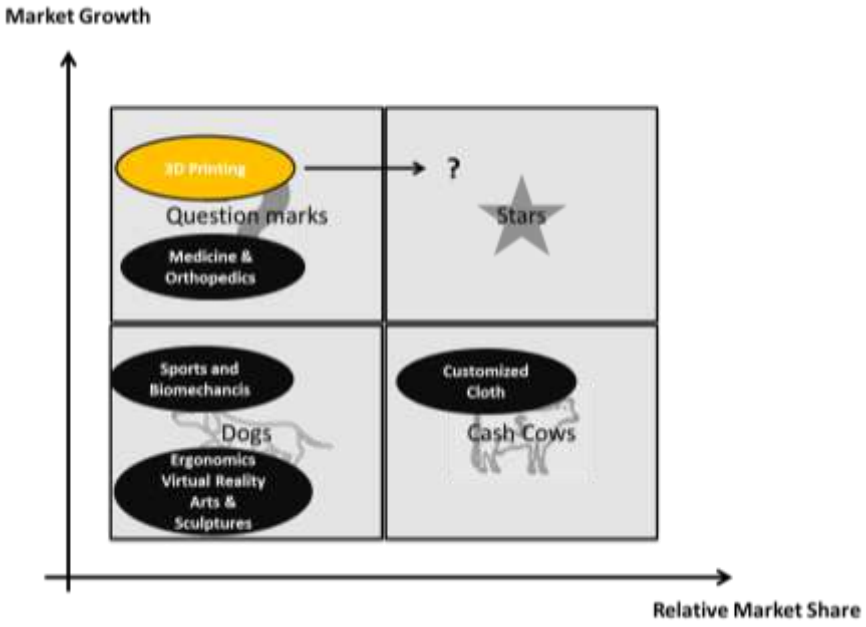
1. **Customized Cloth:** Usage of a "3D Bodyscanner" to capture anthropometric data of customers like height, waste circumference, hip circumference, breast circumference in order to customize the production of cloth. Customers in this field are usually apparel companies that target upper society and specialized in the production of tailored cloth such as suits for men. This market segment also comprises fashion

schools that use the 3D body scanners for teaching purposes as well as research. The latter application usually requires a higher quality in terms of 3D scans as compared to the former. Quality in this case refers to resolution and ultimately accuracy by which the geometrical shape of the human body is captured.

2. **Virtual Reality:** Usage the "3D Bodyscanner" to obtain a 3D image of an individual, which can subsequently be digitally animated for the purpose of film production of or for computer games. This is of interest, as some of the movies nowadays are completely digitally animated. Hence they have been solely produced via computer without real actors.
3. **Ergonomics:** Usage of the 3D Scans to simulate the usage of a product in development by the end customer. For instance car companies use digitally animated 3D scans to test the ergonomics of the car's interior design. To do so they let the 3D scan of an individual take place in the digital model of a car. They intend to find out, how easily the future customer could reach for example certain buttons on the dashboard or how much space they would have for their feet in the foot well.
4. **Medicine & Orthopedics:** Usage of the 3D body scanner to assess the posture of a patient, quantify body deformities (e.g. scoliosis), document and quantify the treatment of a patient (e.g. pre- and post-surgery measurement of body deformities like scoliosis) or run anthropometric studies.
5. **Sports & Biomechanics:** Usage of the 3D Scans to quantify the human body in terms of muscle circumferences, height, body type etc. Based on the gathered data training plans are developed. In the field of sports medicine the 3D scanner is also used for biomechanical studies.
6. **Art & Sculptures:** Usage of the 3D scans by sculptors to ease the manufacturing process. Once the 3D Scan is taken the sculptor can use the 3D image as model and doesn't need a real person to stand still in front of him, as he carves his or her face into stone or other materials. The 3D Scan can also be used as digital blueprint, based on which high precision lasers cut the sculpture out of wood or other materials.

Besides the criterion of "field of application", there are no other criteria in use to segment the market at the "3D Bodyscanning division". This approach is based on the assumption of homogeneous needs in terms of 3D body scanning around the globe in the respective field of application. Socio-cultural differences are put aside which is a classical characteristic for market segmentation in the B2B area (Refer to Chapter 2.1 for market segmentation in B2B).

Figure 16: BCG Matrix - Market Segment of Company "Z" mapped



Source: *Self-created based on the matrix developed by the Boston Consulting Group*

From a product management point of view it makes sense to evaluate the different market segments in order to allocate resources most effectively. One can apply different criteria and models to do so, one of which is the so called Boston Consulting matrix (BCG Matrix). The BCG matrix was created by Bruce D. Henderson for the Boston Consulting Group in the 1960s (Refer to Figure 16: BCG Matrix - Market Segment of Company "Z" mapped). It was designed to help companies evaluate their business units and is used as analytical tool in brand marketing, product management, strategic management and portfolio analysis (Grant, 2013) (BCG, 2014).

This framework categorizes products within a company's portfolio as stars, cash cows, question marks and dogs according to the underlying market growth rate, the relative market share and positive or negative cash flow. A "Cash cow" is a product with a high market share and a slow growing industry. It generates sufficient cash flow to maintain the business. They can be "milked" without major investments. A "Dog" is a product with low market share in a mature, slow growing market. Companies must decide whether do divest or relaunch as they generally don't generate any positive cash flow. "Question marks" are products with a high market growth but a low market share. They must be analyzed thoroughly in order to find out whether they are worthy of investment or if they should be discontinued. "Stars" are products

with a high market share and a fast growing market. Stars need substantial investment to maintain growth and fight competitors. In the long run they are expected to turn into cash cows which are the ideal and desirable outcome for a business. At any point in time the matrix suggests that a company should have a balanced portfolio. This translates into having products that are stars to ensure the future, products that are cash cows to provide the funds for future growths and question marks that might be converted into stars with sufficient funding (BCG, 2014).

The matrix can be applied to the market segments of company “Z”, given the heterogeneity of the segments. If one maps the different market segments of company “Z” in this matrix (Refer to Figure 16: BCG Matrix - Market Segment of Company "Z" mapped), the need to react for the product management becomes obvious. None of the market segments is in the area of a star. Only one segment, namely “Cusotmized Cloth”, is a “Cash Cow”. Four out of six segments are located in the undesirable area of “Poor dogs” and only one segment is positioned as so called “Question mark”. In other words company “Z” is lacking market share in most of the market segments, except for “Cusotmized Cloth” and only “Medicine & Orthopedics” shows potential market growth. The market segment “Customized Cloth” is generating the cash flow to sustain the operations. This is mirrored by the sales figures, as over 90% of all 3d body scanners are sold on the market segment of “Customized Cloth”. The rest is chiefly sold to customers on the market segment of “Medicine & Orthopedics” or “Sports & Biomechanics”. Hence there is a high dependency on one single market segment and an unbalanced portfolio situation, as the company is lacking “Stars”.
The market segment under scrutiny in this paper, 3D Print Stores, which is called in this chapter 3D printing for the sake of consistency with company’s “Z’s” practice of application-based market segmentation, could emerge into a potential star. By doing so it would close the strategic gap, identified by the BCG matrix.

4.2.4 The four “Cs”

The “4 Cs” (Customer, Cost, Communication and Convenience) is, as explained in chapter 2.1, an adaption of the well-known four “4 Ps” (Product, Price, Place, Promotion). The “4Cs” are in particular more appropriate in the context of B2B marketing, as it incorporates the perspective of the customer. It is a set of variables that helps to define a company’s marketing strategy for a product. Ideally each market segment is backed up with unique “4Cs” which reflect the target group’s needs and the market segment’s characteristics (e.g. competition).

As the market segment of “3D Print Stores” hasn’t been part of company “Z’s” market segmentation so far, it is obvious that there are no “4Cs”, which could be described at this point. Nonetheless an analysis of the company’s marketing mix for the other market segments described in chapter 4.2.2 shall be given.

4.2.4.1 Customer

Theory dictates that product development on the B2B markets must incorporate the customers’ needs as much as possible. In the case of company “Z” the product portfolio of 3D Bodyscanners was chiefly shaped by the demand of the market segments of “Customized Cloth” and “Sports & Biomechanics”.

Overall the company markets two different 3D Bodyscanners, which shall be referred to hereinafter as X1 and X2. X1 is the smaller model in terms of price, size and quality of the 3D Scans. It is mainly used in environments where floor space is crucial[6], which is for example the case in retail stores. Hence the main market segment for X1 is “Customized cloth”. The more sophisticated X2 was designed for applications where the quality of the 3D scan in terms of resolution and precision is more important. This is usually the case for the segment of “Medicine & Orthopedics” as well as “Sports & Biomechanics” (Refer to Table 1).
The following table relates the market segments described under point 4.2.3. to the product portfolio of company “Z” in terms of 3d Bodyscanners.

One should note that software is a strategically important component of the whole product, because it significantly increases the margin realized per sale. Software refers to functionalities that go beyond the capability to control the 3D Bodyscanner, compute and visualize 3D Scans on the screen and save them. Being able to offer to the target group more than just hardware increases the value of the product to the customer. It is an important point of differentiation within the competition.

Nonetheless company “Z” is chiefly a hardware provider when it comes to 3D Bodyscanners. Beside its basic software package, which allows to compute and visualize the 3D scan, it is offering on its own only one software package. This software package has been developed for

[6] X1 and X2 differ in size, thus the space required for each system is different.

the market segment of “Sports & Biomechanics” in collaboration with universities of sports medicine.

Table 1: Product Portfolio of company "Z" in terms of 3D Bodyscanners – Source: Internal

	X1	**X2**
		
Field of application	Customized Cloth Ergonomics Virtual Reality	Medicine & Orthopedics Sports & Biomechanics Art and sculptures
Price	35.000 €*	65.000€*
Resolution	7 points per cm²	27 points per cm²
Accuracy**	< 3 mm	<1 mm
*incl. hardware and basic software to operate 3D Bodyscanner, compute and visualize 3D Scans and save them in different formats, excl. delivery, set-up, customs, VAT and training ** Refers to the precision by which the geometric shape of an object or human being was captured		

For the market segments of “Ergonomics”, “Virtual Reality”, “Medicine & Orthopedics” and “Art and Sculpture” it does not provide any specific software package. For the market segment of “Customized Cloth” and partly for “Medicine & Orthopedics” it has engaged in long term relationship with a distribution partner. This partner has specialized in the development of software solutions for 3D Body Scanners. The software developed by the distribution partner remains his property. Moreover the contract with the distribution partner is exclusive. As such it stipulates that only the distribution partner has the right and obligation

to handle all requests for the 3D Bodyscanners for the market segment of "Customized Cloth" and for all requests related to anthropometrical measurements[7] in the field of medicine. Thus company "Z" only provides hardware for all 3D Bodyscanners sold via its distribution partner.

From a profitability point of view this situation is unfortunate; given the fact that margin is earned from the sale of software, not hardware. Since 95% of all "3D Bodyscanners" have been sold via this distribution partner over the last eight years, company "Z" is completely dependent on its performance.
The success of the distribution partner also underlines the importance of software packages for the sale of 3D Bodyscanners. It also reveals the need to for company "Z" to invest in the development of such software, in order to become more independent from its distribution partner and make the product line more profitable.
Company "Z" has the necessary resources and capabilities at its disposal to development new software packages. It is running its own "Research & Development" department and employs the necessary specialists to do so. Nonetheless a market segment worthy of investment needs to be identified, since resources are scarce and need to be allocated most effectively and efficiently.

The fact that company "Z" is barely selling 3D Bodyscanners on its own also implies a strategically misfit between the company's offer and the target groups' (market segments) expectations. In fact one could draw the conclusion that the company is taking the customer side not sufficiently in consideration for this product line. This will become even more obvious throughout the next chapter (4.2.4.2), as the company's approach to pricing is examined.

4.2.4.2 Cost

Theory demands the determination of prices for products by taking the perspective of the customer and think in terms of total cost of ownership (Refer to Chapter, 2.1). This however was not the case for the "3D Bodyscanners" of company "Z". The prices for the two 3D Bodyscanners of the company (X1 and X2) have been fixed using a cost oriented method (Refer t0 Table 1 in chapter 4.2.4.1). Hence the cost of goods and fixed cost at a certain

[7] Anthroprometrical measurements refer to body measures such as height, circumferences, surface etc.

volume have been aggregated and a profit margin was added. Thus a market perspective was not taken. The price for the hardware remains the same on all market segment described under point 4.2.3. The final price however differs significantly when customers demand software packages or desire customization of the software to their needs. The choice of software packages is however, as pointed out earlier, very limited.

The standard price of the hardware stated in "Table 1" is however not the same for the 3D Bodyscanners sold via the distribution partner mentioned in the previous chapter. The distribution partner has negotiated a lower price per 3D Bodyscanner with company "Z". The margin per 3D Bodyscanner sold via this channel is therefore in particular low, especially because the Distribution Partner uses its own software.

It should also be noted that the prices for the 3D Bodyscanners in "Table 1" are usually subject to negotiations, which is common practice in the B2B area (Refer to Chapter 2.1). For instance prices per 3D Bodyscanner decline when greater quantities are ordered. Also payment at once upon delivery is not a must. Leasing is also offered as payment method. Generally speaking there is no tightly defined scheme for negotiation with customers at company "Z". The sales force is encouraged to negotiate rather freely as long as it serves the interest of the company.

For its global sales company "Z" has also engaged in long term relationships with sales representatives. They acquire the 3D Bodyscanners at a specific level of discount which has been established in their contract.

The takeaway from this subchapter is that there is apotential lack of market orientation when it comes to pricing.

4.2.4.3 Communication

To communicate with its target groups (market segments), company "Z" follows the common practice of "B2B" marketing described in chapter 2.1. Its main tools of communication are trade fairs, personal selling and public relations. For the management and organization of trade fair visits alone two marketing professionals at company "Z" are in charge. In addition to that it is engaged in online marketing. Besides its homepage it has established a web presence on all relevant business networks such as XING, LinkedIn and Twitter. Moreover it

uses YouTube to share product videos with a broader audience. Hence it actively uses Social Media Marketing. For online communication alone (Refer to Chapter 4.2.2: Structure of the marketing department) an experienced Online Manager was hired, which underscores the value of this communication channel for company "Z". The online manager is also in charge of On- and Off page optimization of the webpage (also referred to as Search Engine Optimization), in order to increase the webpage's rank in the research results of search engines such as Google and Yahoo.

In addition to that the company publishes product brochures and flyers that are sent out upon request to the respective target groups or which are handed out at trade fairs. When it comes to print media, the company publishes occasionally advertisement in carefully chosen magazines that are relevant for the respective target group.
Over all the company does not use any mass media channel such as television or radio, which is in line with the B2B marketing practices revealed in chapter 2.1.

Although company "Z" clearly has all the relevant B2B marketing communication capabilities in house, the share of the communication efforts described above for 3D Bodyscanners is very limited. The reason for which has been outlined in chapter 4.2.2. and is basically a lack of human resources as well as budget.

4.2.4.4 Convenience

Company "Z" sells its 3D Bodyscanners directly and indirectly to its target groups. For the direct sales it draws upon its own sales force. The indirect distribution is done via distribution partner and sales representatives.

The direct distribution via its own sales force is usually done in countries and regions where the company operates its own subsidiaries (U.S., China, United Arabic Emirates, and England). This however only holds for market segments other than "Customized Cloth" or medical application of the "3D Bodyscanner" for the purpose of anthropometrical measurements. The reason for this is the exclusive distribution contract with the external partner described in Chapter 4.2.4.1. Indirect distribution via sales representatives is pursued in countries without a subsidiary such as Thailand.

The network of distribution doesn't cover so far South America or Africa at all. Africa can be neglected at this point in time, but the ignorance of South America and in turn the economically prosperous country of Brazil is questionable. Beside the lack of access to this Portuguese speaking country the company only employs one representative for Spanish speaking nations and he focuses his attention on products of the "Traffic division".

Moreover it should be noted that, despite the presence of subsidiaries in important markets and regions, there is an absence of sales staff abroad (outside of Germany) capable of dealing with inquiries for the 3D Bodyscanners. The underlying reason is a lack of knowledge about the product as such as well as the target groups amongst company "Z's" global sales force. This problem also stems from their limited exposure to customer requests for 3D Bodyscanners. In fact, as described in chapter 4.2.2, every request for 3D Bodyscanners is currently handled by the product manager himself located in Germany. On top of that the subsidiaries often don't have up to date marketing material for 3D Bodyscanners at their disposal.

One can infer from this that the weak sales of 3D Bodyscanners is also due to sales force resources and capabilities on a global scale. Nonetheless the company has market access to economically strong regions via its subsidiaries and could build upon this by getting its sales force acquainted to the product and providing them with the resources to market it. Moreover there are opportunities for expansion of the sales network in South America.

4.3 External analysis

Companies need to obtain an in depth understanding of their external environment in order to be able to develop a successful strategy. As explained in Chapter 2.1 the environment can be divided into the macro and micro environment (Refer to Figure 7). As the analysis of this chapter follows an inductive approach the micro environment (also referred to as industry) will be analyzed before the macro environment and after the internal environment which has already been scrutinized in the previous chapter.

4.3.1 Analysis of the micro environment

The starting point of the analysis of the micro environment is the definition of the industry under scrutiny. This implies that the industry as such constitutes the micro environment (Refer to Chapter 2.1, Figure 7: The Macro, Micro and internal environment of a company). A

proper definition is of the essence, as it has in impact on the analysis' relevance. To do so one can put the principle of substitutability to work and apply it to the demand side for the market segment of "3D Print Stores". This means rising the question if "3D Print Stores" are willing and able to substitute 3D Body Scanners for other technical devices that fulfill the same need (Grant, 2013). The answer to this question is simple as there is no alternative to a 3D body scanner. As explained in chapter 2.2 and in the introduction, one needs a 3D scan, created by a 3D body scanner, in order to initiate the 3D printing process. These 3D body scanners may use different technologies, but the final output remains the same, a 3D scan of the human body. Since this conclusion is valid on a global level and company "Z" is active on a global level, one can define the industry at hand as the "Global 3D Body Scanning Industry". This is this realm where company "Z" is competing. Global in this case means the markets in which company "Z" is present (Refer to Chapter 2.3).

Although company "Z" is competing in the "Global 3D Body Scanning Industry" one must not neglect the differences between markets, caused by final consumer demand for 3D Printed figurines. As illustrated in chapter 2.1 the demand for B2B products like 3D Body Scanners is derived from the B2C market. Thus the demand for 3D Body Scanners depends on the consumer demand for 3D Printed figurines. The latter demand however is dependent on the respective nation's macroeconomic environment. This environment differs significantly across nations, given their heterogeneity in terms of purchasing power, population size, ratio of unemployment, etc. From this heterogeneity one can derive that an analysis on a global scale is not an appropriate approach. National markets need to be analyzed separately when it comes to the determination of market size and future development. It is for the heterogeneity of national markets in terms of consumer demand that the scope of this marketing research study is limited to Germany. The macroeconomic environment of Germany was chosen, as it is the country of origin of the company "Z" and the first national market to be entered if the target group of 3D Print Stores is deemed to be sufficiently attractive.

4.3.1.1 Target Group Analysis

Given the inductive approach the analysis of the needs of the target group is the next logical step after the definition of the industry and the scope of this study. In order to do so the expert interviews with 3D Print Shops described in the methodology chapter 3.2 have been conducted. Their results are the basis for this chapter.

Firstly a description of the sample is in order. Overall five expert interviews have been conducted with owners of businesses that offer 3D Printed Figurines for a profit. Three of these businesses were located in Germany, one in Austria and one in Thailand. The cultural similarities between Germany and Austria allow the integration of the interview with the Austrian business into this analysis (The Hofstede Centre, 2014). The results of the expert interview with the Thai business shall be considered later on in this thesis, when the long term prospects of the market segment on an international level are discussed. Since there are four businesses so far in Germany that offer 3D printed figurines, one can state that 75% of them have been included into this study.

As described in the methodology chapter, the interviews followed a rough guideline. The answers of the subjects have been structured in accordance to the concept of "4Cs" described in Chapter 2.1. Hence the answers were structured along four categories, namely "Customer", "Costs", "Convenience" as well as "Communication". In addition another category was added, named "Profile of the target group". The latter group provides a rough outline of the target group

a. Profile of the target group

All of the interviewed businesses are located in densely populated urban areas. Half of them have been established in 2013 and offer only 3D Printed Figurines. For the other half the introduction of 3D printed figurines represents a diversification of its product portfolio. The latter group has already been operating before as photo studio. As such they offered professional photography to individuals or businesses. The introduction of 3D Printed figurine was considered by them as logical step, since it is close to their core business and seemingly takes their product to the third dimension.

In general they are all companies of a small scale in terms of turnover and number of employees that operate in a geographical limited area. All of them run a single store and offer 3D Printed Figurines of different size and quality to consumers as well as businesses.

Their customers are chiefly local since the production of 3D printed figurines usually requires the customer to come to the store for the 3D scanning process. Thus the situation can be compared to photo studios, since consumers located in Bavaria for example are unlikely to travel to Berlin for a photo session with a professional photographer. This holds for three of the interviewed stores, since they are using static 3D Bodyscanners (Refer to Figure 23)

which can't be moved easily from location to location. Only one of the interviewed 3D Print Stores uses a highly mobile system. Hence this business could also serve customers at more distant locations. This is however limited since travel expenditures decrease competitiveness of the offer. For instance a 3D Print store in Bavaria for example would find it hard to compete with a 3D Print store in Berlin for customers located in the capital.

As mentioned earlier these 3D Print Stores serve two types of customers: Businesses and Consumers. In general at least 60% of the 3D Printed figurines are sold to consumers whereas the remaining 40% go to businesses. According to the expert's opinion consumers regard 3D Printed figurines as a high quality version of a picture. It is seen as a more sophisticated tool to freeze precious moments of life such as marriages or the first day in school of a child. Compared to pictures consumers seem to regard 3D figurines to be more vivid and of a higher emotional value. It allows them to see themselves in all three dimensions. The vast majority of the consumers don't buy such a figurine for themselves. Instead they either want to give the 3D figurine of themselves as a present to someone of emotional value to them or they come in as family. In fact getting the family 3D printed is the motive that prevails. Besides family consumers also request 3D figurines of their pets.

Businesses on the other hand order 3D figurines either for marketing efforts or to honor employees who distinguished themselves. An example for this could be the Coca Cola "Mini Me" marketing campaign launched in Israel. This campaign encouraged consumers to participate in a contest. The winners of the contest were scanned and printed as 3D figurines (TheCocaColacompany, 2013).

The general perception of the 3D figurines as a more sophisticated way to freeze time (in comparison to pictures) is also consistent with the average prices these 3D Print Shops charge. A 15 cm tall colorful 3D figurine costs on average 224€[8]. The average price together with the information that chiefly families order 3D figurines one can draw the conclusion that families of the middle and upper class are the main target group. What this means in terms of market size in elaborated under point 4.3.3.

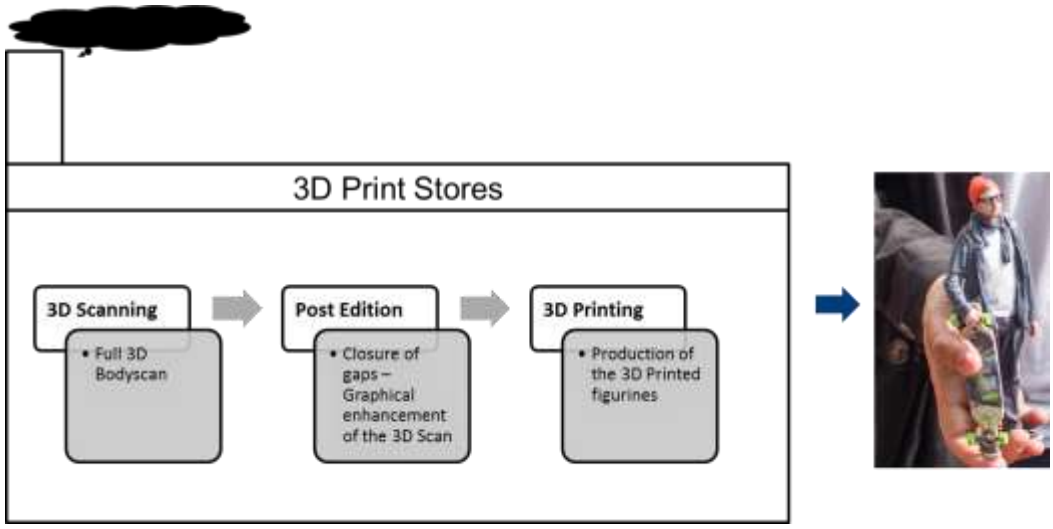
[8] Prices have been retrieved from the websides of 3D Print Shops within Germany and Austria. Arithmetic mean was taken for calculation of average.

b. Customer

Under the point "Customer" the needs of 3D Print Stores in terms of 3D Scanning technology according to the experts' opinions shall be described.

The basis for the analysis of their needs is the value chain for the production of 3D printed figurines (Refer to Figure 17: The value chain for the production of 3D printed figurines).

Figure 17: The value chain for the production of 3D printed figurines
Source: *Self-created figure*



The experts confirmed the basic structure of the value chain for the production of 3D printed figurines which has been explained throughout chapter 2.2 (Refer to Figure 17). Nonetheless they identified a third step in between the actual process of 3D scanning and 3D printing. This step is depicted in Figure 17 and is called "Post Edition". What "Post Edition" means will be explained later on in this chapter, after the first step of the value chain "3D Scanning" was analyzed.

1st Step of the value chain: 3D Scanning

Table 2 summarizes the needs of 3D Print Stores for the process of "3D Scanning" according to the experts' opinions. The first variable of importance is the "Duration of the 3D scanning process".

The longer the 3D scanning process takes, the more it limits the postures a person may take. For instance it is out of question that an individual is scanned for 5 minutes whilst standing on one foot. Even if an in individual is standing normally on both feet at one spot for 5 minutes there will be movements due to breathing. Any movement is likely to hamper the quality of

the 3D scan. In fact individuals need to stand still perfectly for the whole scanning process. Thus one would not be able to take 3D Scans of babies or dogs if the 3D scanning process would take minutes. Hence 3D Scans need to be taken as fast as possible. Especially if one takes into consideration that 3D print stores get requests from individuals who would like to get a 3D figurine of their pet or baby. Experts value a 3D scanning process within seconds.

Table 2: Needs of 3D Pint Shops for the process of 3D Scanning as such

Nr.	**Variable**	**Expectations of 3D Print Stores**
1.	Duration of the 3D Scanning process	Within seconds – Should allow for 3D Scanning of pets
2.	Quality of the output	High resolution and high quality of color textures
3.	Reliability	Low total cost of ownership
4.	Time to compute 3D Scan	Milliseconds

The second variable to consider is the quality of the 3D Scan. Quality for them refers to the resolution of the 3D Scan as well as the quality of the color texture. The experts measure resolution in terms of number of meshes. The more points per cm^2 have been captured, the more meshes can be computed by the software. This translates into the accuracy by which the geometric shape of the individuals has been scanned. Figure 18 depicts a point cloud on the left hand side which allows the software to compute the geometrical shape by connecting the points (right hand side).

The level of resolution a 3D Bodyscanner should provide is determined by the maximum resolution a 3D Printer can print. Experts claim that the maximum that is currently possible is 8000 meshes. As 3D Printing Technology will advance one might observe this threshold to increase over time.

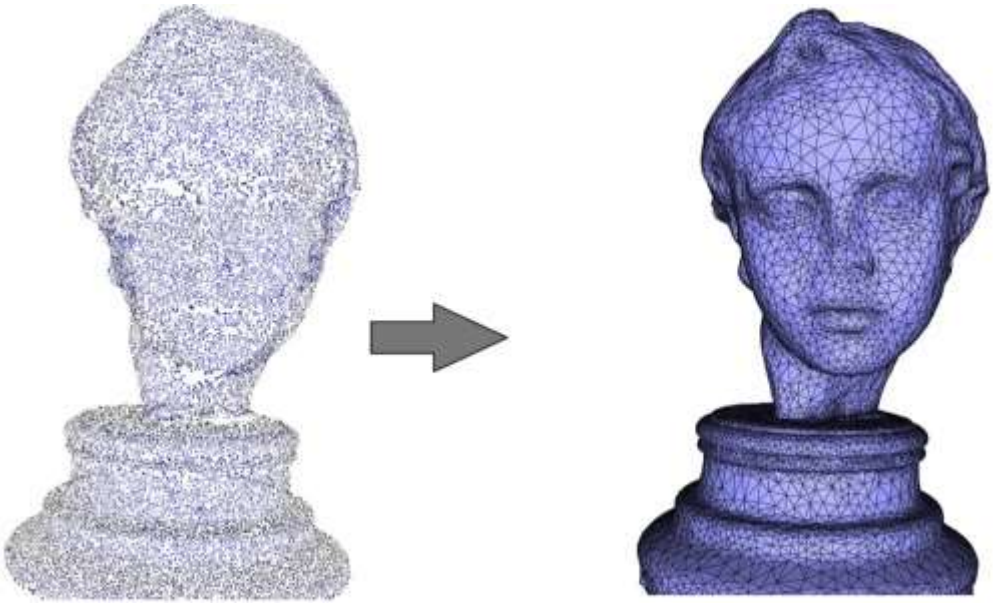
The other criterion of quality is color textures. Color textures in general have been identified as a must by the interviewed experts. This is also consistent with the requests for information received by company “Z” from the target group in 2013 and 2014. Hence 3D Bodyscanners that do not provide color textures won’t sell at all.

The quality of the color textures refers to the number of colors that could be captured by the 3D Bodyscanner. The more colors a 3D Bodyscanner captures the better, since it will

determine how close a 3D Scan comes to reality. Figure 19 depicts a 3D Scan in color to the left and one without color textures to the right. The picture to the left is an example for a relatively high level of color textures provided by the 3D Scanner ARTEC Eva which is a product of a competitor to company "Z".

Figure 18: From a point cloud to meshes

Source: *CGAL. (20/04/2014). Retrieved from: http://doc.cgal.org/latest/Surface_reconstruction_points_3/*



The quality of the color textures also depends on the proper illumination of the individual to be scanned. A diffuse light[9] needs to be shed on the person to be scanned in such a way that it illuminates the surface in an even manner at once and doesn't create any shadow. Experts underline the importance of a proper illumination and identified it as an added value for them if the 3D Bodyscanner provides it.

The third characteristic of quality that adds value to 3D Print Stores is the reliability of the system. Reliability translates into expenses to maintain the system which should naturally be as low as possible. Moreover reliability translates into constant quality over time, irrespectively of number of 3D scans per day, month or years. Reliability could be measured

[9] Def. Diffuse light: *A light ray that is reflected from a surface and broken up and scattered into different directions.This light is used in photagraphy as indirect light that is not pointed directly at the person to be photographed. As such it is the opposite of specular light, which is pointed directly at the object and subsequently creates shadows (*Scott, 1988).

by total cost of ownership. The importance of reliability is not to be underestimated since the purchase of 3D Bodyscanning equipment represents for 3D Print stores a major investment and in turn commitment.

Figure 19: Sample of a 3D Scan taken with color textures (right) and without (left)

Source: König, P. (25/01/2014). Drehen, lasern, knipsen. c't magazin. Retrieved from: *http://www.heise.de/ct/heft/2014-4-3D-Scanner-Neuheiten-2094533.html*

3D Scan with color textures	3D Scan without color textures – Geometrical shape only

The process of 3D Scanning also includes the actual computation of the 3D Scan, which is the fourth criterion of quality. Computation refers to the process of interpreting the data delivered by the 3D Bodyscanner and calculating the actual 3D Scan. The output of this part of the process is the visualization of the 3D Scan on the Screen connected to the computer who undertakes the calculation. The time it takes to compute the actual 3D Scan is another criterion of quality. The speed of calculation depends on the technology of the 3D Bodyscanner in use (Refer to chapter 2.2 for Photogrammetry Method, Millimeterwave or Laser Scanning), the software algorithms in use as well as the performance of the hardware. The expert interviews revealed that the time to compute a 3D Scan differs from milliseconds to several hours depending on the hardware & software mix. The advantage of being able to view a scan instantaneously after 3D Scanning is obvious: 3D Print Stores are able to show the 3D Scans to customers immediately after the 3D scan and ask them if they like the result or not. If not they can directly initiate a 2nd 3D Scan. By doing so they would follow common practice of professional photo studios. This is however not possible if the computation takes

hours. Hence the time of computation should be as short as possible, preferably in the area of milliseconds.

2nd Step of the value chain: Post Edition

The needs of 3D Print Stores from the experts' point of view for the second step of the value chain have been summarized in Table 3.

Table 3: 3D Print Shops' criteria of quality for the 2nd step of the value chain: Post Edition

Nr.	Criteria	3D Print Shop's expectations
1.	Software functionalities	Software should provide the user with a fine set of tools to artificially enhance the 3D Scans quality if necessary
2.	Closure of Gaps in the 3D Scans	Ideally the software is capable of closing gaps in the surface of the 3D scan in a sophisticated and automated way – it should be feasible upon click within minutes

"Post Edition" as such is the process of preparing a 3D Scan for 3D printing. This step comprises a mandatory part, which is the closing of gaps in the surface of the 3D scan and an optional part; the graphical enhancement of the 3D scan. The latter step can be compared to the enhancement of digital photos. For instance it is common practice to enhance pictures taken of a model by having graphical designers retouch any wrinkle on the face, using software tools like "Photoshop" (Photoshop, 12/05/2014). The same logic is behind the graphical enhancement of 3D scans, only that a 3D scan is a three dimensional photo.

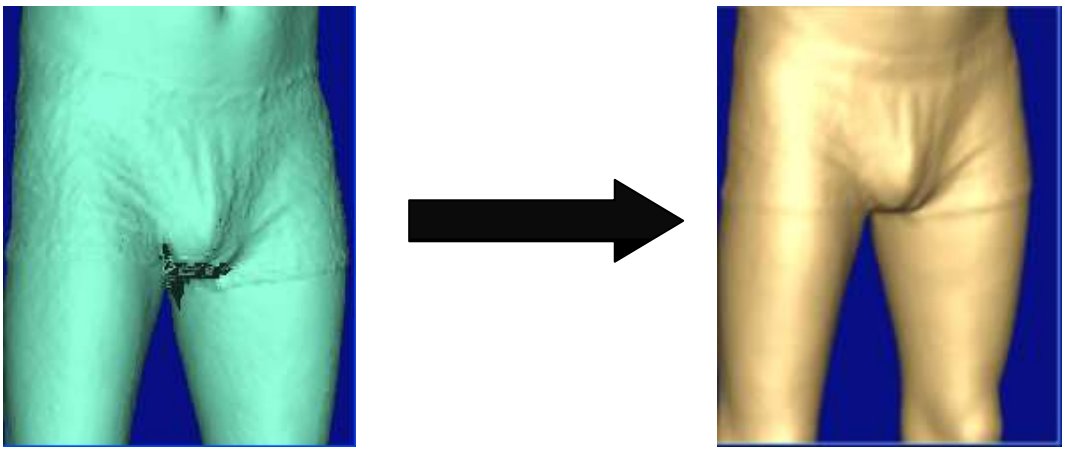
The "closing of gaps" in the 3D scan is necessary because 3D Bodyscanners are technically not capable of creating a 3D scan without wholes. The reason for this is the fact there are dead angles for the sensors of 3D Bodyscanners. These dead angles are spots on the human body where there is no or limited light. Where there is no light, there is no reflection which could be captured by sensors. Usual spots for dead angles are the crotch, the bottom of the shoes or the armpit (Refer to Figure 20 and 19). These gaps need to be closed before a 3D print can be initiated.

For the process of post edition 3D print stores use certain software tools. These software tools can be bought on the market either directly from providers of 3D Bodyscanners or from other companies that specialized in development of 3D Scanning software. Some of the interviewed experts claim that they have even developed software solutions on their own.

The quality of the 3D scans determines the time that is needed for post edition. The better the 3D scan the shorter the post edition. The functionalities of the software are also important. Software tools which enable an automated closure of gaps in the 3D scan fasten the process significantly. The quality by which the software algorithms close gaps differs. The algorithm's quality is measured by its capability to close gaps in a way that the natural shape of the human body is taken into consideration.

Figure 20: Example for gap in 3D Scan which is closed

Source: *Internal*



Example for gap in the 3D Scan

Example of the 3D Scan after the gap was closed

Speed at this point of the value chain is indeed of the essence as experts claim that post edition is costly and that it shouldn't take more than three hours. Otherwise the 3D Print Store might make a loss on a 3D Figurine.

3rd step of the value chain: 3D Printing

All interviewed experts claim that they outsourced the process of 3D printing entirely. After the "Post Edition" the 3D Scans are sent electronically to businesses that specialized in 3D Printing. These 3D Printing Service providers subsequently print the 3D figurines. The reason for the outsourcing of 3D printing is the total cost of ownership of 3D printers. According to one of the interviewed experts the price for professional 3D Printers of high quality easily exceed 60.000€ per piece. On top of that experts pointed to the substantial maintenance costs of 3D Printers. Hence operating 3D Printers on their own was considered to be too capital-intensive and therefore outsourced to external partners who could fully exploit the capacities of the 3D Printers. By doing so they can print 3D figurines at a much lower cost compared to

3D Print Stores. Although most experts refused to indicate the prices charged by the external 3D printing partners, one expert claimed to procure the 3D figurines for 110€ a piece.

For providers of 3D Bodyscanners the implication of this is the necessity to limit the size of 3D Scans in terms of storage space. The reason for this is the electronic transmission of the 3D Scans to the external partner. If the 3d Scan size exceeds the realm of megabytes and reaches the realm of gigabytes in terms of size, the transmission process becomes too time intensive.

c. Cost

At this point the acquisition of 3D Bodyscanners is evaluated from the point of view of 3D Print Stores. The experts were asked to identify the most expensive part within the value chain. Three of them claimed that 3D printing is the most expensive part of the value chain. Only one expert was willing to specify the costs incurred by 3D Printing. According to that expert, 3D printing service providers charge between 70€ and 110€ per 3D printed figurine; depending on size and material. This information is consistent with a quote company "Z" received by such a 3D printed service provider for the production of 100 3D figurines.
Generally speaking one can subsequently assume that at least 60% of the costs are incurred externally during the 3D printing process. This implies that 3D Print Stores have only control over 40% of the costs. These costs include the cost of amortization of the equipment necessary to make 3D scans as well as run the post edition. Experts identified staff costs to be relatively negligible, since the post edition could be taught to temporary workers. Hence one could draw the conclusion that the equipment accounts for the majority of the 40% of costs incurred internally. This implication together with the relatively small scale of the interviewed 3D print stores allows inferring that the target group will tend to be sensitive to significant price differences of 3D bodyscanners (Provided that the level of quality is the same). The validity of this conclusion becomes more evident if one puts the prices of 3D Printers (experts claim that they cost up to 60.000€) in relation to the prices of the 3D Bodyscanner of company "Z" (Refer to Chapter 4.2.4.1, Table 1), which is 65.000€. This comparison must be put into the context of the outsourcing decision of 3D Printing, taken by the owners of 3D Print Stores.

Given the importance of 3D Bodyscanning equipment in terms of total cost, one should lay emphasis on the total cost of ownership perspective, when marketing these products.

d. Convenience

Since three of the experts developed their own 3D Bodyscanner, there was only one expert left who actually acquired a 3D Bodyscanner from company "Z's" competition. Hence the convenience was only of concern for the latter expert. This expert claimed that industry standards for after sales support would be expected. As such a 48 hour down time of the 3D Bodyscanning equipment was the maximum acceptable level. Besides this the expert did not state any other expectations in terms after sales support or if direct contact to the manufacturer via a sales person would be of value. Also expectations in terms of delivery were not stated.
The requests for information company "Z" received for its 3D Bodyscanners from 3D Print Stores in 2013 allow however to infer that short lead times, long term after sales support, set-up as well as training is expected.

e. Communication

Although most interviewed 3D print store owners have developed their own 3D Bodyscanner they indicated to have reached this decision due to a lack of alternatives on the market. According to them there was no company on the market that offered an appropriate solution for them at the point in time when they set up their business. The 3D Bodyscanners of company "Z" were completely unknown to them. This lack of awareness amongst the target group points to the need of company "Z" to engage in marketing activities. The experts' identified the internet as well as trade fairs to be their primary source of information when it comes to 3D Bodyscanning technology.

4.3.1.2 Industry Analysis

As strategy as such is a quest for profit, the external analysis is supposed to identify sources of profit in the environment of company "Z" for the market segment of "3D Print Stores".
Sources of profit can be translated into competitive advantages that a company should establish (Refer to Chapter 2.1). Sources of profit in general depend on three factors (Grant, 2013):

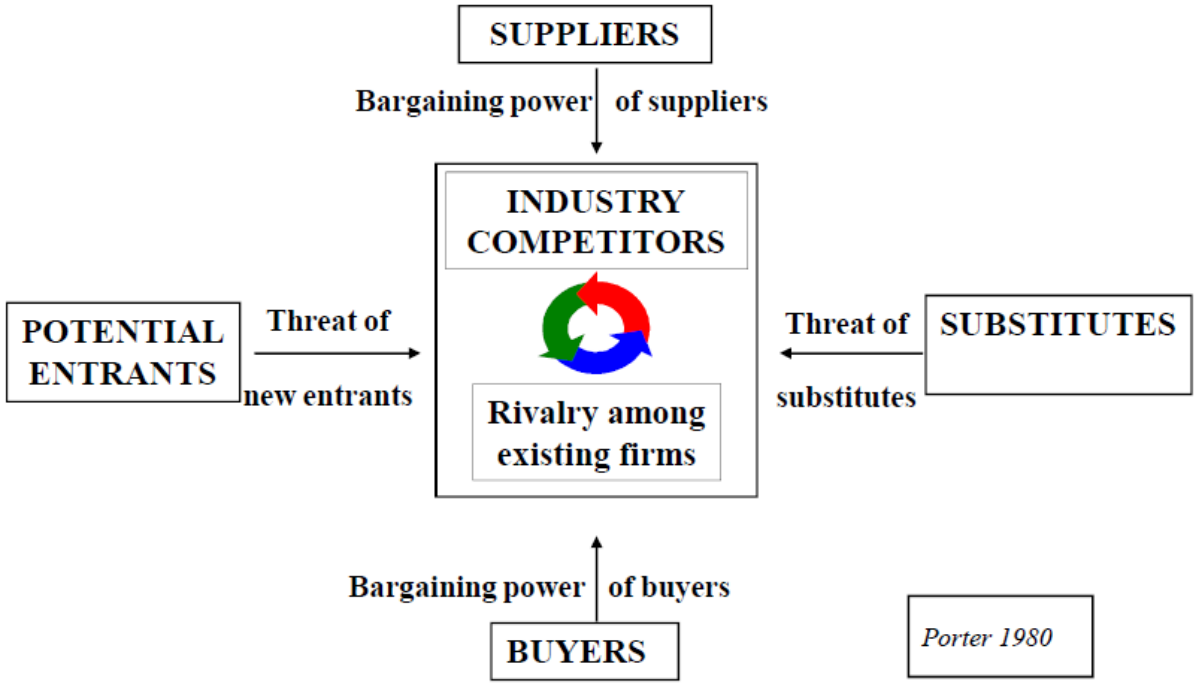
1. The value of the product to customers
2. The intensity of competition
3. The bargaining power of industry members relative to their suppliers and buyers

These three determinants of profitability for a business within a certain industry will be analyzed in this chapter via an analytical framework known as "Porter's five forces". This framework developed by Michael E. Porter of Harvard Business School in the 1980's

suggests that an industry's profitability is determined by five forces of competitive pressure depicted in Figure 21.

The five forces include three horizontal ones (competitors, substitutes as well as threat of new market entrance) and two vertical ones (Suppliers and customers). Porter suggests that one must take three steps when using this model. Firstly one must assess the potency of each competitive force now and especially in the long run. Secondly it is necessary to match the company's strength and weaknesses in the face of each of these forces and thirdly one should consider how to improve the company's competitive situation.
The second step is part of the conclusion of this chapter and the third step is elaborated in chapter five as part of the market entrance strategy.

Figure 21: Analytical model for industry analysis: Porter's 5 Forces



Source: *Michael E. Porter. (1980).*

Industry competitors

At the beginning of the external analysis the industry in which company "Z" is competing was defined as "Global 3D Bodyscanning industry". However the scope of this analysis was limited geographically to Germany, in order to take the derived demand into consideration.

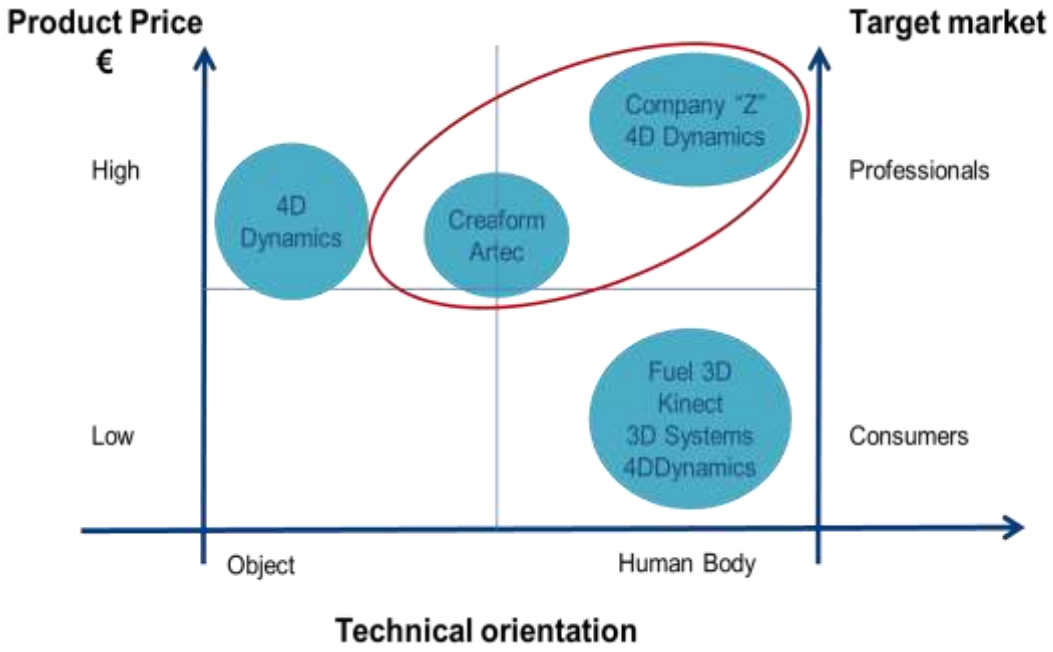
Figure 22: Map of the competition for the 3D Bodyscanner's application of 3D Printing

Source: *Self-created figure*[10]

***Technical orientation**: Measures the degree to which a 3D Scanner is suitable for scanning human bodies and/or objects.*

***Target market:** Differentiates whether companies target professionals or consumers*

***Product Price**: Relates to the price policy of the company*



For the purpose of running "Porter's five forces" this industry definition is even more specified, since not all businesses active in the "Global 3D Bodyscanning industry" offer a solution for the production of 3D printed figurines. For instance there are companies that only serve the "Customized Cloth" market segment (Refer to Chapter 4.2.3: Market segmentation). Hence all companies that don't offer 3D Bodysanners for the purpose of 3D Printing were excluded. The remaining competition was subsequently segmented in order to identify the most relevant competition that follows the same strategy in terms of target group and technical orientation. This strategic group of competitors was marked with a red circle in Figure 22. Thus they all offer 3D Bodyscanners for professionals. Nonetheless their price

[10] The company 4DDynamics has a diversified product portfolio with 3D Scanners for body scanning as well as the 3D scanning of objects. Moreover it offers 3D Bodyscanners for professionals as well as consumers. It is therefore to be placed in more than one quadrant at once.

policy differs and the 3D Bodyscanners of the competitors Creaform and Artec can also be used for the 3D Scanning of objects.

From Figure 22 it can be derived that competition is limited on the market segment of 3D Print Stores. In fact there are only four companies and the supply side can therefore be characterized as oligopolistic. The implication is that price competition is limited and competition focuses more on marketing, service and product development. However there is little statistical evidence that an oligopolistic supply goes along with a higher profitability (Grant, 2013).

Another important factor to consider is diversity as well as differentiation of the competition in terms of objectives, costs, strategies, origins, etc. (Grant, 2013). In order to do so the relevant parameters of the competitors have been compared to company "Z" in Table 5. The four companies competing for the target group can be divided in two groups.

Figure 23: Creaform's GO! Scan 3D Handscanner/ Bodyscanner

Source: *Creaform. (2014). Retrieved from:* http://www.creaform3d.com/de/messtechnik/tragbare-3d-scanner-goscan-3d

Figure 24: 4DDynamics 3D Bodyscanner – Static System

Source: *IIIDBody in NY. (2014). 4DDynamics. Retrieved from: http://www.4ddynamics.com*

Artec and Creaform follow the same strategy (Refer to Table 5). Both of them produce and market 3D Scanners that can be used to scan objects as well as humans. Hence they pursue the strategy of offering hybrid 3D scanners. These 3D Scanners are "Handscanners" since the operator holds the 3D scanner in its hands to scan an object or person (Refer to Figure 23). Since they are "Handscanners" they are highly portable. Moreover both companies charge roughly the same price for their 3D Scanners.

Table 4: Comparison to competitors

Source: *Self-created table based on desktop research*

	Group 1: Handscanners		Group 2: Static Scanners	
Criterion/Company	**Artec Group**	**Creform**	**4DDynamics**	**Company "Z"**
Country of origin	Luxembourg	Canada	Belgium	Germany
Core Competency	3D Scanning	3D Scanning	3D Scanning	Machine Vision Systems
Name of the Scanner	ARTEC EVA	GO! Scan 3D	IIID Evolution	X2
Scanner Type	"Handscanner" = Highly mobile	"Handscanner" = Highly mobile	"Static System"	"Static System"
Price* (Hardware + Software)	~ 25.000 €**	~ 25.000 €**	~46.500€**	~65.000€**
Technical orientation Objects OR Hybrid OR Bodies*	Hybrid = Objects and human bodies can be scanned	Hybrid = Objects and human bodies can be scanned	Only scanning of Bodies – No objects	Only scanning of Bodies – No objects
Time to 3D Scan a Human Body*	3-5 Minutes	3-5 Minutes	< 1 Second	12 Seconds
Time to calculate 3D Scan after 3D Scanning*	< 1 second	< 1 Second	< 1 Second	< 1Second
Time necessary for Post Edition*	1-2 hours	1-2 hours	<1 hour	Remains to be tested
Color textures*	Yes	Yes	Yes	No
Quality of the 3D scan*	Medium for Bodyscanning high for object scanning	Medium for Bodyscanning high for object scanning	High	Low (due to lack of color textures)
Offer own software for Poste Edition*	Yes	Yes	Yes	No

* Criterion for comparison have been established from the perspective of 3D Print Stores based on the results of the expert interviews (Refer to Chapter 4.3.1.1: Target Group Analysis)

** Including Set-Up, Training and Introduction of the system, Software Package. Excl. Transport, Insurance, Maintenance, customs, value added tax

4DDynamics and Company "Z" are both based in countries of the European Union that share high levels of wages. Both of them offer static system, which can't be easily transported from point A to B (Refer to Figure 24 for an example of a static system). Moreover their 3D Bodyscanners have been conceived for the scanning of humans only. Both of them charge at least twice as much as Artec and Creaform.

As explained in the previous chapter time is critical when scanning human bodies or animals. The longer it takes the more the quality of the 3d scan suffers due to movement of the body. Thus reason for the significant price difference between the two groups of competitors is the

fact that it takes significantly more time to 3D scan a person with a Handscanner as compared to a static 3D Bodyscanner (Refer to Table 5). Moreover the static systems are fully automated whereas the "Handscanner" needs to be operated by an individual. In fact the overall time it takes to 3D scan a human body with a "Handscanner" also depends on the skills of the operator. Only if the operator is skilled it might be possible to scan within 3 minutes[11]. In addition to that three of the interviewed experts report that they tested "Handscanners" and considered the output to be of insufficient quality. According to them the "Post Edition" takes too much time due to the low level of quality of 3d Scans acquired with Handscanners.

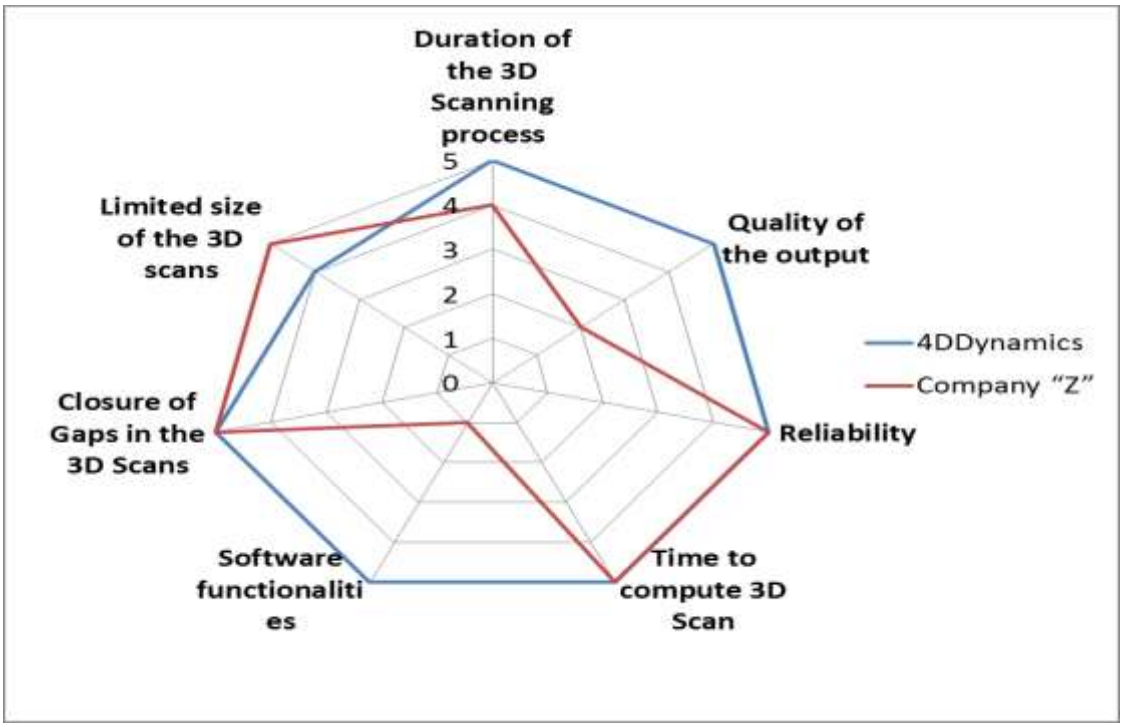
Despite the obvious drawback of Handscanners reported by the interviewed experts, there are 3D Print Shops that use them, especially on an international level. Desktop research revealed that there are a number of 3D Print Stores outside of Germany that use the Handscanners of the company Artec. The reason for this could the relatively low price compared to the static systems as well as the fact that the 3D Bodyscanner of 4DDyanmics was only launched in 2013 and the system of company "Z" does not provide the necessary color textures. Hence entrepreneurs striving to set up a 3d Print Store before 2013 were faced with the choice of developing a 3D Bodyscanner on their own; buying a 3D Bodyscanner that doesn't suit their needs (X2 of company "Z") or acquiring a Handscanner.

All in all one can infer from this analysis that 4DDynamics is the main competitor for company "Z", given the similarities in strategy. However it is also obvious that 4DDynamics offers at this point in time not only a more appropriate solution for 3D Print Stores, it also charges significantly less (Refer to Table 5). Only company "Z's" X1 (35.000€) would cost less than 4DDynamics' IIID Evolution (46.500€). Nonetheless X1 would still be inappropriate for the target group even if it had color textures, due to its relatively low resolution (Refer to Table 1, Chapter 4.2.4.1). Only X2 could possibly compete with IIID Evolution. To illustrate the fit between the target group's expectations and the offer of 4DDynamics, figure 25 was created. It compares the 3D Bodyscanner of company "Z" to the one of 4DDynamics in terms of the product characteristics relevant to the target group. These characteristics have been identified throughout the target group analysis (Refer to 4.3.1.1.)

[11] According to the 3D Print Shop owner that have been interviewed (Refer to Chapter 3)

Figure 25: Comparison of the 3D Bodyscanners of Company "Z" and 4Ddynamics

Source: *Self-created figure*



Coming back to the assessment of the level of rivalry within the industry one can state that it is limited so far, since there is only one provider with an appropriate solution for 3D Print Stores (4DDynamics). This may however change, as will be explained later on.

Threat of entry

The threat of potential market entry is high due to a couple of reasons. Firstly, there are a number of companies that offer 3D Bodyscanners like company "Z" (e.g. Space Vision, SizeStream, Telmat Industrie) but do not target 3D Print Stores so far. For them the effort to tap into the market segment is similar and would not require significant investments. In addition to that there is a whole established industry which serves professional photographers (e.g. Nikon, Canon). This is of relevance since expert interviews revealed the substitutability of 3D printed figurines and professional digital photos. If the market for 3D printed figurines should grow drastically these Multi-National Companies could decide to develop and market their own 3D Bodyscanners. Also the companies that currently focus with their 3D Bodyscanners (e.g. Fuel 3D, 3DSystems) on consumers only might decide to develop professional 3D Bodyscanners.

If companies like Nikon or Canon decide to tap into the market, it is likely that they will dominate it in the long run due to their global scale, financial means, branding, economies of scale as well as instant access to a their well-established global distribution network. These abundant resources and capabilities relative to company "Z" would impose a significant threat.

Supplier Power

As indicated company "Z" sells on average 16 3D Bodyscanners per year. The hardware parts are acquired from various different companies. The production process at company "Z" is limited to assembly of the procured parts. Some parts of the 3D Bodyscanners are not standardized components, which could be acquired anywhere. These parts have been customized for the 3D Bodyscanners and create a certain dependency. Thus switching suppliers is for this limited number of components not easily done. The small number of 3D Bodyscanners manufactured per year further limits the company's bargaining power over suppliers. Overall company "Z's" bargaining power relative to its suppliers is medium to low depending on the degree of customization of the acquired parts.

Buyers

The next competitive force to be analyzed is the "Buyers" (Refer to Figure 21), which is also referred to as target group. The target group is nothing else but the 3D Print Shops under scrutiny.

Suppliers of 3D Bodyscanners create value for 3D Print Stores. How this value is "shared between suppliers and buyers in terms of profitability depends on their relative economic power. The strength of the buyer's power depends on two factors – the buyer's **price sensitivity** and the **relative bargaining power**. Price sensitivity refers to the sensitivity of buyers to the prices charged by suppliers of an industry. Bargaining power ultimately relates to the denial of one party to deal with the other. This in turn depends on the credibility and effectiveness with which one party can make this threat. The key issue is the relative cost sustained by each party as a result of the transaction not being consummated" (Grant, 2013).

The **price sensitivity** of 3D Print Stores when it comes to acquiring 3D Bodyscanners is low at this point for a couple of reasons. Firstly, the ultimate quality of 3D Figurines depends on significantly on the quality of the 3D Scan. Secondly, competition amongst 3D Print Stores is low or close to non-existence, given the fact that there are only four stores so far in Germany

which spread over several cities. Nonetheless one should note that 3D Bodyscanners represent a significant share of the overall costs of the target group. If more companies tap into the market segment and offer 3D Bodyscanners, the supply side will get less differentiated and competition will increase. In such a market 3D Print Shops will have a broader choice when it comes to 3D Bodyscanners and their price sensitivity will increase.

The **relative bargaining power** of 3D Print Stores is limited. One reason for this is the low degree of concentration on the demand side and the situation of oligopoly on the supply side for 3D Bodyscanners. As pointed out earlier the size of 3D Print Stores is limited to a couple of employees and a single store, from which local customers are served. Hence their purchasing power is limited.

3D Print Stores could however develop their own solution, just like three of the interviewed experts did. The investment to do so is however significant and the process time consuming. The costs to develop a solution on their own are estimated to amount to roughly 100.000€. This estimation has been derived from the description of the solutions developed by the interviewed experts. Given the prices of the 3D Bodyscanner developed by 4DDynamics (46.500€) it has become questionable from an economic point of view to integrate vertically as 3D Print Store.
The more information 3D Print Stores have about the suppliers of 3D Bodyscanners in terms of prices and costs the better they are able to bargain. So far the suppliers of 3D Bodyscanners are limited in number and so is the information of 3D Print Stores. As more businesses develop and market 3D Bodyscanners this is likely to change. In the long run it is to be expected that the bargaining power of 3D Print Stores will increase.

Thus the economic power of 3D Print Stores is low relative to providers of 3D Bodyscanners at this point in time. In the long run however this is likely to change as the market develops on the supply and demand side. 3D Print Stores might face a broader choice in the future and their bargaining power will therefore increase to a medium level.

Substitute competition

The first competitive force to be analyzed is the threat imposed by substitutes to 3D Bodyscanners. As mentioned earlier at the beginning of the external analysis there is no real substitute to a 3D Bodyscanner. Although technical approaches may differ (Laser Scanning,

Photogrammetry, etc.) the output is the same; a 3D scan of the human body. Hence if someone seeks to obtain a 3D Body scan he needs to buy a 3D body scanner.

Since demand for 3D Bodyscanner is derived from the market for 3D printed figurines, one should rather consider the need such a 3D figurine fulfills and then relate it to its substitutes. As established in the target group analysis 3D Figurines are a high quality alternative to digital photo. Although digital photos and 3D Figurines fulfill a similar need, the interviewed experts claim that they are not perfect substitutes, due to the distinct quality characteristics of both. Hence there will be a demand for both in the future. Thus the overall threat of substitutes is low.

Conclusion of Porter's 5 Forces Analysis

Table 5: Summary of Porter's 5 Forces Analysis

Competitive Force	Current Situation	Long run
Competition	Low	High
Suppliers bargaining power	Medium	Medium
Buyers bargaining power	Low	Medium
Threat of market entry	High	High
Threat imposed by substitutes	Low	Low

The industry rivalry is currently low. This implies high potential for profits. In the long run however one can expect stronger rivalry, due to the tremendous market prospects which have been identified in chapter 4.3.2. This does however not necessarily mean that the market segment becomes less attractive in the long run. It just reveals the need for businesses that develop, produce and sell 3D Bodyscanners to position themselves carefully to survive competition and secure market shares. The implications for company "Z" in terms of strategy will be discussed in chapter 5.

4.3.2 Analysis of the macro environment

The macro environment of company "Z" for the market segment of 3D Print Stores is analyzed based on the analytic framework called PEST analysis. PEST analysis is an acronym for Political, Economic, Social and Technological factors that constitute the relevant macro

environment (Refer to Figure 7: The Macro, Micro and internal environment of a company in chapter 2.1). It is basically a framework that classifies environmental influences by source (Grant, 2013). Since the scope of this analysis was limited to Germany, the PEST analysis is run for this country. To avoid information overload and distinguish important from unimportant information, one must only consider macro-economic developments that affect the micro environment analyzed earlier. Moreover the time frame to be considered is limited to the next 10 years.

Political environment

The political environment is stable within Germany given the economic development of the recent years. The economic prospects of the country make a disruptive political environment also unlikely in the long run (Refer to Table 7, 8). Thus the country will continue to provide a framework for a competitive economy. Hence there is no threat to company "Z's" business model from a political point of view in the future.

Economic environment

As indicated earlier, the economic environment is stable. The inflation rate amounted to only 1.4 % per year on average over the last five years. Unemployment level has shrunk to 7.3% (January 2014) compared to 12.1% in January 2006 (German Federal Institute of Statistics, 2014). The purchasing power measured at current prices has increased significantly over the past view years, thanks to the growth of the country's economy (Refer to Table 7). Economists predict a continuation of this positive development in the near future (Refer to table 8). Hence the economic environment of company "Z" within Germany is promising and encourages investment.

Social environment

The Federal German Statistical Institute predicts that the total size of the German population will shrink from roughly 81 million in 2014 to 70 million in 2060 (German Federal institute of Statistics, 2014). The reason for this development is the average number of child per women (1.38) within Germany, which is below the level of sustainability (German Federal institute of Statistics, 2014). Thus the average age of German society is increasing, given the size of the generations born in the 1950s ,60s and 70s as compared to today. Today the average age of the German society is 43 and it is predicted to increase to a level of 47 by 2030 (BBSR, 2014).

Table 6: Economic indicators – Germany

Source: *The World Bank. (2014). World DataBank. Retrieved from: http://databank.worldbank.org/data/views/reports/tableview.aspx#*

Indicator Name	2008	2009	2010	2011	2012
GNI per capita, PPP (current international $)	$ 37.550,00	$ 36.860,00	$ 39.150,00	$ 41.910,00	$ 43.720,00
GDP growth (annual %)	1	-5	4	3	1
Inflation, consumer prices (annual %)	3	0	1	2	2

Table 7: Prognosis for GDP development (Germany)

	Prognosis of real GDP development (Germany)		
	2013	2014	2015
Germany	0.4	1.9	2.5
Europe	-0.4	1.2	1.7

Source: Institut für Weltwirtschaft. (13/03/2014). Prognose Zentrum. Retrieved from: http://www.ifw-kiel.de/wirtschaftspolitik/konjunkturprognosen

For the market segment of 3D printed figurines this means a shrinking market size in the long run, since the number of families is decreasing. Nonetheless the horizon for this analysis is limited to the next 10 years. Within this timeframe the decrease in overall population doesn't impose a significant threat to the market participants (79 million in 2024 according to the German Federal institute of Statistics, 2014).

Besides the shrinking size, the German society with its purchasing power as well as sizeable middle and upper class provides a good market environment.

Technological environment

The technological environment imposes a threat to companies that offer 3D Bodyscanners on the market segment of 3D Print Stores. Recently companies like Fuel3D and 3D Systems have launched low cost 3D Scanners (for roughly 300$, refer the companies webpages). With these low cost 3D Scanners Consumers can scan themselves on their own at home and order their 3D figurines from companies that specialized in 3D printing. An example for a company that is building is business model based on this assumption is the company "Shapify". Consumers can use their low cost 3D Scanners and send their 3D scans electronically to Shapify. The company will then prepare the 3D Scan for printing, print the 3D Figurine and deliver it (Shapify, 2014). This is of course a low cost solution and will continue to be, but for

companies that offer 3D Bodyscanners and follow a low cost leader[12] strategy, this could impose a threat.

4.3.3 Estimation of the market size

In order to assess whether company "Z" should tap into the market segment of 3D Print Shops or not one must take the market size and its growth prospects into consideration. As demand for 3D Bodyscanners is ultimately derived from the demand for 3D printed figurines, it makes sense to start with the target group for 3D printed figurines and their motives.

Throughout the previous chapter two main target groups for 3D printed figurines have been identified by the interviewed experts: Families of the middle and upper society as well as business that want to integrate them in their marketing activities. The latter group stands for roughly 40% of the business, whereas the first group accounts for the remaining 60%. At this point a conservative approach is taken, which focuses on the target group of middle and upper class families only for the determination of the market size.

Table 8: Estimation of the market size

Type of City	Number of cities*	Competition muliplicator - Number of 3D Print Shops needed per type of city (Assumption: One 3D Scanner per 3D Print Shop)	Total number of 3D scanners per city type
Middle sized cities 20.000 - 100.000 inhabitants	**594**	1	594
Big cities > 100.000 inhabitants	**76**	2	152
		Total	746

***Source:** *Federal German Institute of Statistics*

As indicated earlier families of middle and upper class regard the figurines as a high quality alternative to a digital photo for special occasions (e.g. marriage). The interviewed experts claim that it is not just hype. Based on this assumption the size of the target group can be derived. According to the Federal German Institute for Statistics there is an overall amount of

[12] Low cost strategy: Competitive strategy which entails offering similar products to competitors at a lower price (Grant, 2013).

7.1 million families within Germany that are part of the middle and upper class (Refer to Table 4). So far only a fraction of them can possible be served by the existing four 3D print stores within Germany. Since 3D scanning of a human as such requires his presence in the store it is likely that there will be at least one 3D Print Stores in every middle sized city and two in every large city of the country, in order to cover the whole market (Refer to Table 4).

The potential market size of 746 3D Bodyscanners for Germany only needs to be put into relation of the current production capacity of company "Z" which is 24 per year. On average the company uses its capacity to 66% with a standard deviation of six around the arithmetic mean of 16 over the last eight years. Hence the long term prospects of the German market alone would properly lead at least to a full use of its capacity p.a. (Provided that the company markets the product properly). If this market segment has similar prospects outside of Germany then a significant increase of the capacities would be necessary. Thus the size of the market segment and its long term perspective can be deemed attractive for company "Z".

4.3.4 International context

In this subchapter the results of this analysis are briefly put in an international context, in order to take the potential of the market segment (3D Print Stores) on a global level into consideration.

On a global scale a total number of 34 businesses has been identified that fit to the description of the target group under scrutiny in this paper. Hence they all sell 3D printed figurines for a profit. The geographical spread of these 3D print stores is depicted in Figure 26.

If one compares these 3D Print Stores (Refer to Annex A) with the profile of the target group described under point 4.3.1.1., the similarities become obvious. With the exception of one business, which is located in China and is running a chain of 11 stores, their size is in general limited to a single store. All of them are located in densely populated urban areas of developed or developing nations and they sell 3D printed figurines to consumers as well as businesses. On average a 15 cm tall 3D figurine in full color costs 242.26 € (Median of the prices for 3D Printed Figurines; based on Annex A). There are few extreme deviations from this price level, namely in China where a 3D figurine costs more than 600€ or in the United States of America where it is available for sale for less than 150€.

Although an in depth analysis of the motives of consumers in the respective countries (other than Germany) for buying a 3D figurines was not done, one can infer at this point that 3D figurines are not a geographically limited phenomenon. Of special interest for companies in the global 3D Bodyscanning industry are developed and developing nations. On condition that the need fulfilled by 3D figurines is similar across the globe this would imply a significant market potential in the long run for suppliers of 3D Bodyscanners.

Figure 26: Geographical spread of 3D Print Stores
Source: *Self-Created Figure based on desktop research (Refer to Annex A)*

This conclusion is also supported by the outcome of a market test run by ASDA, Great Britain's second largest super market chain in terms of turnover, stores and staff (BBC, 23.01.2012). ASDA has been selling 3D figurines to its customers for a profit during the last quarter of 2013 at its store in York, Great Britain. According to a press release published by the supermarket chain, this market test was so successful, that they decided to let the 3D figurine service visit 50 more stores across the country. The company also revealed the motives of customers that bought 3D figurines (ASDA, 27.01.2014):

- *"Family members creating mementoes for loved ones who are going away – including military personnel serving in Afghanistan"*
- *"People showing off sporting medals they've won"*

- *"People showing off their uniform including a serving police officer and football referee"*
- *"Couples making models of themselves to use as wedding cake toppers"*
- *"Three generations of the same family"*
- *"People wearing fancy dress"*

These motives are consistent with the findings of this paper (Refer to Chapter 4.3.1.1), as 3D figurines obviously serve as a substitute to a digital photo. Given the price level of a digital photo compared to a 3D figurine (242€) the conclusion made earlier, that as 3D figurine is considered as a high quality substitute to a digital photo, is also valid.

The expert interview with a Thai entrepreneur who seeks to open up a 3D Print Shop in Bangkok, Thailand also points in a similar direction. According to him the target group for 3D figurines in his country chiefly consists of working class people between 20 and 40. The reason for this is the price level of 3D figurines. As main motive for Thai consumers to buy 3D figurines he identified display, or a making a gift for other people. These motives are in line with the findings of ASDA, although the family aspect seems to be missing. The underlying reason for the missing family aspect could be of cultural nature. Nonetheless the expert's opinion seem to indicate the existence of a market for 3d figurines in Thailand, also motives differ partly.

Hence the international potential of the market segment of 3D print stores is potentially significant. Since the process of 3D Bodyscanning as such doesn't change, no matter where it is executed, this implies that company "Z" could easily sell its 3D Bodyscanners abroad ones it managed to customize it to the needs of 3D Print Stores within Germany.

4.4 Conclusion of the market segment analysis

In order to conclude the analysis part of the master thesis the analytical tool called SWOT matrix was used (Refer to Table 9). It summarizes the in a structured and brief manner the outcome of the external and internal analysis in terms of Opportunities and Threats on the one hand side and Strengths and Weaknesses on the other hand side. The strengths of the company should allow the company to overcome its weaknesses and seize opportunities, whilst tackling potential threats (Grant, 2013).

The analysis of the external environment has established that the market segment of 3D Print Stores shows tremendous potential for growth within Germany. Moreover competition is currently low and the overall economic and political environment encourages investment into product development. In the long run however the level of competition is likely to increase. The market prospects will incline other businesses to tap into the market and the technology for 3D Bodyscanning will evolve.

Table 9: SWOT Analysis

Source: *Self-Created table*

Strengths	**Weaknesses**
- Experience in 3D Bodyscanning - R&D Capabilities - Independency through diversified portfolio of the overall company - Global distribution network	- Lack of human resources and limited financial resources - Misfit between target groups expectations and current offer - Lack of awareness amongst target group - Dependency on Distribution partner
Opportunities	**Threats**
- Tremendous market potential - Low competition so far - Favorable overall economic environment - Opportunity to improve profitability of the product line through creation of a cash cow	- Entrance of new competitors - Development of new low cost solutions

Hence company "Z" should tap into the market segment as fast as possible to exploit early mover advantage and occupy market space. By doing so it could decrease its dependency on its distribution partner who is currently selling 95% of its 3D Bodyscanners. Moreover the new market segment could turn into a "Cash Cow" in the long run, thereby increasing the profitability of the product line significantly.

The analysis however has revealed that the company's current portfolio of 3D Bodyscanners doesn't meet the target group's expectations; chiefly due to the lack of color textures. This is obviously the reason for the company's failure to sell its 3D Bodyscanners to the target group

so far[13]. Moreover the expert interviews showed a lack of awareness amongst 3D Print Stores for the solution company "Z" is providing so far. This is consistent with the revealed lack of budget and human resources for the marketing and sales of the 3D Bodyscanners.

Nonetheless the company as a whole (including all business divisions) has the financial means to sustain investments into the development of the 3D Bodyscanners and expand the marketing & sales efforts. Most notably it has the necessary capabilities in terms of research and development (engineers, laboratory, and expertise) already at its disposal. Hence a simple allocation of financial resources suffices to initiate the development process. In addition it has access to important global markets (e.g. USA, China) via its distribution network to sell the 3D Bodyscanner also abroad.

In conclusion one can state that company "Z" should tap into the market segment and is capable of doing so. A suggestion on how "Z" could enter the market segment is developed throughout the next chapter.

5 Market Entry Strategy

The market entry strategy should provide guidance for company "Z" on how to establish a competitive advantage on the market segment of 3D Print Stores. Overall this chapter comprises five dimensions, namely positioning, customer, cost, convenience and communication. Hence it consists of the four "Cs" introduced in chapter 2.1 which are preceded by the positioning of the product as such on the market segment.

5.1 Positioning on the market

The first and foremost thing to consider is the positioning of company "Z" on the market segment of 3D Print Stores. Hence it about the question whether company "Z" should pursue a strategy of "Cost Leadership", "Differentiation" or a mix of both ("Hybrid"). In order to be consistent with the general strategic approach of the company for all its business units, a differentiation strategy seems to in order. As such the "Z" is trying to establish a competitive advantage by offering above average quality for which it charges a premium (Grant, 2013). This basic strategic approach would allow company "Z" to shield itself from competition on

[13] In 2013 the share of inquiries from the target group of 3D Print Stores amounted to 20% of the overall inquiries received fro 3D Bodyscanners

the market in the long run. It would also avoid price wars with competitors pursuing a "Cost Leadership" approach. A successful establishment as "Differentiator" also bears the opportunity for a superior profitability relative to competitors and reduces vulnerability to the overall economic development (Profitability of the business doesn't depend on the sales of a big number of 3D Bodyscanners).

A company may differentiate itself from the competition in numerous ways. For instance it may differentiate itself in terms of product characteristics. Another way could be a superior after sales service or a sophisticated customer relationship management. It is argued throughout literature that the proper mix of differentiation efforts leads to success in the long run. The more complex a competitive advantage is, the harder it is for the competition to cope with it (Grant, 2013). The first dimension of differentiation to be discussed is the customer dimension.

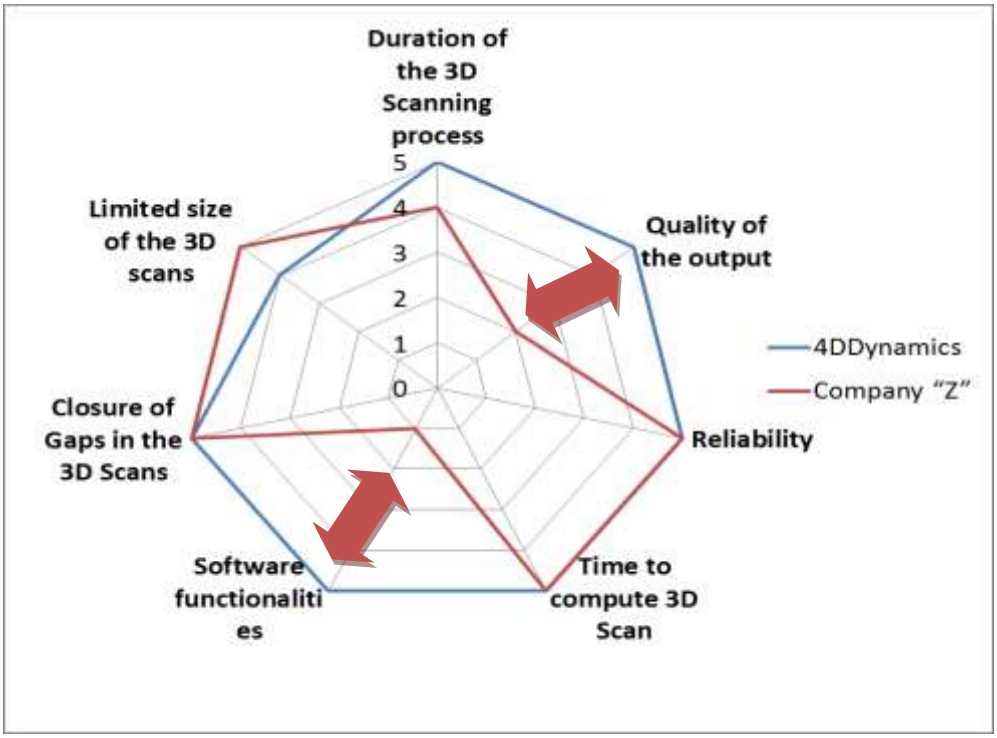
5.2 Customer dimension

Pursuing a strategy of differentiation implies offering superior value in a way that matters to the customer. The industry analysis has revealed that the Belgium Company 4DDynamics is the competitor which offers currently the most appropriate solution for 3D Print Stores. (Refer to Figure 27). Company "Z" should at least offer the level of quality of 4DDynamics and must find a way on top of that to create more value for the target group, in order differentiate itself.

Thus company "Z" must increase the quality of the 3D Bodyscanner's output. This means adding color textures and improving the resolution of the 3D Scan. In addition to that "Z" should find a way to outflank the competitive advantage 4DDynamics currently has in terms of software functionalities. The software package of 4DDynamics allows 3D Print Stores to enhance the quality of 3D scans after the 3D Scan was done (Similar to Photoshop[14] for digital photos). Thus its functionalities go beyond the control of the 3D Bodyscanner, visualization of 3D Scans as well as automatic closure of gaps in the surface of the 3D Scan. As such the software meets the need of 3D Print Stores in terms of "Post Edition" in a better way (Refer to Figure 27).

[14] Photoshop: Name of the software used for post edition of digital photos. Software was developed by the company Adobe Systems Incorporated. For more information please refer to the following webpage: http://www.photoshop.com/

Figure 27: Current product characteristics of company "Z" in terms of 3D Bodyscanners compared to 4DDynamics



Source: *Self-Created figure based on expert interviews and desktop research*

The internal analysis has revealed that company "Z" is rather specialized in providing the hardware for the 3D Bodyscanners. Hence enhancing the software functionalities to meet customer needs would require significant investment in software development capabilities. Moreover it would be a time intensive process. Time however is a scarce resource for company "Z", since it should tap into the market as fast as possible. Thus it makes rather sense to draw upon the solutions developed by companies that specialized in software for post edition of 3D Scans (e.g. Cinema 4D, developed by the German company MAXON Computer GmbH in Friedrichsdorf, Germany, Retrieved from: http://www.maxonshop.de/CINEMA-4D). Company "Z" should strive to engage in a long term distribution partnership with such a software provider. This cooperation should allow "Z" to sell its 3D Bodyscanners together with the software of the partner. Ideally a distinct software package would be developed with together with the partner that suits the needs of the target group only. This package would combine 3D scanner control, visualization of 3D scans, automatic closure of gaps as well as manual enhancement of the 3D scan in a single application. By doing so the target group would only need one software tool.

Closing the gap in terms of quality and software functionalities would put "Z" only at the height of the competition in terms of product characteristics. For differentiation purposes more measures need to be taken, which are elaborated hereinafter.

5.3 Cost dimension

Provided that the strategy described above is followed, company "Z" would still be offering its 3D Bodyscanner "X2" for 18.500€ more than 4DDynamics even though it doesn't create more value for the customer. This gap is significant considering the average size of the target group's businesses. Hence the proposition is made to reduce that difference in prices to 5000€. Company "Z" would still charge more but the difference would be less significant and more appropriate, given the similar performance of the products of both companies.

Moreover company "Z" should offer "Leasing" as modality of payment. The size and degree of diversification of company "Z" would allow sustaining leasing. Moreover it might put it at an advantage over "4DDynamics" which is relying solely on the 3D scanning industry. In addition to that 4DDynamics is much smaller in terms of size (10-20 employees, Source: 4DDynamics, 2014) as compared to company "Z" (~500). Hence the competitor's financial means are likely to be limited in comparison to company "Z". Sustaining leasing is as a consequence more difficult for 4DDynamcis. Desktop research has revealed that 4DDynamics is currently not offering leasing.

Since costs are to be calculated as "Total Costs of Ownership" from the perspective of the customer, company "Z" should lay emphasis on its reliability. As a diversified company, active on a global scale that operates since 1987, the company can be regarded as a reliable partner in the long run. The risk of failure inherent in company "Z" is inferior to the risk inherent in 4DDynamics, due to the lack of diversification of the latter. For 3D Print Stores the loss of the supplier of 3D Bodyscanners means losing the after sales support. Eventually this might force them to acquire completely new equipment instead of paying a simple fix of the existing one. The awareness of this eventuality amongst the target group needs to be sharpened via means of marketing communication and personal selling.

5.4 Convenience dimension

The dimension of convenience offers opportunities for differentiation. Firstly company "Z" could build upon the deployment of its "Customer Relationship Management" (CRM[15]) tool that is currently underway. This CRM tool would allow filling the "Relationship Marketing" approach (Refer to Chapter 2.1) with life. It should better the orientation of the company towards the market. Moreover it would facilitate the gathering and spreading of knowledge about the target groups within the company. This is of importance since a lack of knowledge about the target groups of 3D Bodyscanners amongst company "Z's" global sales force has been identified. Ideally, if implemented correctly, the CRM tool could improve the company's capability to serve and communicate with the customers. Hence it could lead to a competitive advantage (Tapp, 2005).

The internal analysis has revealed a strain of human resources in the sales department for the 3D Bodyscanner product line. Thus improving the company's capability of serving the customer also implies increasing the sales department in terms of headcount. This measure should increase responsiveness of the sales department for 3D Bodyscanner requests. It also allows the department to devote more time on each 3D Bodyscanner inquiry, which is valuable when pursuing a differentiation strategy.

In addition to that Company "Z" needs to provide an after sales support that guarantees the fixing of any 3D Bodyscanner within 48 hours (Refer to chapter 4.3.1.1). A responsive, direct and affordable after sales support is crucial, given the value of a 3D Bodyscanner and the fact that a malfunctioning system brings the whole value chain of 3D print stores to a halt.
The after sales support must go beyond maintenance if it is supposed to serve as point of differentiation. It needs to become rather proactive then only reactive. To this end it could include regular software updates as well as quarterly inquiries on the level of satisfaction with the 3D Bodyscanner. A proactive after sales support should have a positive impact on customer retention rate.

[15] „CRM as *a tool and process* supporting the Relationship-Marketing (RM) ideology, which ideally involves establishing mutuality, trust, engaging in a dialogue, commitment, and focusing on customer loyalty and building relationships with customers" (Tapp, 2005).

The competitor 4DDynamics is offering after sales support for 3,500€ per year, which is roughly the same as company "Z's" after sales support for 3,560€ per year. If 3,500€ per year is appropriate for the target group is yet to be established. If one relates costs incurred for maintenance to the total fix costs incurred by 3D Print Stores (Refer to Annex C), then maintenance costs of 3,500€ would account for roughly 6%[16]. Since fixed cost, according to experts, account for roughly 40% of total costs, 6% of it is a significant part of the overall budget. For this share of cost, the target group supposedly expects more than mere maintenance.

5.5 Communication dimension

The analysis has revealed a lack of awareness of company "Z's" solution amongst the target group of 3D Print Stores. This lack of awareness needs to be overcome.

First and foremost company "Z" needs to include the target group in its web presence. A subpage needs to be created with the proper wording to attract members of the new target group. Secondly search engine advertisement is recommended to increase the traffic on the new subpage. In addition online marketing space in the form of "Banners" could be bought on webpages that target professional photographers or 3D Bodyscanning professionals. On top of that professional social networks like LinkedIn could be used (LinkedIn, 2014). Desktop research has revealed the existence of several interest groups on LinkedIn that are potentially worthy of considering (Refer to Annex F). Besides a new product video should be shot and shared online via channels like "YouTube", professional networks like LinkedIn, company "Z's" webpage, etc. This product video should be customized to the target group's needs.

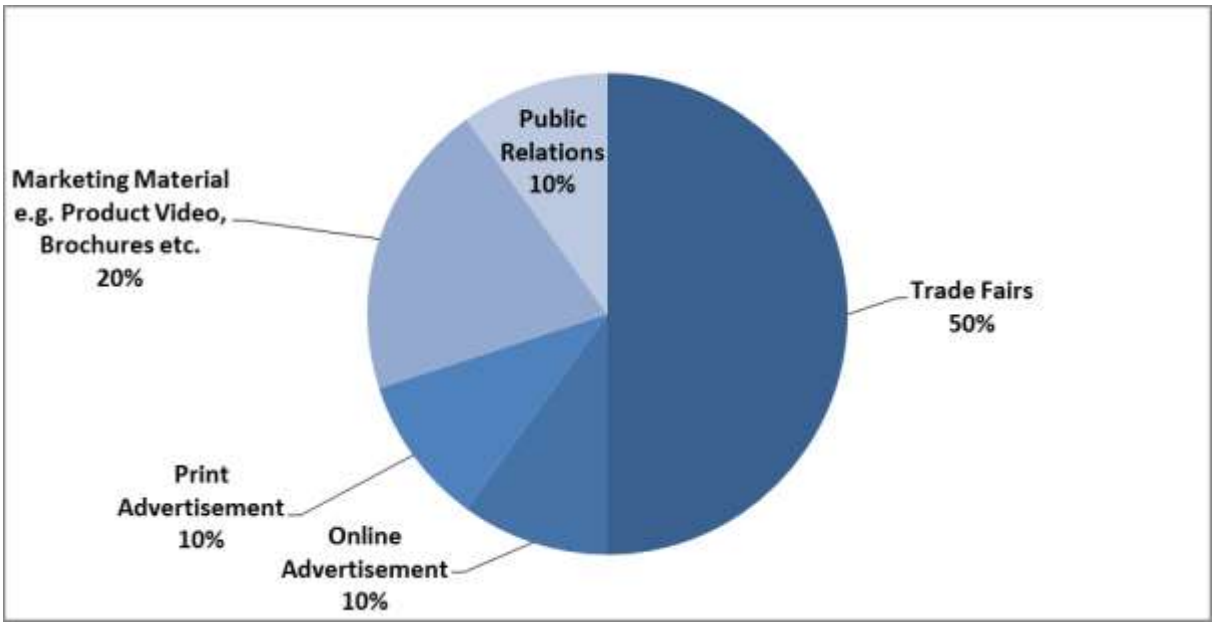
Besides the online marketing efforts, relevant trade fairs for 3D Printing and 3D Scanning need to be visited with a booth. So far company "Z" is only present on one 3D Bodyscanning conference only. A list of other relevant trade fairs "Z" could visit can be found in Annex E. The purchase of a target group specific trade fair booth could enhance "Z's" visibility on such events. Moreover new flyers and brochures need to be created, which communicate the benefits of "Z's" 3D Bodyscanning solution to 3D Print Store owners. In addition to that "Z"

[16] Calculation based on assumption that the 3D Print Store is only offering 3D Figurines for 242€, sells 1000 3D figurines per year and is located in Frankfurt, Germany (Refer to Annex C for more information),

could make use of its upcoming CRM solution to send out on a regular basis with little effort a newsletter to the target group.

In terms of print media, company "Z" should identify magazines that are relevant to the target group and use them to promote its 3D Bodyscanners. The rationale behind advertising in magazines with a narrow audience is their accuracy in terms of targeting as well as the small size of the overall target group as such. For the target group in question advertisement in mass media would not be as effective as advertisement in this kind of very specialized magazines (Pelsmacker, Van den Bergh, 2007).

Figure 28: Media Budget proposal for the market segment of 3D Print Stores



Source: Self-Created figure

Another important pillar of the communication strategy in the B2B area is Public Relations (Refer to Chapter 2.1). Its primary target is not to sell but to inform. As such it strives to convey non-commercial, objective messages. Public Relations activities are of the utmost importance due to their capabilities to build trust and persuade the general public in the long run (Pelsmacker, Van den Bergh, 2007). Since mutual trust is of the essence in the B2B purchasing decision process (Refer to Chapter 2.1), the importance of public relations should not be underestimated. Thus it makes sense for company "Z" to make use of this communication channel for the purpose of entering the market segment. Nonetheless it is to

be noted that “Z” should engage in PR activities on an ongoing basis, if one expects a positive impact in the long run (Pelsmacker, Van den Bergh, 2007).

Since the overall media budget is limited, resources need to be allocated carefully. The theoretical chapter has established the importance of trade fairs and personal selling for B2B businesses. Hence company “Z” should spend most of its media budget on visiting trade fairs (50%). Another 20% is to be spent on online advertisement and print advertisement in professional magazines in a 50:50 relationship (10% Online, 10% Print). 20% should be allocated to new brochures, flyers, photo material and a new product video (Refer to Figure 28). The remaining 10% would in turn finance the Public Relations activities. Given the current lack of human resources at the company’s marketing department, additional staff needs to be hired for managing this market segment entry strategy.

6 Conclusion

The purpose of this paper was the conduct of a marketing research study from the perspective of a German middle-sized company called “Z”. Company “Z” develops and markets, amongst other products, 3D Bodyscanners. The first research objective was to establish whether company “Z” should tap into the market segment of 3D Print Stores with its 3D Bodyscanners. The second objective was the development of a market segment entry strategy, if the market segment’s prospects proved to be promising.

In order to fulfill the first objective, primary as well as secondary data has been analyzed. The primary data was gathered via expert interviews with members of the target group. More precisely owners of 3D print stores have been interviewed. The secondary data was gathered through the means of desktop research. The analysis of the data followed an inductive approach. Hence an inside out approach was applied, analyzing company “Z’s” strength and weaknesses before deriving opportunities and threats from the micro and macro environment. The proper methodology to do so was duly researched upfront and applied accordingly. Moreover the distinct nature of company “Z’s” business was considered before the actual process of research and discussed on an academic level.

In order to take the fact into account that demand for 3D Bodyscanners is ultimately derived from the consumer demand for 3D figurines; the scope of the study was chiefly limited to one

nation, namely Germany. Thus the differences in consumer demand across nations were acknowledged and therefore the need to analyze on a country level became obvious. Germany was chosen, since it is the country of origin of company "Z". Nevertheless the results of the study were also put in an international context at the end of the analysis, in order to take the international scope of company "Z" into consideration.

Based on the results of the analysis a market segment entry strategy was developed in order to fulfill the second objective of this marketing research study.

The market research clearly revealed that 3D Print Stores are a promising market segment for company "Z". Nevertheless "Z's" current offer doesn't meet the needs of the new target group. Its 3D Bodyscanners must be developed further and a distinctive marketing strategy needs to be deployed, if "Z" wishes to enter the market segment. These measures, which have been described in chapter five, also require investment in the company's resources & capabilities in terms of marketing and sales. Nonetheless the commitment it would take to tap into the market segment is worth the effort, especially if one considers the international market prospects. The market for 3D figurines is young and the growth potential is probably tremendous. As 3D Print stores grow in number, the demand for 3D Bodyscanners rises. The rivalry on the market segment is currently low and companies that move fast to establish themselves can profit from first mover advantages and pre-empt the market space. Company "Z's" yearlong expertise in 3D Bodyscanning, financial resources as well as research & development capabilities should make a quick market entrance possible in the short run. In fact time is of the essence; as the emergence of 3D Print Stores will not remain unnoticed by the competition. Thus the recommendation is given that company "Z" should enter the market segment as fast as possible.

It should however be noted that the results of this study are based on a limited number of expert interviews with German owners of 3D Print Stores. Hence the generalizability of the results is limited. This holds in particular for other markets than Germany. Subsequent quantitative studies that validate or dismiss the findings of this study are in order; if one seeks to obtain statistically relevant proof. This is however not feasible at this point, given the current size of the general population of 3D Print Stores and its global spread (Refer to Chapter 3). In the long run however statistical validation of the findings might be a possible solution, as the size of the target group increases.

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8 Annexes

Annex A – List of 3D Print Stores worldwide

Store Number	Name of the Business (3D Print Store)	Number of Stores	Country	City	Inhabitants	Price for full body sculpture, 4c	Webpage
1	NeoVeo 3D	1	Australien	Melbourne	> 100.000	103,62 €	http://www.3dneoveo.com.au/pages/business-cooperation
2	Pinla3D	11	China	Nanjing +	> 100.000	611,51 €	http://www.techinasia.com/china-store-makes-3d-printed-mini-me-figures/ http://www.pinla3d.com/
3	DG Stores GmbH	1	Deutschland	Düsseldorf	> 100.000	199,00 €	http://www.dg-stores.com/so-funktionierts/so-funktionierts/
4	Botspot Berlin GmbH	1	Deutschland	Berlin	> 100.000	220,00 €	http://www.botspot.de/service.html
5	glasow, fotografie	1	**Deutschland**	Erlangen	> 100.000	248,57 €	www.glasow-3d.de
6	TWINKIND	1	Deutschland	Berlin	> 100.000	225,00 €	http://www.twinkind.com/en/landing
7	sculpteo	1	Frankreich	Paris	> 100.000	126,00 €	http://www.sculpteo.com/en/
8	Omote 3D	1	Japan	Tokyo	> 100.000	172,57 €	http://www.omote3d.com/gallery/index_en.html
9	DoubleMe 3D	1	Niederlande (= Holland)	Kruisweg		N.A.	http://www.doubleme3d.nl/
10	3D Druck	1	Österreich	Wien	> 100.000	229,00 €	http://www.3d-druck-wien.at/index.php
11	3DEE.at	1	Österreich	Wien	> 100.000	N.A.	http://www.3dee.at/en/contact/

Store Number	Name of the Business (3D Print Store)	Number of Stores	Country	City	Inhabitants	Price for full body sculpture, 4c	Webpage
12	fabberlounge	1	Österreich	Wien	> 100.000	229,00 €	http://fabberlounge.com/contact-2/
13	Pocket Size Me	1	Schweiz	Zürich und Argau	> 100.000	370,22 €	http://www.pocketsizeme.ch/ihre-3d-portraitfigur/
14	my3Dfigur	1	Schweiz	Zürich	> 100.000	299,00 €	http://www.3dfigur.ch/
15	Uu3D Studio	1	Singapur	Singapur	> 100.000	483,06 €	https://uu.com.sg/
16	Studio Impressionate	1	Spanien	Sevilla	> 100.000	97,00 €	http://www.studioimpresionarte.com/tarifas.html
17	3dU - ThreeDee You	1	Spanien	Madrid	> 100.000	N.A.	http://www.3d-u.es/
18	Me Limited Edition	1	Thailand	Bangkok	> 100.000	248,08 €	http://www.me-limitededition.com/
19	iMakr	1	U.K.	London	> 100.000	189,99 €	http://www.imakr.com/3Dscanners
20	Asda	1	U.K.	York	> 100.000	238,98 €	http://your.asda.com/news-and-blogs/3d-printing-on-tour
21	3D Heights	1	U.S.A.	New York	> 100.000	139,07 €	http://www.shapeshot.com/about.php
22	Bmore3D	1	U.S.A.	Baltimore	> 100.000		http://www.bmore3d.com/?cat=4
23	twindom	1	U.S.A.	Berkeley (CA)	> 100.000	128,71 €	http://twindom.com/locations/
24	Caputre Dimensions	1	U.S.A.	Dallas (Texas)	> 100.000	286,91 €	http://captureddimensions.com/replicas/process/

Total Number of 3D Print Stores	34
Average Price per 3D Printed Figurine	242,26 €
Geographic Location	Large Cities (> 100.000)
Size	Single Stores

Annex B: Results of the expert interviews, part I

Topic	Questions	Store 1	Store 2	Store 3	Store 4	C5: Thai
General Information	Description of shop: What do they offer?	Owner	Co-Owner	Owner	Owner	Entrepreneur
	Since when are they in business	2013 dez	2013	Oct. 2013	2013	To be defined
Cost perspective	Do they perform every step inhouse? If not: What is done externally?	3D Printing outsourced	3D Printing outsourced	3D Printing outsourced	3D Printing Outsourced	n.a.
	What is the most important cost driver in the production of 3D scultpures?	Depends on 3D Figurine - 50% 3D Scanning 50% 3D Printing	3D Printing is the most expensive	3D Printing is the most expensive	3d printing	
	Number of sculptures per month/Day?	n.a.	n.a.	n.a.	n.a.	n.a.
Communication	Where do you look for information about 3D scanning technology?	no idea where to look	Messen - Euromold - Haben Abteilung für Marktforschung	Internet - Trade Fairs	Internet - Trade Fairs	Internet - Trade Fairs
	Why did you choose it?	Didn't know any appropriate provider - hence they developed their own	Didn't know any appropriate provider - hence they developed their own	Didn't know any appropriate provider - hence they developed their own	No appropriate supplier on the market - except for ARTEC	?
	Do you go to trade fairs?	n.a.	yes	no	no	no

Results of the expert interviews, part II

Topic	Questions	Store 1	Store 2	Store 3	Store 4	C5: Thai
Customer Perspective	What kind of 3D scanner do they use?	Own development	Own development based on digital cameras	Own development - two studios 60- bis 120 kameras bei bewegung nur phototechnik möglich	Artec Handscanner	Don't know yet
	Are they satisfied with the scanner? If not why?	yes - satisfied	yes	yes	yes - except kids and dogs can't be scanned	n.a.
	How long does it take to make a full body scan with it?	milliseconds	milliseconds	milliseconds -	3 minutes	The faster the better Ideally seconds
	How long does it take to compute the 3D avatar?	n.a.	depends - less then 6 hours	depends - 10 minutes to 2 hours	real time - instant availability of 3D scan	It should be instant
	How long does it take to prepare the 3D scan for 3D printing?	Depends - one hour or two - several hours depending on the scan partially done inhouse partially done externally	Post Edition necessary, but limited to minor improvements that don't require any artist	One hour is perfect - every post edition that takes more than 3 hours is not profitable	Post edition necessary - one to two hours are needed per scan on average - but Softwaree algorythm of ARTEC Software closes Scan automatically	Seeks automation of the process
	What resolution do you expect?	highest resolution possible	16 thousand meshes are provided by their 3D Bodyscanner - BUT: 3D Printers can currently only print 8000 meshes	highest resolution possible	highest resolution possible	highest resolution possible
	Color Textures?	Yes - absolutely	Yes - absolutely necessary	Yes - absolutely	Yes -	Yes -

		necessary		necessary	absolutely necessary	absolutely necessary
Customer Perspective	Would a faster and more automated scanning as well as editing process represent an added value for you?	So far not capacity limitation	Sieht keine Beschränkung: Warum keinen Handscann : Riesiege Datensatzmengen nachbearbeitung sehr intensiv - Person müssen zu lange gerade stehen - zu viel Bewegung Künsterliche Nachbearbeitung nicht notwendig - Techniker reicht aus für Nachbearbeitung Handscanner für Objekte perfekt Kennt keinen Scanenr der das automatisiert hinbekommt Warum eigenes System haben mit allen anderen Systemen experimentiert andere Systeme defizitär	FDN drucker - kunststoff Drucker Pulverdrucker für Fotofiguren Industriedrucker - arbeitet mit Dienstleistern zusammen 70 - 80 k hohe Wartungskosten	it would allow to scan kids and dogs	Pulverdrucker
	What kind of software do they use to work with the scans? Are they satisfied with it?	Own development - Artec dauert zu lange - ergebnisse schlecht - fehlerbehaftet zu aufwendig - extrem viele Löscher müssen gestopft werden	Own developtment	Bought on the market Photogrammetry software available for sale	Artec Studio	n.a.

Results of the expert interviews, part III

Topic	Questions	Store 1	Store 2	Store 3	Store 4	C5: Thai
Place	What do you expect in terms of after sales support?	48 h Reperatur service - standards	industry standard	industry standard	industry standard	n.a.
Expectations	How do you evaluate your current situation and future business prospects?	Positive	Positive - cyclical demand - exorbitant demand	positive - 3D figurine and 3D foto will coexist	positive	positive
	What is the profile of customers that buy 3D printed sculptures? Gender, Age, social status?	n.a. since business is new	Families with kids and sometimes pets account for 60% of business. Their main motive is buying a sophisticated piece of memory The remaining 40% of business are comapnies that order 3D figurines for marketing purposes	A lot of parents with kids and pets. Also freshly married couples. Another motive is buying a 3D figurine as a gift for someone else. Also companies order 3d figurines for marketing purposes such as sales promotion	Mainly families come in. It's a new form of freezing time. Also business order. People also come in with pets.	Working class members between 20 and 40 years that order 3d figurines for for display or to make a gift to someone

Annex C: Cost structure of sample 3D Print Store in Frankfurt, Germany. Located in the city's main shopping street "Die Zeil". Part I
Source: Self-created figure

Fix costs				
1. Depreciation	**Total**	**p.a.**	**% of total fixed costs**	**Assumptions:**
3D Bodyscanner	55.000,00 €	5.500,00 €	7%	3D Bodyscanner of compoany "Z"
Software	3.100,00 €	310,00 €	0%	Software bought in from third party
Store equipment	30.000,00 €	3.000,00 €	4%	Furniture, Painting, Computer, Monitor, Accounting software etc.
	Per month	p.a.		
2. Rent for store space (30 m², ~ 58,98€/m²)	1.769,00 €	21.228,00 €	29%	Store located in Frankfurt, Inner City
3. Utilities	300,00 €	3.600,00 €	5%	Based on German energy prices
4. Maintenance contract for 3D Bodyscanner		3.560,00 €	5%	Based on company "Z's" price list
5. Administration and Marketing expenses		10.000,00 €	13%	
6. Wages	2.250,00 €	27.000,00 €	36%	Salary of part time staff = 10€ per hour -> Store is open 192 hours per month - 450€ maximum salary per part time employee per month according to German law - otherwise full time employment necessary Hence max. 45 hours of work per employee per month - 192/45= 4,2 5 half time employees *450€ per month*12 month a year = 27.000€ p.a.
Total fix costs		**74.198,00 €**	**100%**	

Annex C continued, Part II of cost structure of sample 3D Print Store in Frankfurt

Variable costs	**per 3D figurine**	**p.a.**	**% of total costs**	**Assumptions:**
Material cost	110 €	110.000,00 €	60%	1000 3D Figurines sold
Total Variable Costs		**110.000,00 €**	**60%**	

	per 3D Figurine	**p.a.**	**Assumptions:**
Revenue	242 €	242.000,00 €	1000 Figurines sold
Total Cost		184.198,00 €	Fixed plus variable costs
Earnings before taxes and interest		57.802,00 €	
ROS before taxes and interest		23,89%	
Break Even		562	Number of 3D Figurines sold per year to cover fix costs

Annex D: Total Size of Target Group for 3D printed figurines within Germany

Source: Birth Rate and Family Situation. (2013). Federal German Institute of Statistics.

Group	Number of kids	Total number of families per group	Ratio of poverty within this group	Number of families that are part of the middle and upper class
1	One	4.310.000	9,8%	3.887.620
2	Two	2.901.000	10,7%	2.590.593
3	Three and more	850.000	24,1%	645.150
	Total	**8.061.000**		**7.123.363**
		100%		88%

Annex E: List of trade fairs company "Z" could visit to market its product to the new target group of 3D Print Stores

Source: *Self-Created table based on information retrieved from: 3DPrinting for Beginners. (04/05/2014). 2014- 3D Printing Fairs, conferences, Event List. Link: http://3dprintingforbeginners.com/fairs_events/*

Trade Fair	Locations	Audience	Link to trade fairs
3D PRINTSHOW-Global 3D Printing Events	Paris, London (2014) and New York (2015), Berlin, Dubai, Singapore (2016)	B2B, B2C	http://3dprintshow.com/
3D Inside Printing Conference	Seoul, Melbourne, Hong Kong, Tokyo, Santa Clara, Milan, Shanghai (2014) and Singapore, Berlin, New York (2015)	B2B	http://www.mediabistro.com/inside3dprinting/
3D Printer WORLD EXPO	Los Angeles (2015)	B2B	http://www.3dprinterworldexpo.com/Content/Why-Attend/17_57/

Annex F: List of interest groups on LinkedIn, that could be used to reach the target group

Source: *LinkedIn. (04.05.2014).Retrieved from: https://www.linkedin.com/*

Interest Group	**Link**	**Number of members**
ACG – 3D Imaging, 3D Printing, Rapid Prototyping & Additive Manufacturing Users	**https://www.linkedin.com/groups/ACG-3D-Imaging-3D-Printing-88762?trk=my_groups-b-grp-v**	**2.205**
3D Printing Entrepreneurs	**https://www.linkedin.com/groups/3D-Printing-Entrepreneurs-4752051?trk=my_groups-b-grp-v**	**1.456**
3D Printing	**https://www.linkedin.com/groups?gid=792077&trk=my_groups-b-grp-v**	**18.623**