Marketing and sales strategies development using value-based selling

Masterarbeit
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Graz, im Mai 2019

In Kooperation mit:

B. BRAUN Melsungen AG

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Kurzfassung

Die Medizinprodukteindustrie ist in der heutigen Zeit geprägt von hohen regulatorischen Anforderungen, kurzzyklischen Innovationen, Preisdruck und Kunden, die kollektive Einkaufsstrategien verfolgen. Um in diesem Branchenumfeld bestehen zu können, müssen die Hersteller von Medizinprodukten ihre Marketing- und Vertriebsstrategien anpassen, um einer Preiserosion vorzubeugen. Darüber hinaus müssen diese Strategien modifiziert werden, um auch mehrere Einflussfaktoren im typischen Lieferantenauswahlprozess des Kunden zu berücksichtigen. Eine potenzielle Lösung, die auch vom Industriepartner B. Braun Melsungen AG genutzt wird, ist die Wertorientierte Verkaufsphilosophie (eng. value-based selling).

Die vorliegende Masterarbeit beschäftigt sich mit diesem Konzept und zielt darauf ab, einen Einblick in die erforderlichen Marketing- und Vertriebsstrategien zu geben, die zur kontinuierlichen Ausweitung der Wertorientierte Verkaufsphilosophie bei der B. Braun Melsungen AG erforderlich sind. Zu diesem Zweck wurden Literaturrecherchen zu verschiedenen Themen durchgeführt, um das relevante Marktumfeld und den Lieferantenauswahlprozess des Kunden zu analysieren. Dieses Wissen wurde dann genutzt, um die Grundlagen der Wertorientierte Verkaufsphilosophie zu erforschen, wobei der Schwerpunkt auf praktischen Umsetzungen der Philosophie lag. Schließlich wurde eine Total Cost of Ownership (TCO)-Analyse sowohl für ein Produkt von B. Braun als auch für ein Konkurrenzprodukt durchgeführt, um eine wirtschaftliche Mehrwertberechnung (eng. value case) zu bilden, die als integraler Bestandteil moderner Verkaufstools das untersuchte Konzept unterstützt.

Die Ergebnisse der TCO-Analyse zeigten, dass die Lösung von B. Braun dem Kunden Kosteneinsparungen in Bezug auf den Betrieb und die Vermeidung klinischer Komplikationen bietet. Dies bestätigte, dass qualitativ hochwertigere Produkte, die die Sicherheit von Patienten und Mitarbeitern im Gesundheitswesen in den Fokus rücken, immer noch als überlegene Mehrwertlösungen präsentiert werden können, selbst wenn sie zu höheren Preisen verkauft werden. Insgesamt wurde der Schluss gezogen, dass eine Wertorientierte Verkaufsphilosophie den Bedarf an Zeit- und Ressourceninvestitionen erhöht, allerdings auch eine Möglichkeit bietet, das Verkaufsgespräch von der Preisdiskussion wegzulenken und das Geschäftsmodell des Kunden zu beeinflussen.

Abstract

The medical device sector in today´s time is characterized by high regulatory requirements, rapid innovation, pricing pressures and customers engaging in collective purchasing strategies. Competing in this sector means that the medical device manufacturers have to adapt their marketing and sales strategies in order to prevent price erosion. In addition, these strategies have to be modified to also consider multiple influencers in the typical customer`s supplier selection process. A potential solution, which is also employed by the industry partner B. Braun Melsungen AG, is the sales philosophy of value-based selling.

This thesis revolves around this concept and tries to fulfill the main objective of providing a view into required marketing and sales strategies that are needed to further boost value-based selling at B. Braun Melsungen AG. To do this, literature reviews on several topics were performed to analyze the relevant market environment and the customer`s supplier selection process. This knowledge was then used to research the basics of value-based selling with a focus on practical implementations of the philosophy. Lastly, a Total Cost of Ownership (TCO) analysis was performed on a B. Braun product as well as a competitor product in order to form a value case as an integral part of modern sales tools supporting the researched concept.

Results of the TCO analysis showed that B. Braun`s solution offers cost savings for the customer in terms of operation and prevention of clinical complications. This confirmed that higher quality products, which focus on patient and healthcare worker safety, can still be presented as better added-value solutions, even when being sold at a higher price point. Overall, it was concluded that practicing value-based selling increases the need for time and resource investments, but it also offers a way to shift the sales conversation away from prices and towards impacts on the customer`s business model.

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1 Introduction

The introduction describes which problems were addressed and how the content develops throughout the thesis. To show this content overview, the initial situation was set, followed by the main goal and corresponding sub-goals, which steer the research. Next, several tasks that lead to proposal of solutions were set in the form of research methods. Finally, the research area was constructed to precisely limit this thesis to the areas that are relevant for quality conclusions.

1.1 Initial situation

Situation in today´s medical device industry is characterized by a steady growth through global demographical changes and growing middle class.[1] [2] [3] [4] On the other side, this sector experiences a trend increasing regulations and growing competition.[5] [6] [7] This increase in numbers of global and local competitors, together with healthcare providers exploring new opportunities to reduce costs, increases required effort for the medical device suppliers to protect their revenues. As price sensitivity increases, many buyers may decide to transition to cheaper local suppliers to stay within their annual budgets.[8] [9] Further business success now depends on the value generated for the customer. To do this, in depth understanding of customer needs has to be prioritized and this knowledge must be converted to developing solutions that directly aid customer`s business model. This can be achieved by presenting added-value in medical devices. Such solutions reduce processing time, lower the risks of hospital-associated complications, improve operational efficiency or assist with handling safety.[10] [11] [12]

This is also a description of the market that the German medical device supplier B. Braun Melsungen AG is operating in. To protect its market share, the company has to retain customers that have the potential to switch to other producers that cut their prices. As the company is engaged in the advanced to premium market segments, which enable high profit margins, it is also in risk of tenders opting to cheaper alternative products. To counter this, the company is focusing on innovative products which promote safety and risk reduction for the customer.[13] In order to market in this segment profitably, B. Braun employs value-based selling (VBS) approach as a philosophy behind their marketing strategies. This results in requirements for marketing and sales teams to have deep insights about the hospital procurement processes. During this process, different decision makers and influencers, with different

[1] Vgl. B. BRAUN MELSUNGEN AG, (2015), S. 14 f.
[2] Vgl. MARTIN, J. J. M. (2011), S. 19.
[3] Vgl. INTERNATIONAL TRADE ADMINISTRATION. (2016), S. 6.
[4] Vgl. WHO. (2011), S. 2 ff.
[5] Vgl. SPENCE, P. et al. (2018), S. 10.
[6] Vgl. HEUVEL, R. (2018), S. 3.
[7] Vgl. EMERGO GROUP (2018), S. 7.
[8] Vgl. CHILUKURI, S. et al. (2010), S. 2.
[9] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 75 ff.
[10] Vgl. https://invivo.pharmaintelligence.informa.com (29.01.2019)
[11] Vgl. TERHO, H. et al. (2012), S. 178 ff.
[12] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 9.
[13] Vgl. https://www.bbraunforsafety.com/en.html (05.02.2019)

perceptions of value, interact to evaluate the attractiveness of manufacturer's offer.[14] For the manufacturer this means targeting marketing messages to several hospital stakeholders, with varying interests and needs (e.g. nurses, physicians and purchasing department).[15] Another challenge concerns the fact that many products in B. Braun`s portfolio are regarded as commodity products. To avoid the gradual decrease in differentiation of this portfolio, the company has to address customer challenges in new and more economical beneficial ways in comparison to the competition.[16] Dealing with issues like these means implementing successful added-value sales arguments. The challenge here is to show how exactly B. Braun`s solution solves known, underestimated or even unknown needs in customer`s everyday process. In practice, implementing VBS does not represent a single change or even a simple solution. The sales force needs to be trained enough to offer knowledge about the customer`s business model, his key performance drivers and day to day issues.[17] [18]

This thesis offers insight into how suppliers in the medical device market can tackle the current market environment, by developing effective marketing and sales solutions based on the value-based selling philosophy. The provided solutions will also show how this philosophy can protect pricing levels and enable the company to continue selling the medical devices profitably.

[14] Vgl. LINDGREEN, A. et al (2009), S. 182 f.
[15] Vgl. OMBAKA, E. (2009), S. 20.
[16] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 6 f.
[17] Vgl. TÖYTÄRI, P. et al. (2011), S. 499.
[18] Vgl. KAARIO, K. et al. (2003), S. 96 f.

1.2 Objectives

Purpose

To tackle the described problem, the main purpose revolved around providing a view into required marketing and sales approaches that are needed to further boost value-based selling strategy in the department of Global Marketing and Sales at B. Braun Melsungen AG. This was done for the example product provided by the industry partner (Discofix® C with Safeflow).

Objectives

These marketing and sales approaches will in the end be used to support the launch of this product on the market by enhancing product´s value presentation from the sales representatives to the customer. To achieve this, following sub-objectives were set:

A. Describe the relevant market environment in order to list its properties, challenges and opportunities. The analyzed sector was the medical device industry, and the results of this analysis show the economical context, as well as provide a basis to propose solutions and conclusions.

B. Provide insights into procurement process of the relevant customer base and analyze the stakeholders that influence the medical supplier selection procedures.

C. Describe the concepts behind value-based selling. The aim was to present the theoretical background behind this philosophy and to show how it can be implemented into marketing and sales strategies to target different customer stakeholders.

D. Explain what a value case is and how it can be used as a sales tool that incorporates the concepts behind value-based selling.

E. Develop a value case on an example product by using the Total Cost of Ownership (TCO) method.

F. Present the value case as a sales tool that boosts value-based selling in marketing and sales strategies. The aim is to show how this sales tool can be used by sales representatives to increase customer´s perceived value of the product.

1.3 Conceptual formulation

The set goals were completed by performing tasks that were categorized into theoretical and practical part.

1. For the theoretical part, literature reviews on several topics were performed:

    a. To identify the relevant business fields and the corporate scale of the industry partner (B. Braun), a literature review was performed on company`s internal records, intranet, official website and corporate reports. This was used to form a company profile.

    b. Literature review was performed on the topic of medical device industry and its market environment, with a focus on challenges and opportunities in the sector. Together with company profile data, this task aimed to complete sub-objective A.

    c. Literature was performed on procurement and supplier selection process of a typical medical device customer. This research focused on different stakeholders and influencers and it aimed to complete sub-objective B.

    d. Further examined literature described the philosophy of value-based selling. It covered sub-topics such as, how this philosophy evolved, how it is defined, how it affects the selling process and what are the implications for medical device sector. This task aimed to complete sub-objective C.

    e. Final literature review was performed on the topic of a value case, as a marketing and sales tool that supports implementation of value-based selling. This task aimed to complete sub-objective D and to provide theoretical background for sub-objectives E and F.

2. For the practical part, a value case was developed for the B. Braun`s example product. This value case was presented as a marketing and sales tool that can be potentially used to improve sales performance in the medical device sector. As the basis, the main calculation method, Total Cost of Ownership (TCO), was explained and set in the context of this specific analysis. Then, a product profile was developed in order to find costs-influencing features and benefits. Lastly, parameters and limitations were set and a calculation of TCO values for the B. Braun`s product and a reference product was performed. The results were compared and a value case was formed, which enabled the formation of conclusions. This task aimed to complete sub-objectives E and F.

1.4 Research area

The larger research area of this thesis is in the field of business economics, with a focus on marketing and sales. This area is in line with the B. Braun`s department of Global Marketing and Sales where the research for this thesis took place. Within this area, special focus was on the topic of value-based selling as a possible marketing and sales strategy for medical device suppliers like B. Braun. This topic was then be further researched within sub-topics like value definition, customer`s perceived value, evolution of modern sales processes and value-based sales force. The final researched area focused on the value case, as a specific marketing and sales tool that supports the implementation of value-based selling.

In order to provide the right context, as well as to offer a clear and precise research area, some definitions and limitations had to be set. The following facts provide boundaries to the relevant research of this thesis:

1. The research area was limited to the medical device industry. The goal was to differentiate this term from other similar terms, such as medicinal products, medical supplies, healthcare appliances or pharmaceutical products industry. Interchangeable use of terms could negatively impact the research, so several definitions, like the definition of a medical device, were presented during the research.

2. The medical device supplier market was limited to Germany. Germany offers a large enough medical industry example, with a sufficient amount of research and statistical data. This limitation avoids the possibility of wrong generalizations because of the complexity and large differentiations in the global supplier market.

3. The medical device buyer market was limited to developed regions, such as Europe and United States of America. This limitation still grants access to a large enough statistical sample with valid previous research, while also providing the most relevant context to this research. Another reason for this limitation was that regulations, pricing sensitivity, segment attractiveness, available technology and healthcare budgets are highly differentiating between countries on a global scale.

The thesis is presented from a view point of a large-sized German medical device supplier, such as B. Braun. A supplier like this is characterized by already developed and established marketing and sales strategies, as well as innovative and high quality products. This limitation is important to differentiate between companies that would target lower price segments and would likely have a different set of selling approaches.

2 Market environment

This thesis focuses on the market environment of the medical device sector, from the perspective of a supplier competing in it. Such a supplier manufactures inputs for the healthcare provider industry and the healthcare providers then use these inputs to provide public or privately organized healthcare services.[19] Both sides are affected by sector`s regulations, technological changes, pricing strategies, competition and other factors, when trying to satisfy their business model needs. The aim of this chapter is to provide context and basis for argumentation in the later chapters, where it is discussed why and how value-based selling should be incorporated into M&S of a medical device supplier (in the case of this thesis, specifically the Global Marketing and Sales - GMS department at B. Braun). The following figure provides an overview on the market environment and relevant parties.

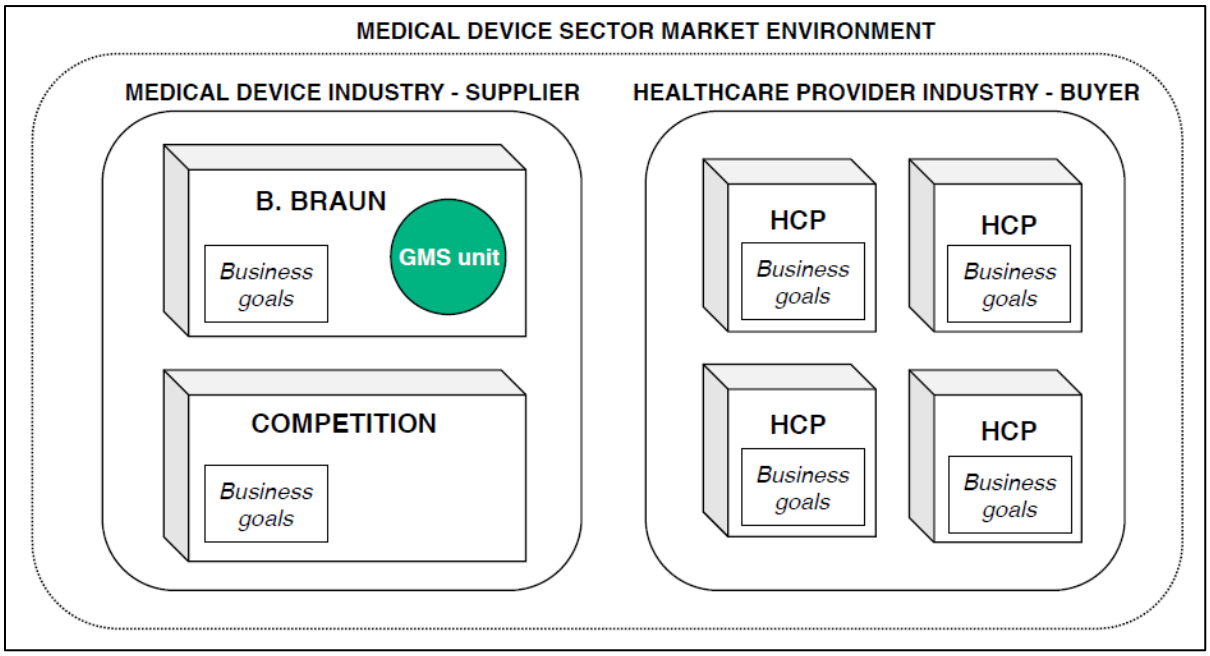

Figure 1: Market environment and involved parties overview

2.1 Company profile – B. Braun Melsungen AG

One of the global leading providers and manufacturers of healthcare solutions in this market sector is B. Braun Melsungen AG, the industry partner of this thesis. The company mainly manufactures medical devices, but also offers pharmaceutical products, medical services and production services (OEM manufacturing). Company`s headquarters reside in Melsungen, Germany, where the company was founded in 1839, starting as a pharmacy business.[20] [21] [22]

Since then, the operations and product portfolios have greatly expanded and today`s modern

[19] Vgl. MEDPAC (2017), S. 207 ff.
[20] Vgl. https://www.bbraun.com (07.02.2019)
[21] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 43.
[22] Vgl. https://www.bbraun.com (11.02.2019)

B. Braun produces a range of medical devices and solutions, comprising together 5,000 different products along 18 therapeutic areas, shown in the table below. Relevant therapeutic area for this thesis is area of infusion therapy.

Acute Dialysis	Hemodialysis	Neurosurgery
Apheresis	Incontinence	Nutrition Therapy
Cardio-thoracic Surgery	Infection Prevention	Orthopedic Joint Replacement
Degenerative Spine Surgery	Infusion Therapy	Interventional Vascular Diagnostics & Therapy
Diabetes	Stoma	Pain Therapy
General Open Surgery	Laparoscopy	Wound Management

Table 1: Therapeutic areas of B. Braun products[21] [24]

In 2017, the company employed 61.583 employees across 64 countries, where it has its subsidiaries. The 2017 sales amounted to 6789 million €, producing an EBITDA value of 985.1 million €.[23] Gross profit in percentage points amounted to 44 % and the share of SG&A (Selling, General and Administrative expenses) was 30%.[24] Company`s operations are organized into four divisions – Hospital Care, Aesculap, Out Patient market and B. Braun Avitum. Each of the divisions has products and solutions that target a specific healthcare therapy on the market, such as infusion therapy (Hospital Care division) or diabetes care (Out Patient Market division). This divisional structure also allows for independent tracking of business performance.[25].

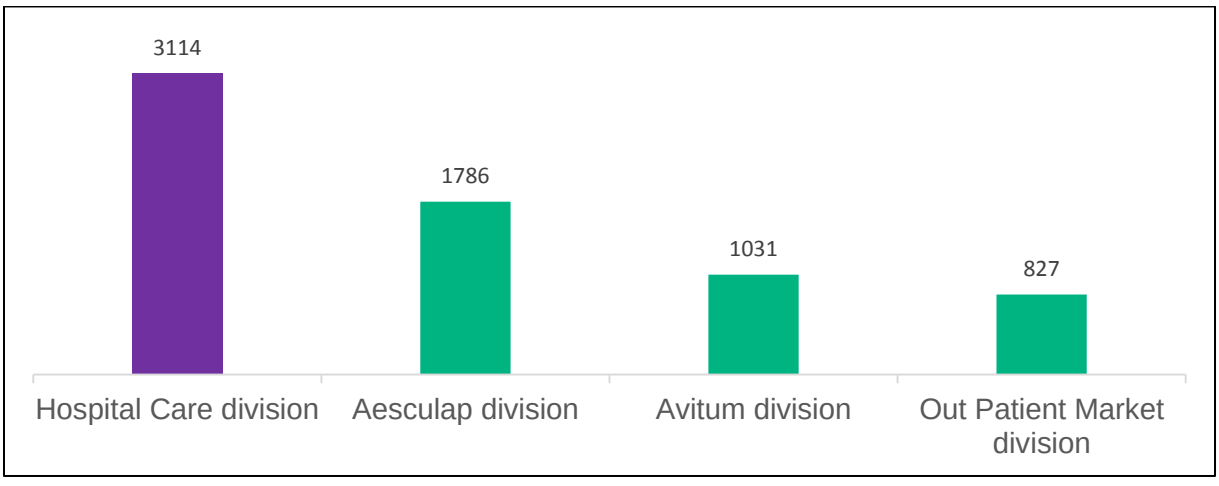

Figure 2: Division belonging 2017 sales (in thousand EUR)[23]

One of the main business strategies of B. Braun is global presence, which means offering

[23] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 55 f.
[24] Vgl. https://relaunch.bkc.bbraun.com (20.03.2019)
[25] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 43.

products in various markets on a global scale. This enables the company to be present in already developed markets with high purchasing power such as USA and West Europe, as well as being an already solidified supplier in the countries with high market cap potential such as China and the rest of Asia-Pacific region.[26] For more efficient management and clearer outlook on business performance, company segments the global market into six regions. These regions perform with high discrepancies, with the strongest ones being Germany, Europe (without Germany) and the North America. These markets alone represented 72% of total sales in 2017, despite not having the highest population numbers.[27]

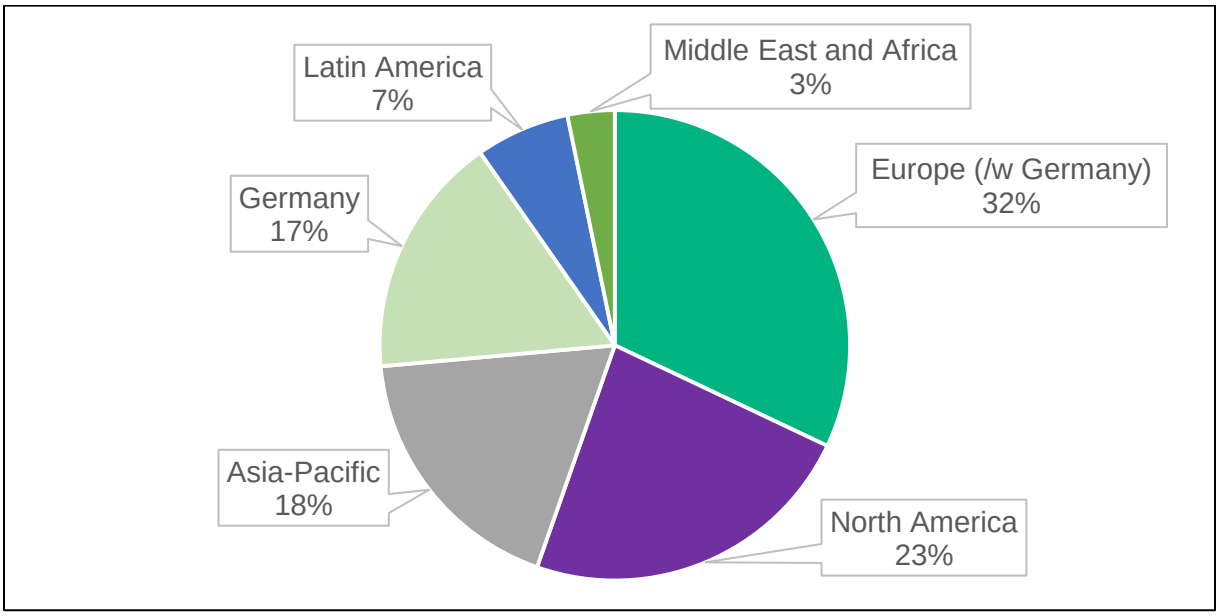

Figure 3: Region belonging sales in B. Braun for 2017[23]

Because of its size, B. Braun additionally provides centralized services for the corporate group. These services comprise of international human resources, IT, logistics, tax and legal department and corporate communications. Subsidiaries also have access to group based offices, such as purchasing, accounting, controlling and compliance office. Corporate bodies are the management board, the supervisory board and the annual shareholders meeting. Together they steer the group and its strategies and towards long term sustainability and profitability. Through its subsidiaries and holdings, B. Braun Group includes 269 fully consolidated companies and has manufacturing capacities in many countries around the world.[28] The basic view of B. Braun`s value chain can be seen on the following figure.

Figure 4: Value chain of BBMAG[29]

[26] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 52 f.
[27] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 55 f.
[28] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 45 f.
[29] Vgl. B. BRAUN MELSUNGEN AG. (2015), S. 14 f.

The core brand message behind B. Braun is based on the slogan “Sharing Expertise”. The detailed description on brand positioning can be seen in Appendix 1. To B. Braun, Sharing Expertise means continuous development of effective solutions through dialogs with customers and partners. The main vision of the company is to protect and improve health of people around the world. This is done by following the main mission of the company which focuses on development of effective solutions and guiding standards for the healthcare system. These effective solutions stand on innovative treatments, user-friendly products and product systems, safer procedures and cost-effective offerings.[30] [31]

2.2 Medical device industry specific market

During the scope of this market analysis, a medical device industry was defined as all companies developing and producing medical technology equipment, supplies and therapeutic devices. To precisely define what a medical device is and to differentiate the term from other similar terms such as “medicinal products”, the definition for the term “medical device” by Federal Institute for Drugs and Medical Devices of Germany was used: “Medical devices are products that have a medical purpose and are intended by the manufacturer for use in humans. In contrast to medicinal products that act pharmacologically, immunologically, or metabolically, the main intended purpose of medical devices is primarily achieved by physical means.”[32] Some sources during this research also referred to medical devices as medical technology or “MedTech”, however this should not be used interchangeably with the term “Health technology”, which has a much wider application. Health technology represents usage of knowledge and skills in the form of devices, medicines, vaccines and other systems that have a purpose to improve life conditions and solve health problems.[33] Market analysis will be presented based in the following fields: [1] key market statistics, [2] competition and [3] trends.

2.2.1 Key market statistics

Total global medical device sales amounted to 360 billion USD in 2017, with a compound annual growth rate (CAGR) value projection at 5,9% until 2022.[34] The focus in this thesis however was market analysis on medical device manufacturers with headquarters in Germany. Germany was chosen as it offers high relevancy as a market on a global scale, gives the analysis a larger weight and provides the ability to generalize conclusions. This chapter comprises statistical data that affects this medical device market and presents an overview of it. Key facts are shown in the following table:

Total sales of the German medical device manufacturers in 2016 (>20 employees)	28 billion €[35]
Export share of total sales in 2016	65%[35]

[30] Vgl. https://www.bbraun-brand.com (06.03.2019)
[31] Vgl. https://www.bbraun.com (06.03.2019)
[32] Vgl. https://www.bfarm.de (07.02.2019)
[33] Vgl. WORLD HEALTH ASSEMBLY. (2007), S. 106.
[34] Vgl. FITCHSOLUTIONS (2019b), S. 4 ff
[35] Vgl. BUNDESVERBAND MEDIZINTECHNOLOGIE E.V. (2018), S. 4.

Top 3 export destinations in 2017	EU28 (43%), US (17,3%), China (7,6%)[36]
Number of companies producing in the sector in 2017 (> 20 employees)	1250 companies[37]
Number of employees in the sector in 2017	210.000 people[37]
Percentage of large size companies in 2017 (250 employees and more)	7%[37]
Percentage of small to middle size companies in 2017 (less than 250 employees)	93%[37]
Expected worldwide sales growth in the sector	4 – 6%[37]
Domestic market sales growth (Germany)	2,8%[37]
Operating margins	20 – 30%[38]

Table 2: Key facts of the German medical device sector

The German market provides headquarters to some key global players in the medical device sector. B. Braun, Fresenius SE & Co and Siemens AG all have their headquarters located in Germany and are in the top 20 biggest medical device producers in the world.[36] [39] [40] [41] Germany also offers the highest prospects in medical device industry in Europe, with regards to risk versus reward ratio. Its high healthcare expenditure (11,1% of total GDP per year) and strong production capacities place it among world`s most important medical device markets.[36] [41] [42] Other advantages of German medical device sector are its location in the center of Europe, developed clinical research, strong domestic manufacturing and a highly receptive market to new technology.[43]

2.2.2 Competition

German medical device industry is competing against many different competitors in terms of size, degree of innovation or organizational structure.[44] [45] More than a third of total sales in the sector belong to 10 largest international enterprises, as seen on figure 5. The current global market leader by revenue size is Medtronic PLC with almost 29 billion USD annual sales, followed by Johnson & Johnson at 25 billion USD and GE Healthcare at 18 billion USD. B. Braun is on 15th place respectively (data for 2016).[40] It should be noted however, that the relevancy of rankings like these may not be significantly high when performing a specific

[36] Vgl. FITCHSOLUTIONS (2019a), S. 46 f.
[37] Vgl. BUNDESVERBAND MEDIZINTECHNOLOGIE E.V. (2018), S. 4.
[38] Vgl. MEDPAC (2017), S. 207 ff.
[39] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 3.
[40] Vgl. https://www.mpo-mag.com (12.03.2019)
[41] Vgl. FITCHSOLUTIONS (2019a), S. 58 f.
[42] Vgl. FITCHSOLUTIONS (2019a), S. 5 ff.
[43] Vgl. FITCHSOLUTIONS (2019a), S. 6.
[44] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 69 ff.
[45] Vgl. B. BRAUN MELSUNGEN AG, (2015), S. 12.

analysis and that it is highly dependent on the definition of the market. Important direct competitors of B. Braun can be seen in Appendix 4.

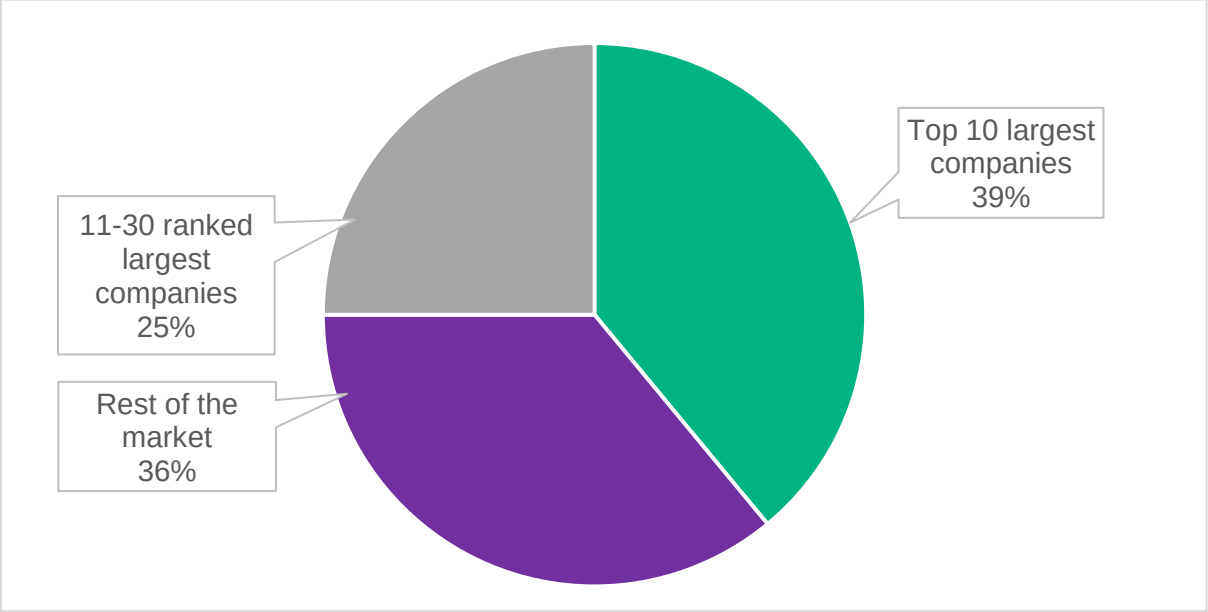

Figure 5: Percentage composition of companies by revenue size in 2017[46]

The industry as a whole is still dealing with a high degree of fragmentation but it is transitioning to a more consolidated structure in the future.[47] [48] Consolidation of the market will happen due to current trends in this sector which are merging and acquisition strategies, where companies work together or buy other companies in order to achieve competitive advantage. Mergers and acquisitions are most popular with smaller and mid-sized companies that have a lot of potential to boost product offerings by expanding the product portfolio with specialized, early-stage innovations. This helps large companies by closing gaps in their portfolios as well as moving towards full system offerings.[47] [48] [49] Enterprises competing in this market can be segmented into three types: [1] global, large-sized corporations, [2] R&D leaders and companies with high regional presence and [3] newcomers focusing on new technologies.[47]

Global, large sized corporations: these companies are manufacturing multiple products and product families. They are most likely to engage in acquisition strategies and increase their profits through them, however they are many times characterized by lower rates of return. Their revenue and profit growths will be mostly under 10%. Examples of such companies are GE Medical, Johnson & Johnson, Becton Dickinson, Siemens and Roche.[47] [50]

R&D leaders and companies with high regional presence: their product area is slightly smaller than the first group, but this enables them to respond faster to new demand or technologies. This group mostly faces issues with maintaining high returns and keeping their market shares

[46] Vgl. EVALUATE MEDTECH (2018), S.11.
[47] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 69 ff.
[48] Vgl. B. BRAUN MELSUNGEN AG, (2015), S. 12.
[49] Vgl. FITCHSOLUTIONS (2019b), S. 4 ff.
[50] Vgl. https://www.mpo-mag.com (12.03.2019)

high in multiple product segments. Examples of such companies are: B. Braun, Baxter, Smiths Group, Medtronic and Fresenius.[51] [52]

Industry newcomers: their competitive advantage lies in innovative products and new technological developments. They are mostly small firms that operate only in specific markets and are important especially in markets like Germany and France. Their strengths are high potential for expansion, specialized products and alternative market areas. Short product life cycles result in innovation being the key driver of their competitive advantage. Examples of such companies are: Drew Scientific, Disetronic and Biorobotics.[51] [53]

2.2.3 Market trends

In the next chapters the data on important trends that affect the medical device sector suppliers, such as B. Braun, was analyzed. The focus of literature review was to collect challenges and opportunities in the sector. It is important to note that there are sometimes two sides of the challenge or opportunity. For example, as described in chapter “Medical and technological innovations”, innovations in this sector present a challenge for the medical device manufacturers since they have to allocate large R&D budgets to stay in pace with the industry and compete with smaller, specialized SME companies. On the other hand, innovations can present a great opportunity for differentiating their offering at the customer sales meeting.

It is also important to differentiate between healthcare sector opportunities and medical device sector opportunities. For example, as shown in chapter “Rising healthcare expenditure”, the world population is rising, the middle class is getting more numerous and the shares of older people are increasing. The result of this is increased demand for healthcare services. Because of this increased demand, the healthcare expenditures are rising significantly, as shown in chapter “Pricing pressures”. This is a challenge for the HCPs (eg. hospitals) but it is a potential opportunity for medical device sector, because of increased demand.

2.2.3.1 Challenges

Medical device manufacturers in Germany face several challenges in their relevant market environment. Literature review has shown four major fields of barriers that these manufacturers must overcome. Summary of challenges follows:

1. *Regulations:* legislative shifts and new regulatory requirements are the primary business concern for medical device manufacturers.[54] [55] [56] [57]
2. *Pricing pressures:* hospitals that are dealing with budget containment will increase their pressure on prices of medical device suppliers.[54] [58] [59] [60]

[51] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 69 ff.
[52] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 3.
[53] Vgl. FITCHSOLUTIONS (2019a), S. 46 f.
[54] Vgl. FITCHSOLUTIONS (2019a), S. 58 f.
[55] Vgl. UPS (2011), S. 2.
[56] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 65 ff.
[57] Vgl. B. BRAUN MELSUNGEN AG. (2015), S. 14 f.
[58] Vgl. CAVLAN, O. et al. (2018), S. 2.
[59] Vgl. https://data.oecd.org (19.02.2019)
[60] Vgl. GRENNAN, M. (2013), S. 175 f.

3. *Medical and technological innovations:* constantly presenting new innovative products to the market that can satisfy customer`s needs will be one of the main differentiating factors for success in this industry.[61] [62] [63]
4. *Group Purchasing Organizations (GPOs):* an increasing number of hospitals join GPOs in order to take advantage of collective buying power and to negotiate lower prices.[61] [63] [64] [65]

2.2.3.1.1 Regulations

The European legislation assures safety and efficacy of medical devices, while ensuring access to those devices to the patients in the European market. There are multiple stakeholders that regulations take into account, such as producers, users and distributors of medical devices, together with health professionals and other clinical experts.[66] These regulations affect multiple stages in the medical device product life cycle, as seen on the following figure.

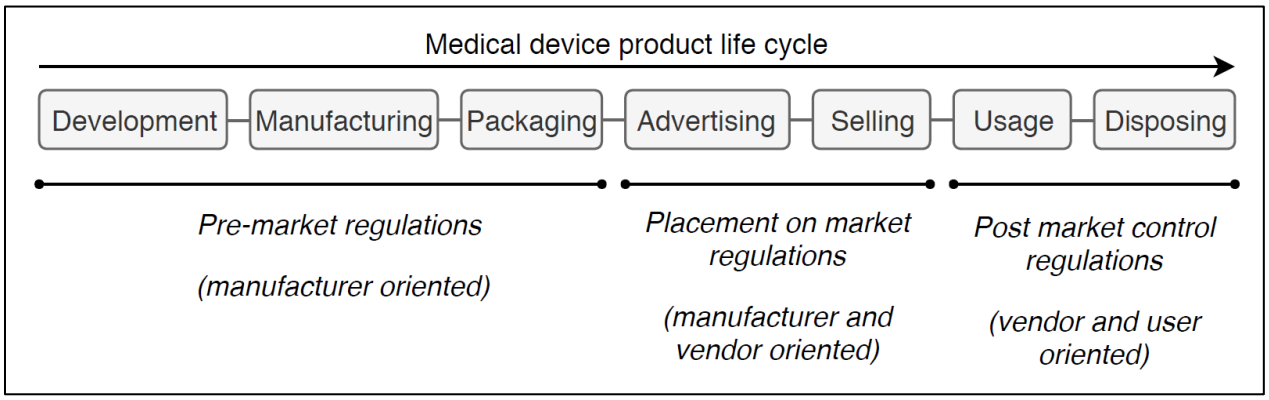

Figure 6: Regulations affecting medical devices through their life cycles[67]

German medical device industry is affected by German and EU directives, with one of the main governing bodies for regulations being The European Union Medical Device Regulation under the European Commission. More precisely, there are three EU council directives with their amendments, which all medical device manufacturers must comply with before placing their products on the EU market. After compliance has been confirmed, the manufacturers have to mark their approved products with a CE marking, which stands for European Conformity.[68] [69] This governing body cooperates with the industry to develop legislation that ensures safety and efficacy of medical devices, along with caring for access to these devices by the users in the European market.[66]

In order for the company to gain the CE mark for their product it means going through the regulatory pathway, which is oriented to placing a risk class on each medical device sold. There

[61] Vgl. FITCHSOLUTIONS (2019a), S. 58 f.
[62] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 65 ff.
[63] Vgl. B. BRAUN MELSUNGEN AG. (2015), S. 14 f.
[64] Vgl. YANG, Y. et al. (2017), S. 1.
[65] Vgl. RXCOMMERCIAL RESEARCH INTERNATIONAL INC. (2012), S. 160.
[66] Vgl. https://ec.europa.eu (07.02.2019)
[67] Vgl. WHO (2003), S. 10.
[68] Vgl. MARESOVA, P. et al. (2015), S. 1509.
[69] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 2.

are four different risk classes ranging from Class 1 to Class 3, with Class 1 having the simplest regulatory pathway for its approval as it is considered as having the least amount of risk. After receiving the CE mark approval, the manufacturer is able to sell his medical device in all other countries under EU regulations.[70]

An example of this legislation can be presented by two regulations: Regulation (EU) 2017/745 and Regulation (EU) 2017/746. Their main goals are to update EU legislation based on technical advances, changes in healthcare science and law.[71] Among other things, the regulations plan also to increase reinforcement of the rules on clinical evidence as well as strengthening of post-market surveillance requirements for manufacturers. The full legislative documents describe in depth how this will be performed and what it means for the manufacturers, but the effects of clinical evidence regulations will also be noticeable in the practical part of this thesis. European Commission´s regulations therefore have a direct impact on the industry, with some of their general goals being: [1] consistently high level of health and safety protection for EU citizens using medical devices, [2] free and fair trade of the products throughout the EU and [3] adaptation of EU legislation to the significant technological and scientific progress occurred in the sector.[72] Other examples of regulation programs are Evidence-based medicine (EBM), Comparative effectiveness research (CER) and Health assessment technology (HTA).[73]

These regulatory requirements and changes in already existing regulations are one of the dominant challenges in the medical device sector. Regulations affect businesses of all sizes meaning that the companies have to understand how to operate in highly regulated markets and present sophisticated clinical evidence to support regulatory approval.[74] [75] This challenge could be argued to be universal to this industry, according to a survey by Emergo Group. Over 4200 medical device industry professionals were asked about the biggest challenges they face, and the results showed that 68% of survey takers had concerns about changing regulatory environment. This was especially dominant with the large sized companies (more than 1000 employees).[76]

More literature sources present this issue as one of the top concerns, with one source warning about further uncertainty that the new European Medical Device Regulation in 2020 brings, likely forcing companies to have to adapt and innovate, which has potential value, but also presents increased costs.[77] Bundesverband Medizintechnologie e.V. Chairman has also expressed concerns that the companies in the sector are experiencing increasing regulatory requirements and that they fear longer duration of new innovations reaching the patients in need.[78]

[70] Vgl. SHOUKIER, D. (2011), S. 24-26.
[71] Vgl. https://ec.europa.eu (14.02.2019)
[72] Vgl. https://ec.europa.eu (09.02.2019)
[73] Vgl. LUCE, B. R. et al. (2010), S. 271.
[74] Vgl. B. BRAUN MELSUNGEN AG. (2015), S. 14 f.
[75] Vgl. SPENCE, P. et al. (2018), S. 10.
[76] Vgl. EMERGO GROUP (2018), S. 7.
[77] Vgl. HEUVEL, R. (2018), S. 3.
[78] Vgl. BUNDESVERBAND MEDIZINTECHNOLOGIE E.V. (2018), S. 4.

Focusing on Germany, one study examined weaknesses and opportunities in the licensing medical devices in the German market. It empathized importance on the depths of clinical evaluation analyses that are required for approvals. Especially with high-risk devices (Classification 3), the companies must strive to always follow regulations and standards. As stated by previous sources who focused on industries view, there are concerns about regulations prolonging innovation and limiting competitiveness. However, innovation and competitiveness should not be promoted at the cost of reducing patient safety. A solution might lie in subsidies and faster, more efficient licensing procedures for prototypes and small sized manufacturing orders.[79]

2.2.3.1.2 Medical and technological innovations

Medical device industry offers a large potential for technological advancements, as new technologies are faster in development than clinical innovation, meaning that the medical device companies will have to fully prepare for the future of rapid technological advancing.[77] Product innovation is predicted to be one of the main drivers for medical device suppliers to stay relevant and it therefore poses a challenge, as well as an opportunity for early adopters.[41] One of the factors for technological advancements is government spending for research and development, which should also be rising each year and should follow the demand. The quality of this research and development is dependent on cooperation between manufacturers and end users (healthcare workers). Also existing, is the impact of financial and time difficulties which are currently present in the research and development of medical innovations.[80] A report by FitchSolutions described innovation as key issue and driver for the German medical device industry. The report claims that innovation initiatives must be adopted in order to stimulate growth and strengthen the competitive edge of German medical device suppliers. One example of a supporting government action is a program called “High Tech Strategy 2025” which provides financial funds for development projects in advanced technologies and was approved by the German government in September 2018. Another challenge is keeping up with the industry 4.0 movement. The German officials have therefore launched a national artificial intelligence (AI) strategy in November 2018. This will boost public and private investment to generate enough funding that will secure Germany´s competitiveness for the future. These and other initiatives solidify Germany as a highly advanced production location.[81] Following table summarizes key facts about the current German medical device market from the perspective of technological innovations.

Revenue of innovations	Products that have been on the market under 3 years, represent a third of German medical device sector´s sales. [82]
Strength of SMEs	93% of German medical technology companies employ less than 250 people.[83]
Patents applications	There were more than 12,000 medical technology patent applications in the European patent Office (EPO) during 2016. This correlates to

[79] Vgl. REINHARDT, M.; WILDNER, M. (2016), S. 844.
[80] Vgl. MARESOVA, P. et al. (2015), S. 1509.
[81] Vgl. FITCHSOLUTIONS (2019a), S. 58 f.
[82] Vgl. https://www.exportinitiative-gesundheitswirtschaft.de (12.02.2019)
[83] Vgl. BUNDESVERBAND MEDIZINTECHNOLOGIE E.V. (2018), S. 4.

	7,7% of total patent applications, making this sector one of the most innovative sectors in Europe.[84]
Origin of patents - Germany	Germany holds the top position for patent applications in Europe, generating 11% of all patents in 2016.[84]
Technological clusters in Germany	There is significant collaboration for specialized R&D projects in more than 30 innovation clusters across Germany. Biggest ones being around Berlin, Düsseldorf and Tuttlingen. [85]
Innovation financing	SME and start-up companies within the German medical technology sector have access to many EU-based, Germany based and state-based funding. Biggest one is an EU Research and Innovation program "Horizon 2020" that has nearly 80 billion € of funding available over a 7-year period (2014-2020). [86]
Technological trends	Current most important technological trends: • wearable and wireless medical devices, • specialized medical software and computer-assisted surgery, • miniature electronics and nanotechnology, • diagnostic equipment for chronic diseases, • customizable medical devices for individual requirements, • easy-to-use homecare products and • big data technology.[87]

Table 3: Key facts about medical technology development.

In the German market for medical devices, innovations and technological advancements offer great prospect for starting companies to position themselves among the already established players. With specialized and niche products they can gain market share and attract financing from investors. Results of this are seen in the fact that medical device industry in Germany is still predominantly a small and medium-enterprise (SME) industry.[88] Developing technological innovations with an SME business also brings other advantages, such as eligibility for support under many different EU business-support programs leading to fewer requirements for EU administrative compliance or reduced compliance fees.[89] The market can be defined as being dominated by big players when it comes to selling relatively generic, one-time-use medical devices (such as a variety of products in B. Braun`s product portfolio). Established companies with large economies of scale perform better with products like infusion systems, basic surgical equipment or irrigation solutions. These are products which are viable for mass production and have a high buying frequency. There is however still possibility to enter the medical device market for smaller companies. With specialized, highly innovative and differentiating products

[84] Vgl. https://www.epo.org (03.04.2019)
[85] Vgl. GTAI (2017), S. 8 f.
[86] Vgl. https://ec.europa.eu (16.02.2019)
[87] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 4.
[88] Vgl. FITCHSOLUTIONS (2019a), S. 46 f.
[89] Vgl. https://ec.europa.eu (09.02.2019)

they can build on market niches, and therefore erode large manufacturer`s market shares.[90] [91]

Looking from a more holistic perspective, the challenges in this field affect both parties in the medical device market environment, the manufacturers and the HCOs. While manufacturers compete on bringing their innovations on the market first and transforming these innovations into a profitable product, the HCOs have to deal with the challenges of introducing new technology while still maintaining patient and worker safety. Patients expect safety in their procedures, while having the options to choose from new innovative devices. However, these technological advancements have to be screened for approval and reimbursement clearances. This means that each new technological advancement needs to present and comply with enough clinical evidence to support its claims for being safe to use on the market.[92]

2.2.3.1.3 Pricing pressures

Discussed technological advancements offer positive impacts on diagnosis and treatment of each patient, but on the other hand increase total expenditure on healthcare.[93] [94] [95] In combination with shifting demographics, the costs of healthcare are alarming, and the healthcare system is threatened by financial unsustainability in the long run. Hospital procurement must therefore adapt, and new activities of cost control have to be set. Hospitals face the most budget pressures as they account for almost half of total spending in most government healthcare systems.[96] The HCP market therefore experiences a trend of cost-cutting through government reforms and tightening budgets. As hospitals themselves are having issues with profitability and sometimes operating at a loss, this leads to their procurement departments looking for ways to reduce expenditure.[97] [98] [99] In fact, according to data from US and Germany, healthcare expenditure has never experienced an annual decrease so far in the 21st century.[100] These facts make the medical device market a lot more challenging.[101]Following figure presents healthcare expenditure per capita in US dollars from 2000-2017 for two example countries.

[90] Vgl. https://www.bbraunforsafety.com/en.html (05.02.2019)
[91] Vgl. ATUN, R.; SHAH, S.; BOSANQUET, N. (2002), S. 69 ff.
[92] Vgl. MÜHLBACHER, A.C.; JUHNKE, C.; MÖRK, V. (2016), S. 707.
[93] Vgl. OECD (2017), S. 170.
[94] Vgl. DI MATTEO, L. (2005), S. 40.
[95] Vgl. WERBLOW, A; FELDER, S; ZWEIFEL,P. (2007), S. 1125.
[96] Vgl. LICHTENBERGER, S; EVERETT, N; UNGERMAN, D. (2010), S. 19.
[97] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 3.
[98] Vgl. FITCHSOLUTIONS (2019a), S. 6.
[99] Vgl. GRAVES, K. (2011), S. 101.
[100] Vgl. https://data.oecd.org (19.02.2019)
[101] Vgl. CAVLAN, O. et al. (2018), S. 2.

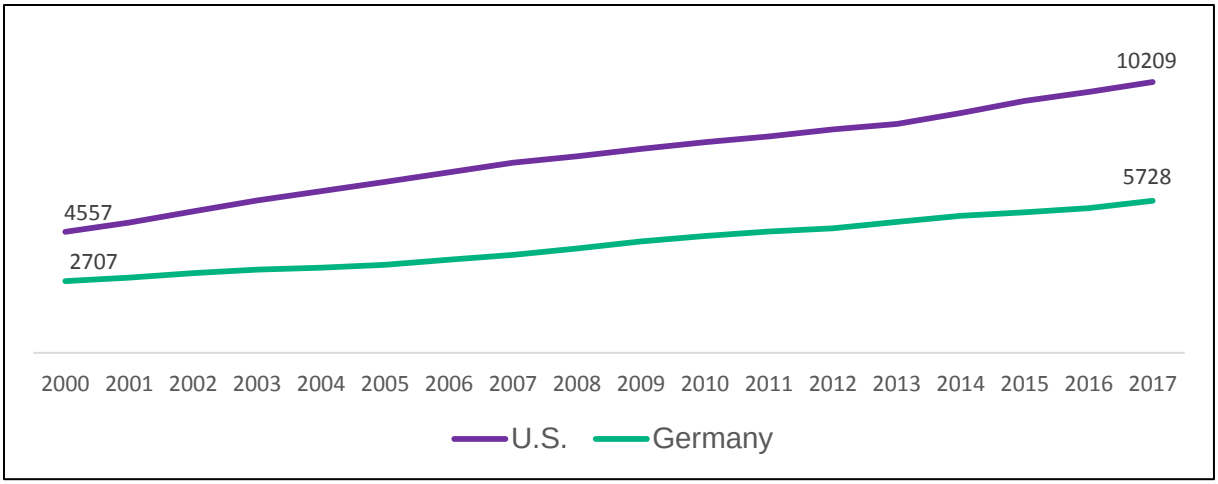

Figure 7: Healthcare expenditure per capita in US dollars (2000 to 2017)[102]

Because of this, the HCOs want to be able to significantly impact the price bargaining and final contracted price with the manufacturers. Hospitals also look towards eliminating pricing discriminations, limiting or completely preventing the manufacturers to sell at different prices to different customers. This is achieved through hospital mergers, Group Purchasing Organizations (GPO) and higher transparency.[103] [104] The next section of this chapter explains the system behind GPOs and their effects on the industry in detail. The opinions of HCO leaders on this topic were captured in one industry survey and provided the following results:

- 41% of leaders in healthcare organizations are putting “Cost reduction” among the top three areas of improvement for the financial state of their organizations.
- 91% of them also considered “Reduced reimbursements” as a threat, making a connection between the two results.
- 72% believe that healthcare industry will transition from volume-based buying to value-based buying.
- 81% of survey takers put “Expense reduction via process improvement” into their top three areas to focus when controlling costs.[105]

Reduction of costs is also in the interest of governments, as in most healthcare systems hospitals represent the largest part of healthcare spending, ranging from 40% to 50%.[106] However, a study on this topic suggests that the costs of medical devices specifically, have been growing at a relatively low rate (according to data from US market). In a period from 2000 to 2010, the prices for medical devices have increased by only 1,0% annually, falling also behind the Consumer Price Index (CPI), which averages at 2,7% annual growth. The overall expenditure for medical devices in the US in 2010 totaled at 156 billion €, representing 6,0% of total national health expenditure (2,6 trillion €). In conclusion, taking the US system as an example, the medical devices represent a relatively small and constant share of the combined

[102] Vgl. https://data.oecd.org (19.02.2019)
[103] Vgl. GRENNAN, M. (2013), S. 175 f.
[104] Vgl. KYLE, K. M.; RIDLEY, D. B. (2007), S. 15 f.
[105] Vgl. HEALTHLEADERS MEDIA (2014), S. 18 ff.
[106] Vgl. BOLDT-CHRISTMAS, O.; DIMSON, J.; KLOSS, C. (2010), S. 7.

national healthcare costs.[107] According to McKinsey & Co, prices for medical devices in Europe have even experienced a decline in the period from 2012 to 2016. On average, there was a 1.5% annual decrease in prices for all major medical device categories.[108]

It was therefore concluded that, while the market is experiencing cost pressures, it is not because the medical devices would get more expensive, but because the overall demand is growing (as discussed in later chapter “Rising healthcare expenditure”). Increased demand puts larger strains on hospital budgets, decreasing their profits, which then triggers hospital procurement teams to initiate cost saving methods, resulting in pressure on medical device suppliers.

2.2.3.1.4 Group Purchasing Organizations

Group purchasing organizations (GPOs) are businesses that take advantage of collective buying power to lobby for significant discounts from vendors (suppliers, distributers or manufacturers).[109] On average, 72% of US hospital purchases are made with the assistance of GPOs and their services.[110]

As HCOs are looking towards decreasing their costs, joining a GPO can offer many advantages. The main driver being lower total costs of purchasing, where total costs of purchasing represent the actual product costs (price per product multiplied by quantity purchased) plus the fixed costs of a contracting fee payable to the GPO.[111] Buyers are therefore collaborating and competing at the same time. They collaborate in the purchasing process and then compete on the consumer market (market for healthcare services).[112] GPOs themselves generate revenue through contracting fees, which are charged because of administrative costs needed to support the GPO`s operations. These fees are charged by the GPO and can be charged to both, either the vendors or to the interested buyers (GPO members). GPOs have access to market intelligence and product expertise, which would otherwise be unaffordable for a single HCO.[111] Ultimately, GPOs are based on the collective purchasing power, as they represent many willing buyers, and therefore have a higher purchasing power, which leads to a better negotiating position in order to achieve better deals and volume discounts. They can also provide security in form of mitigating demand and price risks. The main point is that GPOs are achieving larger economies of scale effect. GPO will additionally also offer the following services: [1] supplier discovery, [2] supply chain solutions, [3] sourcing and contracting, [4] data management and [5] price benchmarking.[113] [114]

GPOs have a positive impact on total healthcare expenditure. The healthcare system in US generated savings of 29,3 billion € to 64,5 billion € in 2008 and had in that year a projection of savings in the range of 381 to 838 billion € for the next ten years. It is estimated that GPO activity is responsible for a reduction of 10 to 18 percent in supply-related purchasing costs for

[107] Vgl. DONAHOE, G.; KING, G. (2012), S. 5.
[108] Vgl. FITCHSOLUTIONS (2019a), S. 6.
[109] Vgl. YANG, Y. et al. (2017), S. 1.
[110] Vgl. RXCOMMERCIAL RESEARCH INTERNATIONAL INC. (2012), S. 160.
[111] Vgl. HU, Q.; SCHWARZ, L. B.; UHAN, N. A. (2012), S. 7 f.
[112] Vgl. KESKINOCAK, P.; SAVASANERIL, S. (2008), S. 517.
[113] Vgl. KARABAG, O.; TAN, B. (2017), S. 32.
[114] Vgl. SORENSON, C.; KANAVOS, P. (2011), S. 47.

the hospitals and nursing homes, compared to those who do not use GPO services.[115] However, one study also warns about the disadvantages of GPOs, such as [1] additional step in the supply chain, [2] costs and efforts of maintaining a cohesion within the group members, [3] leaks of strategic information and [4] potential for supplier oligopolies. Each HCO should therefore base their decision on joining a GPO on strategical basis, looking at purchasing as a strategic and not as an operational function.[116]

While the US GPOs might be the largest by volume, the German market GPOs are also connecting the HCOs across Germany. One such example is Prospitalia GmbH, Germany´s leading healthcare purchasing service provider, which also has relations with B. Braun. According to company's website they want to attract suppliers to become contract suppliers, by providing them access to their database of decision makers from different HCOs. This would support the manufacturers in contracting and offer them opportunities to present their solutions through newsletters and congresses.[117] Sales and pricing strategies of medical device manufacturers are therefore affected by this trend of collective purchasing system. One source summarized the impact of GPOs in this market: "It should be noted that the success GPOs have had in penetrating the healthcare marketplace has resulted in the GPO price structures becoming the de facto market price. Even for items not purchased through a GPO, the power of lower prices negotiated by GPOs is present."[118]

2.2.3.2 Opportunities

Analysis in previous sections indicates rising healthcare expenditures for many countries around the world. There are multiple factors that are causing this trend and they can be sectioned into two categories: demographic and non-demographic. Demographic factors are primarily dependent on the age structure and non-demographic on income levels. These are the strongest drivers of this trend, however factors like technological advances and proximity to death have also been proven to contribute.[119] [120] [121]. And while this trend presents a challenge for government healthcare expenditures, it also presents an opportunity for medical device manufacturers. Positively stimulated demand for healthcare services around the world can potentially lead to growth in the medical device sector.[122] [123] [124] This chapter contains analyzed opportunities (rising healthcare expenditure and emerging markets) and outlooks for the future of this sector.

2.2.3.2.1 Rising healthcare expenditure

Previous research agrees on shifting demographics being a large factor on healthcare costs.[120] This fact is relevant for the medical device manufacturers, as older populations tend to

[115] Vgl. GOLDENBERG, D. E.; KING, R. G. (2009), S. 17 - 18.
[116] Vgl. NOLLET, J.; BEAULIEU, M. (2005), S. 16.
[117] Vgl. https://www.prospitalia.de (23.02.2019)
[118] DOBSON, A. et al. (2014), S. 24.
[119] Vgl. DE LA MAISONNEUVE, C.; MARTINS, J. O. (2013), S. 7 f.
[120] Vgl. MARTIN, J. J. M. et al. (2011), S. 19.
[121] Vgl. SORENSON, C.; DRUMMOND, M.; KHAN, B. B. (2013), S. 223.
[122] Vgl. FITCHSOLUTIONS (2019a), S. 6.
[123] Vgl. https://www.lucintel.com (27.02.2019)
[124] Vgl. EVALUATE MEDTECH (2018), S. 4

consume more health resources and therefore increase the demand.[125] [126] The following variables in demographic changes should be emphasized: [1] rising populations and [2] shifting age structure. These variables also vary around the world by their effects, for example rising population numbers are more dominant factors in emerging regions like Asia. But in traditional markets such as the US and Europe, aging will positively influence the demand for medical technology. In the end, both emerging and traditional markets continue to offer good export opportunities for the German medical device sector.[127]

Rising populations

The trend of rising population numbers is clear. According to The World Bank Group data, since 1960 to 2017, the total world population has increased by almost 60%, with no single year experiencing an annual drop.[128] This growth is not expected to slow down, as United Nations are predicting that the world population will continue to grow to 11 billion by 2100.[129] For the context of this thesis it was relevant how this population changes affect medical device manufacturers. Higher number of people should generally increase demand of healthcare goods and services, which stimulates medical device sales, however further research showed details of these statistics and pointed out to some important facts. Most of this population growth is attributed to a smaller number of countries. These countries (eg. India, Democratic Republic of Congo, Pakistan) have lower development and wealth levels and spend far less on healthcare as the developed countries.[129] Example being India, which spent 238 US dollars per capita on healthcare in 2015, compared to Germany, which spent 5297 US dollars per capita in the same year.[102] Despite rising populations predominantly in other regions, most of the spending on healthcare will continue to occur in traditional markets, such as EU and North America despite these two region`s smaller and stagnant population numbers.[130] [131] This is relevant for German medical device manufacturers since these markets, such as for example the US market, represented about 18% of all German medical technology exports in 2015.[132] [133] B. Braun also generated 72% of its revenue in traditional markets (data for 2017).[134]

Shifting age structure

Rising life expectancy and lower birth rates are primary reasons for increasingly larger portion of older population in developed countries around the world.[135] [136] This expanding share of older people presents a potential opportunity for the medical device sector to increase revenues caused by an increase in demand.[137] Report by WHO projects that the number of people over 65 years of age will increase to about one and a half billion in 2050, while being at 524 million in 2010. Most of the increase is projected to happen in developing countries. In

[125] Vgl. DI MATTEO, L. (2005), S. 40.
[126] Vgl. https://www.mddionline.com (28.02.2019)
[127] Vgl. BRÄUNINGER, M.; VÖPEL, H.; STÖVER, J. (2010), S. 5.
[128] Vgl. https://data.worldbank.org (28.02.2019)
[129] Vgl. https://www.un.org (28.02.2019)
[130] Vgl. PÖTZSCH, O.; RÖSSGER, F. (2015), S. 6.
[131] Vgl. https://data.oecd.org (02.03.2019)
[132] Vgl. FITCHSOLUTIONS (2019a), S. 46 f.
[133] Vgl. GTAI (2017), S. 8 f.
[134] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 55 f.
[135] Vgl. FEDERAL STATISTICAL OFFICE, WIESBADEN. (2016), S. 6 ff.
[136] Vgl. WHO. (2011), S. 2 ff.
[137] Vgl. INTERNATIONAL TRADE ADMINISTRATION. (2016b), S. 6.

percentage of world`s population this means a rise from people over 65 representing 8% of the total population to 16%, increasing the burden on the healthcare system and driving up the associated costs. Same report also emphasizes new disease patterns which will affect the healthcare system as a result of this aging trend. The rise of chronic non-communicable diseases will be present in every world region over next 10 to 15 years, with developed countries suffering the most. Examples of these diseases are heart disease, cancer and diabetes.[138] Countries like US and Germany, which are also among the biggest spenders on healthcare services (and the largest markets of B. Braun) will be most affected by these changes. Their shares of older people is projected to only increase in the future.[139] [140]. To conclude, this trend can positively influence the demand for medical devices, since older population requires more treatments, medical goods and hospital services.[139] [141]

2.2.3.2.2 Emerging markets

Traditional markets, such as US, Europe and Japan still account for majority of medical device sales, representing 75% of the market. However, this picture is projected to change significantly, with emerging markets offering much higher growth rates.[142] The rise of living standards and the expansion of middle class is connected to growth in demand for healthcare services and therefore has a positive impact on demand for medical devices.[143] [144] [145] In 2016, over 3 billion people were considered to have a middle class income, with 140 million joining this income group every year. The largest contributor to this trend was the population in Asia, while European and North American middle class could be considered as stagnating.[146] Asia represented less than 25% of global middle-class population in 2010. A projection by 2020 is that population structure could change significantly, with every second middle class person being from Asia.[146] This leads to increased healthcare spending, as seen on example from China, where the potential growth rate of healthcare related costs is projected to be averaging at 11% annually until 2026.[147] As a result, Asia-Pacific market for medical technology could even outgrow the EU market by 2020, placing it on the second position, right after the US market.[148] Following figure summarizes the discussed trend by showing shares of global medical device market in emerging compared to traditional markets.

[138] Vgl. WHO. (2011), S. 2 ff.
[139] Vgl. FEDERAL STATISTICAL OFFICE, WIESBADEN. (2016), S. 6 ff.
[140] Vgl. GTAI (2017), S. 8 f.
[141] Vgl. https://www.mddionline.com (28.02.2019)
[142] Vgl. DONOGHOE, N. et al. (2012), S. 5.
[143] Vgl. DONOGHOE, N. et al. (2012), S. 6.
[144] Vgl. https://www.mddionline.com (03.04.2019)
[145] Vgl. https://www.bcg.com (03.04.2019)
[146] Vgl. KHARAS, H. (2017), S. 2.
[147] Vgl. FARELL, D.; GERSCH, U. A.; STEPHENSON, E. (2006), S. 1.
[148] Vgl. AGARWAL, A.; LE DEU, F.; THEN, F. (2016), S. 1.

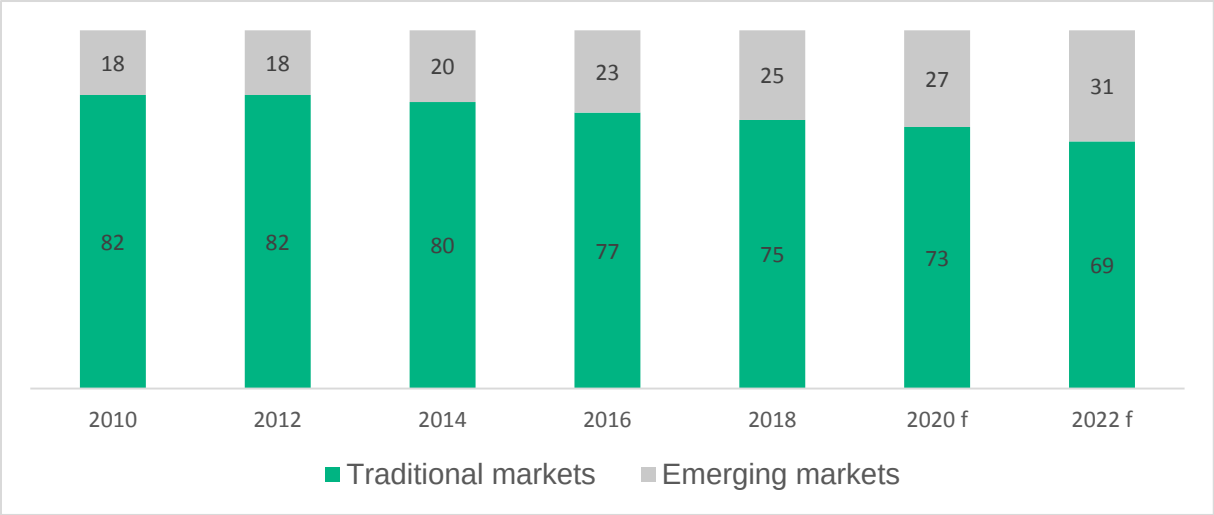

Figure 8: Share of global medical device market[149]

One study offered recommendations on how to catch this opportunity in emerging markets, such as [1] investing in local talent and service infrastructure, [2] being involved in development of treatment protocols, [3] being first to build loyalty with local healthcare staff and [4] using mergers and acquisitions to enhance reach over the market.[150] Another study also showed the importance of frugal innovations for these markets, offering easy-to-use products that don`t require expert training, low cost alternatives and cost reduction for the customer and the manufacturer himself.[151]

2.2.3.2.3 Future outlook

This section presents the future view on the medical device sector. Different outlooks, forecasts and opinions were collected in order to make conclusions on general expectations from the industry. Sources used were reports from consultant firms researching and tracking this industry (provided by B. Braun). The following data supports the conclusion that in general, the medical device industry is going to experience a positive market growth.

1. A report by FitchSolutions stated that total sales in the medical device market will increase every year at least until 2022. The compound annual growth rate (CAGR) value for the period of 2017 to 2022 is predicted to grow by 5,4%. The drivers for this growth will be ageing population, growth of private health services, EU and local funding and strategies that support technological advancements.[152]

2. Evaluate MedTech projected that the industry will grow at 5,6% CAGR between the period of 2017 and 2024.[153]

3. Emergo Group survey results showed that in terms of most promising regions, Asia is still a favorite. 52% of survey takers agreed that Asia represents the highest growth potential.

[149] Vgl. https://www.bcg.com (03.04.2019)
[150] Vgl. DONOGHOE, N. et al. (2012), S. 7 ff.
[151] Vgl. VERMA, S. (2018), S. 5 ff.
[152] Vgl. FITCHSOLUTIONS (2019a), S. 58 f.
[153] Vgl. EVALUATE MEDTECH (2018), S. 4.

North American and European market are experienced as stable, but they have a lower potential for growth (23 and 17% respectively).[154]

4. A report by Lucintel stated that the global medical device market will grow at a CAGR value of 4,5% in the period from 2018 to 2023. With this expansion, the market would reach an estimated total volume of 409,5 billion $ in 2023. They see major drivers for growth in healthcare expenditure, technological innovation, aging population and the rise of chronic diseases.[122]

5. BBC Research emphasized a healthy growth driven by developing economies, higher healthcare spending and higher life expectancy. They estimated that the market for medical devices technologies will grow at a CAGR value of 5,3%.[155]

6. Moody`s Investors Service forecasted that in the next 1 to 2 years, the industry EBITDA will increase in the range from 4 to 5%, despite continuing pricing pressures in the industry. They see product innovation as potentially the main growth driver for many companies.[156]

7. McKinsey&Co also presented a positive outlook on the future of the medical device industry. They projected that sales will increase by between 4 to 5 percent annually over the next few years and emphasized the importance of innovations.[157]

Summary of the general outlook by B. Braun follows:

- Healthcare expenditure will continue to steadily grow in developed markets.
- Emerging markets will experience a significant increase in healthcare expenditure.
- There will be a growth in demand for products and services connected to a number of age-related diseases (eg. chronic diseases).
- The main region for sales growth will be Asia-Pacific, while the established markets in Europe will hold a constant demand.
- Companies that manage to offer products which improve process efficiency for the HCPs will have competitive advantage.
- Development of purchasing systems and increased price transparency could lead to erosion of profit margins for the medical device suppliers.[158]

2.3 Hospital procurement process

In this chapter tasks and approaches of the hospital procurement system were examined, with a focus on potential effects on medical device suppliers. The emphasis was on advanced procurement systems, such as the value-based procurement, and also on different influencers on the final purchasing decisions. Ultimately, the goal was to show that this procurement is not just buying products, but a complex decision making system that strives to fulfill buyer`s

[154] Vgl. EMERGO GROUP (2018), S. 7.
[155] Vgl. https://www.bccresearch.com (02.03.2019)
[156] Vgl. https://www.moodys.com (02.03.2019)
[157] Vgl. COPP, J. et al. (2017), S. 1.
[158] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 75 ff.

operational and business needs, along with managing potential risks.[159] This analysis is relevant because it offers a view into the customer`s decision making and supplier selection process, potentially aiding the development of sales strategies, argumentation and tools. The conclusions are in later chapters connected to the topic of value-based selling.

Hospital as a business

Hospital procurement is oriented towards overall business efficiency. This means that the hospital procurement team is not only focused on providing the organization with tools needed to offer services, but also on profit maximization and revenue protection. This affects the medical device suppliers and forces them to adapt their marketing and sales strategies.[160] Hospitals are calculating the profit based on the difference between collected revenues (reimbursements through public and private insurance) and operating costs, such as personnel costs, medical supplies, outsourced services and administration expenses.[161]

Hospital costs are primarily not occurred by medical devices. As seen on one example from a German hospital, the majority of costs are personnel costs, which represent 61% of all expenses. Material costs represent 37% of costs and materials for medical needs represent only 18% of total costs (containing medical devices).[162] Another source confirms this on an example from the US system. According to Minnesota Hospital Association, hospitals in Minnesota had 51,4% of their total costs occurred through personnel costs and only 15,9% through medical supplies.[161] Another study showed that hospital costs focus on three key areas: staff costs, consumables, capital equipment and clinical support services. Medical devices are part of the consumables category, where sub-categories include products like drugs, disposable equipment, nutritional products and blood products.[163]

Hospital procurement teams

The next question was how collected facts about price cuts and tightening budgets affect medical device suppliers when they interact with HCO`s procurement. Even though it was concluded that medical devices don't represent the largest portion of hospital expenses, the procurement still faces pressures to contain these costs. In addition, the purchasing officers can many times underestimate the input of healthcare worker`s views when selecting supplier offers.[164] [165] The decisions of these purchasers are driven by incentives and stimulations from hospital management to maximize cost reduction. Because of this, they might sometimes not pick the best value-for-price offer, leading to potentially negative effects on their organizations. This occurs more often when the following is true:

- Purchasing officer receives instructions from management to choose only offerings with the lowest price.
- Purchasing officer gains personal financial incentives when cutting costs, therefore he might avoid other offers because of short term personal gain.

[159] Vgl. OMBAKA, E. (2009), S. 20.
[160] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 75 ff.
[161] Vgl. https://www.mnhospitals.org (03.03.2019)
[162] Vgl. https://www.destatis.de (03.03.2019)
[163] Vgl. NEGRINI, D. et al. (2004), S. 202.
[164] Vgl. LINGG, M.; WYSS, K.; DURAN-ARENAS, L. (2016), S. 2 ff.
[165] Vgl. BAIN & COMPANY. (2018), S. 8 f.

- A lock-in effect occurs because of a long-term relationship between purchasing officer and a specific supplier. The purchasing officer is reluctant to switch the supplier because of previous investments and potential switching costs.
- There is a lack of alignment between individual goals and organizational goals.[166]

Factors in purchasing decisions

The severity of price sensitivity and factors in purchasing decisions differentiate in different markets. Clinical evidence for example was a lot more dominant factor in developed countries. One study shows, that procurement officers in Mexican hospitals were viewing price as the ultimate criteria, while in the countries like UK, Switzerland and Germany, clinical evidence played a bigger role.[164] Additional factors, such as reliability of the products, delivery dates, production capacity, maintenance needs and innovative features are also taken into account.[167] Another study summarized the variables that are considered in planning of hospital procurement strategy based on literature review on the topic. When considering citation frequency of different factors, device costs were considered as the primary factor for procurement strategies. This was followed by specialist expertise, health needs assessment, regulations and clinical guidelines, with all these factors being relatively equally important.[168]

2.3.1 Value-based procurement

Value-based procurement (VBP) comes from the idea of price to quality ratio. It means purchasing the most optimal product at a given price, with which the HCP can maximize patient outcome and optimize product usage in terms of handling and safety. This procurement mentality is also enforced by the European Parliament.[169] And while VBP still has a lot of room to be fully and efficiently integrated, it is important for medical device suppliers to understand and adapt to it. This is supported by an analysis on the example of healthcare sector in UK. Research discovered that NHS procurement is still primarily focused on product price with current processes not focusing enough attention on costs along the entire patient pathway. There is high pressure to deliver annual cost cutting targets, which moves the focus away from long term goals. Supplier relationship management is also lacking and both NHS suppliers and NHS procurement teams, have to contribute to solving this issue.[170]

VBP is connected to a larger effort in many healthcare systems around the world to increase the idea behind value-based healthcare. Since procurement has large impacts on the economical and clinical health of a hospital, it is one of the logical steps when enforcing value-based healthcare.[171] According to Porter, value in healthcare is defined as patient outcomes on each dollar spent. He believes that value is measured over the complete length of care for the patient and the final result should consist of [1] total outcome of patient beneficial results on his health and [2] total costs of patient care over the entire process. The view should therefore transition from cost centered to a more holistic view of providing value in the entire

[166] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 5 ff.
[167] Vgl. SORENSON, C.; KANAVOS, P. (2011), S. 46.
[168] Vgl. DIACONU, K. et al. (2017), S. 8.
[169] Vgl. http://www.europarl.europa.eu (05.03.2019)
[170] Vgl. MANGAN, B.; LUDBROOK, M. (2018), S. 3 ff.
[171] Vgl. PRADA, G. (2016), S. 163 f.

healthcare process.[172]

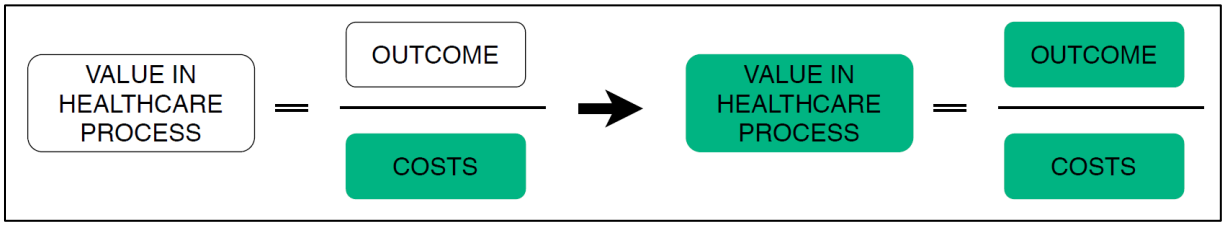

Figure 9: Value in healthcare[173]

To conclude, VBP is an approach that moves away from purchasing based on the lowest price only. A hospital procurement team that has incorporated VBP, will base buying decisions on a more holistic view. It means considering how a product can maximize patient outcomes, influence long term cost efficiencies and reduce the total cost of care. Another key factor is also higher connectivity between supplier and buyer, with which both parties can identify opportunities to improve their products and services.[174] [175] It also means redefining the role of hospital procurement officer, as they have the potential to impact patient outcomes, increase business performance and maximize efficiency in hospital operations.[176]

Recommendations for VBP

Recommendations from the European Union in the form of EU directive on public procurement (2014/24) were found to support VBP as the best hospital procurement system. Two considerations in the supplier selection are emphasized:

a) Total cost of ownership (TCO). This offers public procurement officers a change to not only take initial purchasing cost into consideration, but to also consider total expenses during the device usage time.
b) Price-quality ratio. This incentivizes procurement officers to purchase products that bring value to all stakeholders in a patient pathway.[101]

More recommendations were collected during the literature review. It was found that HCOs should consider the following when implementing VBP:

a) Evaluation of total costs of care based on entire patient pathway. Initially expensive products should not be immediately disqualified and should be evaluated based on their total cost of ownership.[174] [177]
b) Introduction of procurement goals that are based on improving operational efficiency.[174]
a) Focusing on achieving best patient outcomes at lowest available cost.[174]
b) Pre-tendering activities that enable all internal stakeholders and suppliers to be involved in development of specifications that lead to better patient outcomes.[178]
c) Engaging management, nursing and financial staff in decision making.[174]
c) Encouragement of supplier variety to support competition. This avoids too much

[172] Vgl. https://www.isc.hbs.edu (05.03.2019)
[173] Vgl. PRADA, G. (2016), S. 163 f.
[174] Vgl. MANGAN, B.; LUDBROOK, M. (2018), S. 3 ff.
[175] Vgl. https://www.medtronic.com (05.03.2019)
[176] Vgl. http://www.europarl.europa.eu (05.03.2019)
[177] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 3.
[178] Vgl. https://www.medtecheurope.org (07.03.2019)

supplier power from one manufacturer, enables alternative supply sources and does not exclude SME companies with smaller economies of scale, who might offer a better total value.[179] [180]

d) Transparency and fairness (the steps in choosing a supplier should be clear and transparent with defined requirements).[179]
e) Professionalization of procurement through training, reduction of red tape and increased transparency.[180]

Existing VBP practices

In addition to these recommendations, the European Commission is promoting a procurement system initiative called MEAT, which encourages procurement departments to shift their award criteria towards most economically advantageous tender system (MEAT is an acronym for Most Economically Advantageous Tender). The goal of the MEAT criterion is to solidify that the public organization gets best value for money, instead of only the lowest price. It encourages to incorporate quality and costs through whole product life cycle into the decision-making process.[181] [182] [183]

For medical device suppliers it is also relevant to know which countries are currently leading in VBP implementation and which countries are going to increase its effects in the upcoming years. Organizations from Sweden and United Kingdom are the trend leaders, using a variety of innovative procurement strategies that focus on evaluation of innovative tenders, patient outcomes and economical efficiencies. Organizations from Germany, France, Netherlands and Spain are considered as fast followers and are expected to make significant advancements in the next three to five years. An example of a slow adopter are organizations in Italy, which are currently using a lower number of innovative procurement strategies.[184] One already active example of a healthcare system that highly integrates VBP can be found in NHS (National Health Service in United Kingdom). In 2009 they implemented recommendations on how the NHS should execute the process of technological appraisals, including medical devices. This is done through a program called „NICE technology appraisal guidance“, which focuses on recommendations based on clinical and economic evidence. The goals are to prove how efficient a medical device, drug or treatment is and then to evaluate how efficiently it works in comparison with how much the NHS had to pay for it.[185] [186]

To keep pace with this changing procurement landscape, the medical device suppliers must adapt. One study proposed recommendation for the manufacturers:

a) Manufacturers should follow the demand of the market and should be proactive instead of reactive in their research and development efforts.
b) Manufacturers should enter the tendering process early and should adapt swiftly.
c) Value propositions must be encouraged, and the sales strategy must move away from

[179] Vgl. INTERNATIONAL TRADE ADMINISTRATION (2016a), S. 3.
[180] Vgl. https://www.medtecheurope.org (07.03.2019)
[181] Vgl. http://www.europarl.europa.eu (05.03.2019)
[182] Vgl. PRADA, G. (2016), S. 163 f.
[183] Vgl. EUROPEAN COMMISION. (2018), S. 70 ff.
[184] Vgl. CAVLAN, O. et al. (2018), S. 2.
[185] Vgl. https://www.nice.org.uk (08.03.2019)
[186] Vgl. CAMPBELL, B.; CAMPBELL, M. (2012), S. 295 f.

selling only based on device features. This requires deeper insights on customer needs, active participation and cooperation between the medical device supplier and the employees or stakeholders in the hospital.[187]

It was concluded that good procurement is not just selecting the cheapest product, but it means to choose an offer with best value across its entire life cycle. In context of medical devices this will be the product that results in improved clinical outcomes and offers better overall quality.[188]

2.3.2 Buying centers

Buying centers are a part of the buying behavior of an organization that is in the process of making or deciding on a purchase. This buying behavior can be classified as a step by step process of making a purchase decision, starting at the basic recognition of a problem.[189] The following figure shows the steps in the buying process.

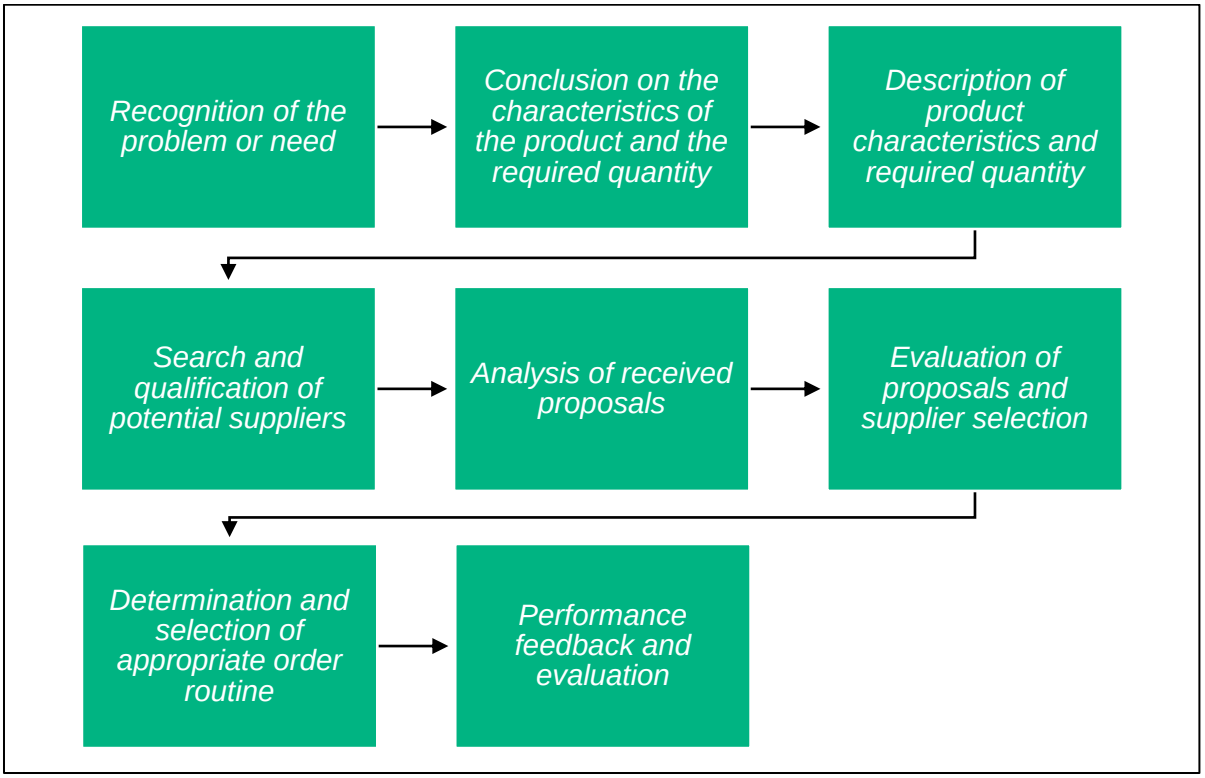

Figure 10: Buying process steps[189]

Buying centers ultimately represent the involvement of multiple stakeholders in the buying-decision process (BDP). These stakeholders usually come from various functional areas and therefore have different views and needs. The main differentiation can be made between economical and operational buying centers with regards to their purchasing expectations. Each stakeholder has their own priorities on products purchased, but many stakeholders also share

[187] Vgl. CAVLAN, O. et al. (2018), S. 2.
[188] Vgl. HEALTH PURCHASING VICTORIA. (2015), S. 2.
[189] Vgl. INGRAM, T. N. et al. (2006), S. 62.

their priorities.[190] [191] [192] [196] The position of the buying center in the bigger picture of organizational buying behavior can be seen on the following figure.

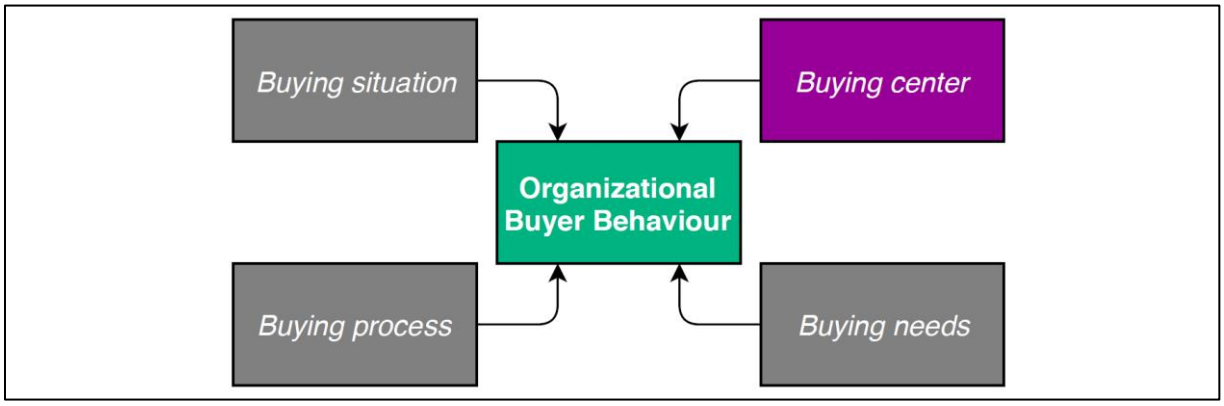

Figure 11: Position of the buying center[193]

Size of the buying center is correlated to complexity and importance of the purchasing decision and it affects the allocation of resources. Higher importance decisions will require a larger amount of people to cooperate, higher number of managers will be included and the scope of roles will be larger. [194] [196] One study suggested that the average size of the buying center is five and a half members.[195] The following table shows differentiating roles in the BDP.

Role	Properties
Initiator	First observes that an organizational need could be satisfied by acquisition of a product or service and starts the actual procurement process.
Gatekeeper	Controls the flow of information among different members of the procurement process.
Influencer	Provides input into the purchasing decision, usually with sharing his expertise in the matter. In general, larger purchases have also a higher amount of influencers. These influencers can be on any level of the hierarchy.
Decider	Provides the final decision on the relevant purchase.
Purchaser	Implements the decision and executes the purchasing order. This is mostly the corporate purchasing department.
User	Consumes the purchased product or service.

Table 4: Roles and their properties within buying centers[190] [195] [196] [197]

[190] Vgl. INGRAM, T. N. et al. (2006), S. 60 ff.
[191] Vgl. BURNETT, J. (2010), S. 108.
[192] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 189.
[193] Vgl. INGRAM, T. N. et al. (2006), S. 60.
[194] Vgl. LEWIN, J. E.; DONTHU, N. (2005), S. 1383.
[195] Vgl. LACZNIAK, G. R. (1979), S. 61.
[196] Vgl. BONOMA, T. V. (2006), S. 1.
[197] Vgl. HEALTH PURCHASING VICTORIA. (2015), S. 2.

These buying centers classification also correlates to a difference in the degree of involvement at different stages of BDP. One study performed in the medical device sector concluded that final users have a high degree of involvement in the majority of BDP steps, while buyers only moderately influenced the final supplier selection process.[199] The results of the study are presented in the following table.

Buying center	Needs identification	Objectives establishment	Alternatives evaluation	Supplier selection
User	High	High	High	Moderate
Influencer	Moderate	High	High	Low
Decider	High	High	High	High
Buyer	Low	Low	Low	Moderate

Table 5: Degree of involvement of buying centers in different BDP steps[199]

2.3.3 Hospital stakeholders

This chapter follows up on the topic of different buying centers, but with a focus on hospitals only. In order to boost M&S performance, medical device manufacturers have to analyze each hospital stakeholder. The definition of a stakeholder is „any group or individual who can affect or is affected by the achievement of the organization´s objectives“.[198] An important factor in determining selling strategies for the medical device supplier is to find out what is the current stage of customer`s BDP and which stakeholders are participating. This affects the amount of influence that different stakeholders have. A medical device sales representative that is only focused on the purchasing department is highly likely to miss out on true decision makers and influencers.[199] For companies like B. Braun it is therefore relevant to adapt their marketing and sales approaches based on this system. They have to focus on differentiating products and services and different value elements. These elements should be customized for the different buying centers and influencers as well as for various stages of the procurement process.[200]

In a typical hospital, the procurement teams have to involve different experts in order to complete the supply chain tasks, such as [1] definition and monitoring of supply sources, [2] supplier development, [3] supplier performance evaluation, [4] purchasing strategies development, [5] assessment of clinical outcomes and [6] device usability feedback.[201] Procurement officer alone cannot complete all of these tasks, therefore a hospital procurement team consists of employees from purchasing, management, nurses, physicians and other clinical staff. From the medical device supplier`s point of view, all of these functions present a different set of interests and should be considered in M&S strategies.[201] [202] The stakeholders that actually sign the purchasing contracts are usually management and procurement,

[198] FREEMAN, R. E. (1984).
[199] Vgl. LACZNIAK, G. R. (1979), S. 61.
[200] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 116 f.
[201] Vgl. OMBAKA, E. (2009), S. 20.
[202] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 75 ff.

however healthcare workers, such as physicians, should not be in a reactionary role in the BDP. The clinical departments of the hospital have to support the economical departments with insights from operational perspective and clinical outcomes.[203] The roles in the hospital can be differentiated into clinical (eg. a nurse) and non-clinical (eg. management).[204] It was concluded that the view of HCWs is more process oriented and the view of procurement more business oriented. To analyze different hospital stakeholders from a marketing perspective, different functional areas were connected to the typical buying center roles and their most probable interests. The following table presents a summary on this analysis.

Role of the buying center	Functional area	Interests
Purchaser / Initiator	Procurement officer	Supplier characteristics, product quality, delivery conditions, reliability of the product and supplier, location, price.[205] [206]
Influencer / User	Physician	Handling, reduction of required steps, increased safety, convenience, user-friendliness, quality, improvement of working conditions[207]
Influencer / User	Nurse	Handling, reduction of required steps, increased safety, convenience, user-friendliness, quality, improvement of working conditions[207]
Initiator	Any HCW	Solved problem by acquisition of a product[208]
Influencer / User	Pharmacist	Handling, reduction of required steps, increased safety, convenience, user-friendliness, quality, working conditions[207]
Gatekeeper	Assistant, procurement officer	Efficient information flow[209]
Influencer / Decider	Main nurse, chief physician	Quality of patient outcomes, cost effective care, team effectiveness[210]
Influencer / Decider	CPO, main procurement officer	Buying goods needed and buying them economically, ability to negotiate contracts and generate savings, supplier development and performance evaluation[211] [212]

[203] Vg. DIXON, M.; ADAMSON, B. (2011), S. 102.
[204] Vgl. https://www.tforg.com (07.03.2019)
[205] Vgl. HERBST, U.; BARISCH, S.; VOETH, M. (2008), S. 128.
[206] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 116.
[207] Vgl. REILLY, T. (2010), S. 74 ff.
[208] Vgl. BONOMA, T. V. (2006), S. 1.
[209] Vgl. INGRAM, T. N. et al. (2006), S. 60 ff.
[210] Vgl. SWANWICK, T.; MCKIMM, J. (2017), S. 1 f.
[211] Vgl. ROZEMEIJER, F. A.; VAN WEELE, A.; WEGGERMAN, M. (2003), S. 12.
[212] Vgl. BAILY, P. J. H. (1987), S. 2.

Influencer / Decider	Hospital management	Work efficiency, customer satisfaction, employee satisfaction, reduced costs, risk management, profitability[213]

Table 6: Analysis of hospital stakeholders and their interests

Four main stakeholders were selected and analyzed further: [1] procurement officers, as representatives of purchasing, [2] physicians, as representatives of clinical process, [3] nurses, as representatives of nursing process and [4] hospital management, as representatives of leadership.

Procurement officer

Procurement officers are likely to be the most direct stakeholders when it comes to the interaction with medical device suppliers. They responsible for managing supply sources, supplier cooperation, execution of purchasing strategies and also takes part in supplier performance evaluation.[214] Their interests are in minimizing inventory, uninterrupted supply, supplier relationships and overall cost reductions.[215] In general, their decisions are also mostly price driven as sometimes their performance gets incentivized and stimulated based on their ability to cut costs.[216] According to one survey, most BDPs are predominantly led by procurement officers with some amount of physician input. A quarter of procurement results come from equally influenced processes regarding the two stakeholder groups. Surveyed procurement officers and physicians agreed that high product quality is the top reason that they recommend a medical device supplier. However, the procurement officers stated that high prices were the main reason for the rejection of supplier`s offer.[217]

Physician

Whether a device must be used on a patient and, if so, which type of device and from what manufacturer, is a decision to be made by the responsible physician. Physicians are the strongest influencer in the BDP.[218] [219] Their buying preferences will be evidence-based, which means that they are likely to evaluate a medical device based on its statistics concerning safety and performance efficiency.[220] Many times, the physicians also act as initiators as they discover a need for the product in their everyday work. They often have most holistic view on clinical needs that a product should satisfy and their knowledge comes from using the device in daily situations. Therefore their inputs should be implemented early in the BDP.[221] [222] Collaboration between physicians and procurement officers should therefore not be underestimated, as it can result in cost savings and improved patient outcomes.[223] Another important collaboration is between physicians and medical device innovations as one study

[213] Vgl. REILLY, T. (2010), S. 74 ff.
[214] Vgl. OMBAKA, E. (2009), S. 20.
[215] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 116.
[216] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 5 ff.
[217] Vgl. BAIN & COMPANY. (2018), S. 8 f.
[218] Vgl. LACZNIAK, G. R. (1979), S. 61.
[219] Vgl. GOOGLE; HIMSS ANALYTICS. (2013), S. 8.
[220] Vgl. POWELL, D.; SCHEEL, O.; TRIBE, B. (2014), S. 3.
[221] Vgl. GAMBA, A.; NAPIERSKA, D.; MILKOWSKA, M. (2018), S. 5.
[222] Vgl. CHATTERJI, A. K. et al. (2008) 1533 f.
[223] Vgl. HEALY, W. L. et al. (2000), S. 12.

showed that physicians contributed to almost one fifth of medical device patents and that they were engaged already in the discovery phase.[224]

Nurse

Same as the physicians, the nurses are stakeholders focused mostly on the clinical process. Their main interests are in products that make their everyday handling easier, safer and more convenient. For this reason they are mostly concerned with product usage and functionality.[225] [226] Even though their work is mostly going to revolve around patient care, they can a lot of times have significant connection to the industry. One study found out that nurses have a high degree of interaction with medical device industry representatives. They are also participating in market research or consultation and are sometimes compensated with product samples, events, gifts or even attendance at sponsored dinner events.[227] When interacting with a nurse, the sales representatives must target safety aspects of the offered product. The products offering risk management benefits will address the needs of the nurse that come from her occupational exposure (eg. exposure to mutagenic and carcinogenic drugs).[228] [229] A product with benefits that are based on nurse`s needs and an appropriate sales approach can therefore positively influence them to recommend a manufacturer. One study points to different examples from practice, where nurses impacted treatment and buying decisions. Participants in the study also referred to them as potential key influencers because of their direct links to all stakeholders that medical device suppliers want to target: patients, prescribers and purchasing officers.[230]

Hospital management

Some of the hospital management roles are business planning, budgeting, job structuring and HR, performance evaluation and daily problem-solving. Their main goal is to provide services at consistent quality and under budgeting constraints.[231] Hospitals are always under pressure to be financially healthy and stable. Management will therefore calculate the profitability based on difference between collected revenues and operating costs.[232] They can also influence other areas by enforcing a high degree of cooperation with medical staff when creating quality strategies.[233] Hospital management role can therefore improve outcomes in terms of quality and safety.[234] With this high influencing power in multiple areas, managers can create funds for an idea or a product they like. Unlike procurement officers, who have to follow budgeting constraints, managers can exert high impact on financial changes in order to turn around the BDP. They will also tend to be more interested in business partnerships with suppliers, rather than focusing only on products.[235]

[224] Vgl. CHATTERJI, A. K. et al. (2008) 1538 ff.
[225] Vgl. REILLY, T. (2010), S. 74.
[226] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 104 ff.
[227] Vgl. GRUNDY, Q.; BERO, L. A.; MALONE, R. E. (2016), S. 735.
[228] Vgl. LEISS, J. (2017), S. 39.
[229] Vgl. BAKER, E. S.; CONNOR, T. H. (1996), S. 2718
[230] Vgl. GRUNDY, Q.; BERO, L. A.; MALONE, R. E. (2016), S. 737.
[231] Vgl. KOTTER, J. P. (2013), S. 1.
[232] Vgl. https://www.mnhospitals.org (03.03.2019)
[233] Vgl. VAUGHN, T. et al. (2006), S. 2 ff.
[234] Vgl. PARAND, A. et al. (2014), S. 5.
[235] Vgl. REILLY, T. (2010), S. 77.

So far, the mentioned hospital stakeholders were management, purchasing officers, nurses, physicians and other clinical staff. One study offers alternative but similar classification by functional role: physicians, nursing staff, administration staff, engineering experts, purchasing experts.[236] The following table shows the degree of involvement of these different functions (stakeholders) at different stages in BDP. It was therefore concluded that degree of influence and involvement changes over the whole BDP for every functional area or stakeholder.

Functional area	Needs identification	Objectives establishment	Alternatives evaluation	Supplier selection
Physicians	High	High	High	High
Nursing	Low	High	High	Low
Administration	Moderate	Moderate	Moderate	High
Engineering	Low	Moderate	Moderate	Low
Purchasing	Low	Low	Low	Moderate

Table 7: Degree of involvement of stakeholders in BDP by function[236]

Another approach is available for the medical device suppliers that want to identify stakeholders that have the power and influence to significantly impact the procurement process. Sales representatives can determine key decision-making authorities by focusing on different types of buyers in terms of their perceptions, needs, wants and desired outcomes. The recommendation is to always strive to form relationships with accounts high up in the organizational hierarchy.[237] The following table shows three different possible levels of decision-makers in the hospital and their corresponding properties.

Level of decision-maker	LEVEL 1 decision-maker	LEVEL 2 decision-maker	LEVEL 3 decision-maker
Orientation	Logistics oriented buyer	Utility oriented buyer	Strategic oriented buyer
Involvement	In product acqusition	In usage	In partnerships
Role	Reactional role	Influential role	Strategical role
Authority	Limited authority	High impact on BDP	Authority to create funds
Focus	Short term results	Operational results	Long term results
Interests	Price, delivery, packaging, billing terms, lead time and contracting.	Handling, maintenance, product safety and performance.	Profitability, customer satisfaction, shareholder value, and employee issues.

[236] Vgl. LACZNIAK, G. R. (1979), S. 61.
[237] Vgl. REILLY, T. (2010), S. 74 ff.

Examples	Purchasing officers, materials managers, office managers, buyers	Safety officers, technical staff, equipment operators, distributors	Company executives, mid and top tier management, department leaders
Potential hospital implications	Hospital purchaser	Nurse, head nurse, physician and pharmacy leaders.	CPO, COO, chief physician, and hospital executive.

Table 8: Different levels of decision makers[238] [239]

To conclude this analysis with practical implications for medical device suppliers, the approaches that help identify most influential buying center members were collected:

- *Isolation of stakeholders:* Individuals with higher personal interests in the decision will exert higher influence on the BDP.
- *Following the information flow:* Information flow will likely be centralized at the most influential members.
- *Expert identification:* Sales representatives can identify highly influential individuals by recognizing who has highest level of expertise and asks the most specific questions.
- *Tracing connections to the top:* Information and resources always play a big role in procurement scenarios. That is why powerful buying centers will likely associate themselves with top management.
- *Understanding the purchasing role:* Dominant purchasing individuals will show a lot of technical and supply chain dynamics knowledge and will have close relationships with suppliers.[240]
- *Target high-level decision makers:* Focusing selling strategies on stakeholders higher up the hierarchy can result in budgeting and funding changes. When applying this strategy, the sales representative should focus on topics like profitability, cash flow, competitive positions, customer needs, market trends and shareholder value.[239]
- *Shift the primary selling interaction:* The traditional way for a sales representative to approach a selling process was to receive some information from the customer stakeholders in order to then sell only to the decision maker with a more appropriate sales pitch. The emerging model is shifting the focus to the stakeholders and generating a more widespread support for the product.[241]

[238] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 116 f.
[239] Vgl. REILLY, T. (2010), S. 74 ff.
[240] Vgl. HUTT, M. C.; SPEH, T. H. (2010), S. 81.
[241] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 107 ff.

3 Marketing and sales approach

Conclusions from previous chapters indicate that medical devices market environment has its own unique opportunities and challenges. On one hand the forecasts argue for steady market growth based on demographical changes and on the other hand the industry is experiencing pricing pressures from their customers. The M&S departments in this sector, like B. Braun`s GMS, are therefore facing a hard situation of trying to persuade a price sensitive customer. In addition, this same customer is not always just one person. Hospitals are using collective purchasing powers of GPOs or they are operating on a complex system of multiple decision makers and influencers.

This chapter discusses solutions to the problems that medical device companies face, with regards to their M&S strategies. To provide the right context, precise data and generalized conclusions, the following research base was set:

I. M&S strategies, approaches and recommendations were analyzed and presented from a perspective of a medical device company, such as B. Braun. Focus was therefore on innovative, already developed firms that target advanced to premium segments, where pricing ranges are at or above average. This was to avoid large differentiations between all medical device companies, as a company competing in low pricing segment would likely apply a different set of M&S approaches.

II. The typical customers were HCOs, with focus on hospitals.

III. Analyzed market is a business-type market (also called B2B market). This was to differentiate from consumer-type market. Business markets (such as medical device sector) are going to incorporate sellers that are in business of selling goods and services and buyers that purchase these goods or services to make a profit through their own business models. Customers are likely to be highly informed with higher skills in evaluating competitive offers. The role of M&S department in a business market is therefore to demonstrate their products in a way that it shows how they can boost customer`s revenue or lower customer`s costs.[242]

3.1 Marketing and sales strategies overview

Throughout this thesis and in the relevant B. Braun department (GMS), the term M&S was used conjunctionally as a single term describing both aspects of marketing and sales. However the two parts of M&S should not be perceived as interchangeable or same. They work together and complete each other, but marketing is a much broader idea compared to selling. While selling starts only when a company has a product, marketing is the process that occurs before company has a product and also continues after the company has sold a product. In practice, this means extensive market research, R&D of products that satisfy customer`s requirements,

[242] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 9.

appropriate pricing determination and raising awareness about the product. In short, marketing means providing customers with quality, service and value in order to satisfy their needs.[243] Regardless of their differences, marketing and sales are both necessary for a company to succeed as M&S strategies are able to provide an important competitive advantage in B2B markets.[244] There is a significant relationship between how an organization develops its M&S strategies and how well it performs on the market.[245] This chapter serves as basis for consecutive analysis and calculations, therefore some key terms on this topic, which are relevant for this thesis, were collected and explained.

M&S as a business function

M&S is one of the primary functions of a business and its position with regards to the company`s whole value chain can be seen on the following figure.

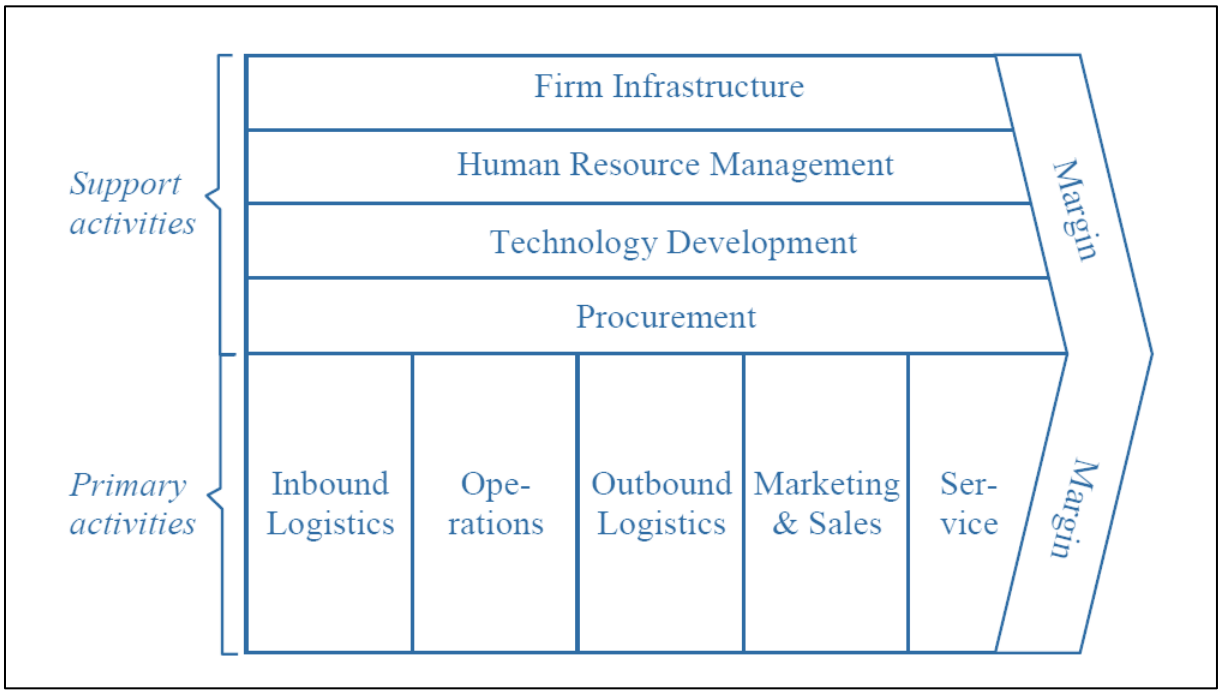

Figure 12: Porter`s Value Chain model[246]

As a business function it operates towards creating, communicating and delivering value to the customer and simultaneously manages customer relationships. If these tasks are appropriately executed, they result in the benefit of organization and organization`s stakeholders.[247] Effects of M&S can be seen in exchange of goods in services for money between the two parties: industry (a collection of sellers) and the market (a collection of buyers). Industry companies, and their respective M&S departments, also exchange information and communication with the market. They will collect information from the potential sellers and then target these sellers through communication which is aimed at promoting and selling their products.[248]

[243] Vgl. https://www.kotlermarketing.com (12.03.2019)
[244] Vgl. MILLER; W. (2003), S. 106 ff.
[245] Vgl. TERHO, H. et al. (2015), S. 14.
[246] Vgl. PORTER, M. E. (1985), S. 33.
[247] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 28.
[248] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 9 f.

To successfully reach the market, M&S departments will use different marketing channels. [1] Communication channels transmit messages to the customer, [2] distribution channels sell and deliver products or services and [3] service channels execute transactions.[249] They will also deploy different types of salespeople to develop and manage relationships with the customers. For example, account managers are sales representatives that have a strategical role and are responsible for deals and contracts of higher importance.[250] One study analyzed the importance of account managers and concluded that the quality of inter-firm relationship is highly dependent on the relationship with the account manager (salesperson). A well build relationship with the account manager can positively influence customer loyalty and perception of inter-firm relationship`s value.[251]

Needs, wants and demands

As seen by the definition of marketing, customer needs will be an important factor in developing M&S strategies. Kotler and Keller differentiated needs, wants and demands by pointing out how they relate to each other. On the lowest level, needs are the basic human requirements. When there is a product that will satisfy those needs, wants will occur. Demands on the other hand, are a combination of wants that would get satisfied by a product and the ability to pay for that product.[252]

The STP process

Segmentation, targeting and positioning are M&S activities and are usually referred to with an acronym STP. Company focus their marketing efforts on those consumers that they have the largest probability to satisfy. To do this they will first identify customer groups with different needs and place them into segments by specific characteristics. These characteristics can be needs, wants, expectations or responses to market stimuli. Criteria for segmentation is size, measurability, accessibility and responsiveness. Next step is to choose the segments to target with marketing strategies and tailored products. The number of segments chosen depends on seller`s goals, segment attractiveness, flexibility of manufacturing and heterogeneity of requirements on the market. Final step is to develop communication with regards to relevant benefits of the offering. This is most effective when a product has some competitive advantage.[253] [254] [255] [256] [257] Engaging in STP process has many advantages, such as optimized allocation of marketing resources, successfully targeting homogeneous customer groups and better opportunities for new products.[258]

Pricing strategy

Price is one of the elements of the traditional marketing mix, accompanied by product, place and promotion.[259] However, it is the only element that generates revenue while all other

[249] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 11.
[250] Vgl. OLIVER, R. L. (1987), S. 76.
[251] Vgl. ALEJANDRO, T. B. et al. (2011), S. 41 f.
[252] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 9 f.
[253] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 213.
[254] Vgl. FILL, C.; FILL, K. E. (2005), S. 54.
[255] Vgl. HOLLENSEN, S. (2010), S. 300.
[256] Vgl. KOTTLER, P.; KELLER, K. L. (2012), S. 234.
[257] Vgl. HOLLENSEN, S. (2010), S. 286 f.
[258] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 213 ff.
[259] Vgl. ETTENSON, R.; CONRADO, E.; KNOWLES, J. (2013), S. 1.

elements are producing costs. If set successfully, pricing strategy will allow for high profit margins on sold products.[260] One study suggests that a 5% increase of the average selling price will on average result in 22% higher EBIT value.[261] When defining prices of products, important factors to consider are company, customers, competition and market environment. Prices also have to be in line with already established brand image, target markets and overall marketing strategy.[260] Choosing a correct price for a product in large companies (such as B. Braun) is usually done by divisions and product managers. Many times, companies will pick the most basic form of pricing: get the selling price by adding industry`s average profit margin on the occurred costs. However, a good pricing strategy will usually require a more complex and thorough process.[262] Other possible pursued pricing strategies are: survival pricing, maximum current profit, maximum market share, market skimming and product-quality leadership.[263]

Product differentiation

Product differentiation means that a customer perceives a specific product offering as different in comparison to its competition. This differentiation can be on any characteristic of the product, including the sales price. Two types of differentiation can occur, with first one being based on perceptual differences that can be influenced by usage experience or promotion and the second one being based on actual differences, which are based on product characteristics.[264] Successful product differentiation will maintain or improve market share that the company has reached with a certain product.[265]

Advanced to premium market segment

Based on STP process and identification of product differentiation characteristics, the example product for this thesis is marketed by B. Braun as an advanced to premium segment solution. B. Braun`s reasons for competing in this segment are opportunities for higher profit margins and offering products that go in line with their corporate brand image, which revolves around high quality, user-friendly products that improve process efficiency and maximize safety.[266] [267] Premium segment in the context of this thesis should not be mistaken with the luxury segment, which would mostly be applicable for other industries (eg. clothing, watches) and where perception is based more on psychology than rationality.[268] Premium priced goods in medical device industry still need to be justified by presenting objective facts and value.[269] Therefore this segment targets customers with high levels of price versus quality awareness. These customers take price in consideration, but they also look at quality, efficacy, risk-reducing features and overall service. The premium segment for medical devices could therefore be defined as all product offerings that are differentiated from others by their ability to provide efficacy, improved outcomes and quality of care. They are sold with advanced selling and

[260] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 383.
[261] Vgl. HINTERHUBER, A. (2003), S. 766.
[262] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 386.
[263] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 389.
[264] Vgl. DICKSON, P. R.; GINTER, J. L. (1987), S. 4.
[265] Vgl. BURNETT, J. (2010), S. 177.
[266] Vgl. B. BRAUN MELSUNGEN AG. (2017), S. 75 ff.
[267] Vgl. https://www.bbraun.com (06.03.2019)
[268] Vgl. KAPFERER, J.; BASTIEN, V. (2009), S. 179
[269] Vgl. KAPFERER, J.; KLIPPERT, C.; LEPROUX, L. (2013), S. 3.

servicing models and because of their innovative benefits, they can be sold in above average price range.[270]

To summarize, successful managing of M&S efforts means that a company fulfills some or all of the following tasks:

- Marketing strategies and plans development (providing tactics that will capture opportunities on the market).
- Market insights collection (developing marketing information system to capture market potential and shifts in demand).
- Connection with customers (understanding customers and their buying process).
- Strong branding (understanding potential and challenges of own brand image).
- Market offerings development (pricing, delivery, maintenance, etc.).
- Value delivery (presenting the value behind products or services).
- Value communication (communicating this value).
- Long term growth (initiating innovations and researching opportunities and challenges).[271]

3.2 Modern function of sales

Previous chapters indicate that market environments and procurement processes evolve over time. It should not come as a surprise that sales strategies have to adapt and follow as quickly as possible. A sales department today needs a wider range of skills to compete in this market.[272] [273] Efforts should be centered towards the customer and serving his needs. Following figure summarizes the characteristics of modern selling process.

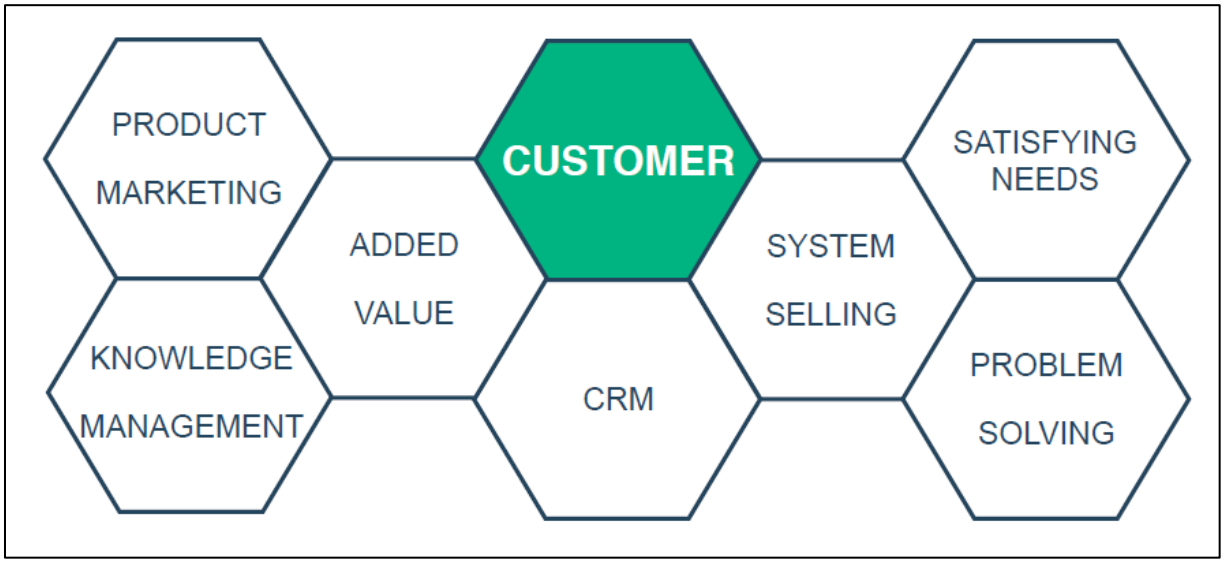

Figure 13: Summary of characteristics in modern selling process.[274]

[270] Vgl. LLEWELLYN, C.; PODPOLNY, D.; ZERBI, C. (2015), S. 1.
[271] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 26 f.
[272] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 6 f.
[273] Vgl. JOBBER, D.; LANCASTER, G. (2009), S. 5.
[274] Vgl. MONCRIEF, W. C.; MARSHALL, G. W. (2005), S. 13 ff.

Selling is therefore changing from the old model of just selling products and services to a more complex and integrated model of focusing on a customer and his processes. Salespeople are satisfying market needs by increasing customer`s productivity. This means developing relationships, solving customer`s problems, offering improvement opportunities and providing value to customer`s business model.[275] [276] This transforms the selling role into a strategical activity where the goal is to build and maintain a long term relationship with the customer. This shifted the role of the salesperson away from traditional order manager to a relationship manager.[277] In many B2B selling process scenarios, the conversation has changed from product to solution selling. This puts additional strain on the tasks of a typical sales representative. The scope of their knowledge has shifted from just understanding marketing. A modern sales representative will have to be skilled in [1] selling points, such as unique product features, usage, competitive advantage, product segment, branding, [2] operational characteristics (typical product problems, manufacturing schedules, quality control, product development) and [3] economic implications (profit and loss factors).[278]

The evolution of M&S therefore goes in the direction of increasing complexity and towards more holistic views on the customer`s and supplier`s processes. A so far very useful tool can therefore be put in question: marketing mix or “The 4 P`s of marketing”. The mindset is still applicable and relevant, however literature proposes modifications based on the changing environment of B2B markets.[279] [280] One study showed that the traditional “The 4 P`s of marketing” model focuses too much on product features and underestimate the importance of providing a case for the differentiating value that the product would bring to the customer.[280] The following figure shows the traditional marketing mix and two possible extensions or modifications from the literature.

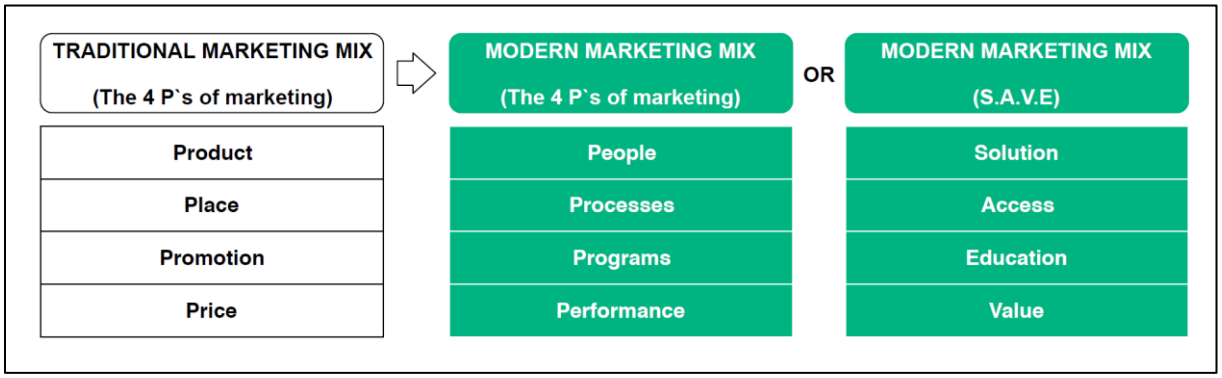

Figure 14: Modifications to traditional marketing mix[279] [280]

In order to provide a summary on modern M&S, the changes in key M&S concepts were collected. The following shifts were found to be applicable:

[275] Vgl. LEIGH, T. W.; MARSHALL, G. W. (2001), S. 83.
[276] Vgl. INGRAM, T. N. et al. (2006), S. 6 f.
[277] Vgl. ATKINSON, T.; KOPROWSKI, R. (2006), S. 22.
[278] Vgl. VARGO, S. L.; LUSCH, R. F. (2004), S. 1 ff.
[279] Vgl. KOTLER, P.; KELLER, K. L. (2012), S. 25.
[280] Vgl. ETTENSON, R.; CONRADO, E.; KNOWLES, J. (2013), S. 1.

I. *From function to process:* independent function of sales has transformed to an elementary part of a more holistic process in customer management.

II. *From isolated to cross-functional:* sales departments have moved from having a small amount of cross-functional impact to a more integrated function that is connected with finances, marketing and operations.

III. *From operational to strategic:* focus in product selling has moved away from operation-based to strategy-based, ideally contributing to customer`s business strategy.[281]

IV. *From individuals to teams:* multidisciplinary teams that form a permanent, customer-oriented group that can better identify and solve problems.[282]

V. *From sales volume to sales productivity:* focus on sales profitability and not only quantity and taking selling associated costs into consideration.[283]

VI. *From transactions to relationships:* short term contacts based only on transaction time have evolved into long term cooperation.[284]

3.3 Value-based selling

This chapter discusses the core solution offered by this thesis in detail. In order to present a full picture on value-based selling (VBS), several basic concepts behind it were analyzed. First, [1] the meaning of VBS and [2] customer's perception of value were defined. Then it was discussed [3] how products can add value and lastly [4] how VBS can be implemented into the sales process. The main purpose was to provide a concrete concept that can support and improve M&S efforts of a medical device supplier in the current market environment. And even though previous research of this thesis indicates price sensitive customers and general pricing pressure in medical device sector, this solution does not focus on price reduction or discounts. VBS is everything a seller does before price becomes relevant. It means building up the value in an offering so that price essentially becomes a lesser problem.[285] It means setting the quality of the product and service as a benchmark, instead of competitor`s price.[286]

3.3.1 Value-based selling evolution

As suggested by findings in the previous chapter, modern M&S strategies require more multi-dimensional approaches, customer-first selling methods and additionally trained salespeople that can implement VBS.[287] [288] Because selling based on features only is not effective enough

[281] Vgl. STORBACKA, K. et al. (2009), S. 895.
[282] Vgl. INGRAM, T. N. et al. (2006), S. 8.
[283] Vgl. INGRAM, T. N. et al. (2006), S. 9.
[284] Vgl. LEIGH, T. W.; MARSHALL, G. W. (2001), S. 83.
[285] Vgl. REILLY, T. (2010), S. 14.
[286] Vgl. REILLY, T. (2010), S. 225.
[287] Vgl. ATKINSON, T.; KOPROWSKI, R. (2006), S. 22.
[288] Vgl. TERHO, H. et al. (2015), S. 19.

anymore, product benefits have to be added to the sales argumentation.[289] [290] [291] Product`s features and benefits comprise the first two layers of a sales offer. VBS expands the offer further and adds another layer of argumentation: value. Selling statements that focus on value will have a much higher impact on stakeholders that are higher up the decision making process.[292] [293] Following figure presents different layers of sales argumentation leading to VBS.

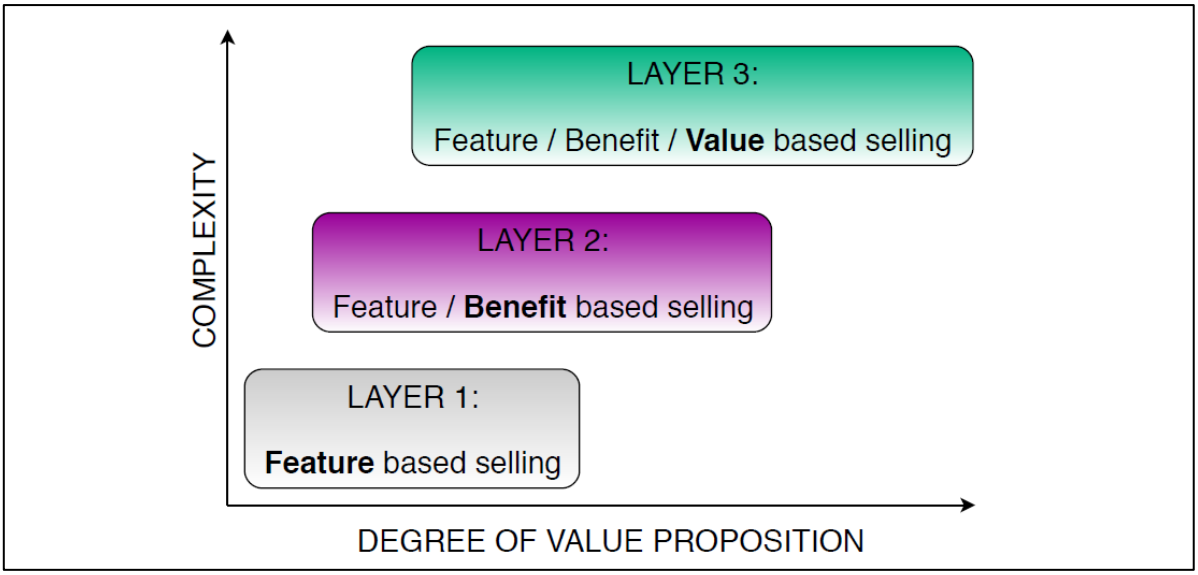

Figure 15: Three layers of sales argumentation[292] [293] [294]

How VBS evolved presents a significant change in how selling in modern B2B markets is perceived. New approach to selling is a buyer-seller interaction that has a goal of resulting in economic exchange which is a part of the value-creating context.[295]

3.3.2 Definition of value-based selling

VBS is a value-driven sales philosophy that seeks to improve customer`s perception of value and the achievable sales price, through a proactive approach to customer-focused performance. At the heart of the approach is the fullest possible satisfaction of complex customer`s needs. In VBS, the customer is shown concrete qualitative and quantitative performance advantages to improve his competitive position in terms of revenue, profit or costs.[296] [297]

It is therefore a proactive view on M&S that strives to create meaningful value for the customer.[298] This means offering a product that results in economic benefits for the customer`s business model and demonstrates how the supplier can contribute to the buyer`s profitability

[289] Vgl. MILLER, W. (2003), S. 50 f.
[290] Vgl. MILLER; W. (2003), S. 106 ff.
[291] Vgl. REILLY, T. (2010), S. 201 f.
[292] Vgl. ATKINSON, T.; KOPROWSKI, R. (2006), S. 22.
[293] Vgl. TERHO, H. et al. (2015), S. 19.
[294] Vgl. TERHO, H. et al. (2012), S. 177 ff.
[295] Vgl. DIXON, A. L.; TANNER, J. F. (2012), S. 12.
[296] Vgl. REILLY, T. (1993), S. 7.
[297] Vgl. SCHMÄH, M.; STARK, H. (2006), S. 8.
[298] Vgl. INGRAM, T. N. et al. (2006), S. 9.

and operational efficiency. There are three dimensions of VBS: [1] insight and understanding of customer`s business model, [2] development of value proposition and [3] communication of value to the customer.[299] If executed correctly VBS will lead to improvements in offering customer`s value, satisfaction, loyalty and retention.[300] M&S strategies based on VBS will be adaptable, agile, consultative, customer-oriented, partnership-oriented and relationship-oriented. A key aspect that VBS incorporates is therefore the buyer-supplier relationship.[301] The following figure presents an overview of VBS based on this relationship.

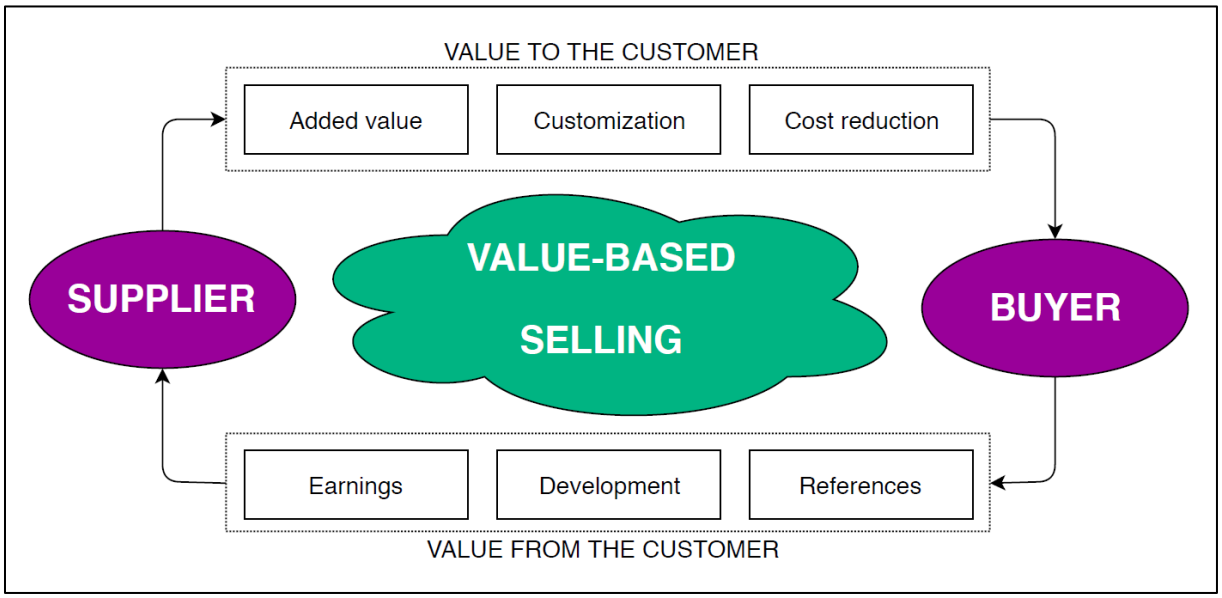

Figure 16: Supplier-buyer relationship with relation to VBS[302]

One study summarized VBS with: “the degree to which the salesperson works with the customer to craft a market offering in such a way that benefits are translated into monetary terms, based on an in-depth understanding of the customer`s business model. Thereby convincingly demonstrating their contribution to customer`s profitability.”[303]

3.3.3 Customer perceived value

The presentation of value was summarized with the following quote: „The essential challenge that sales and marketing managers in industrial markets face is this: converting their firm´s own competitive advantages into quantified, customer-specific value. Doing so enables B2B sales and marketing personnel to justify a difference in price between two competing offers with a difference in monetary value.“[304] Price and value should therefore be differentiated, as price is what a buyer pays, and the value is what he receives.[305]

Definition of value

[299] Vgl. TERHO, H. et al. (2012), S. 178.
[300] Vgl. KHALIFA, A. S. (2004), S. 661 f.
[301] Vgl. MILLER, W. (2003), S. 50 f.
[302] Vgl. SCHMÄH, M.; STARK, H. (2006), S. 5.
[303] TERHO, H. et al. (2012), S. 178.
[304] HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 3.
[305] Vgl. REILLY, T. (2010), S. 12.

Value is how a customer perceives a product offering with respect to the benefits that he receives when using it, in comparison to other available alternatives.[306] It is essentially the ratio between how a customer perceives the benefits versus how he perceives the sacrifices made to obtain those benefits.[307] In the end, the benefits and value of the product, will define the maximum price that buyers are willing to pay. When they compare two offerings, they will connect the price difference to the difference in value. Value quantification is therefore impacted by different value characteristics.[308] [309] The following figure presents value quantification from the customer`s perspective.

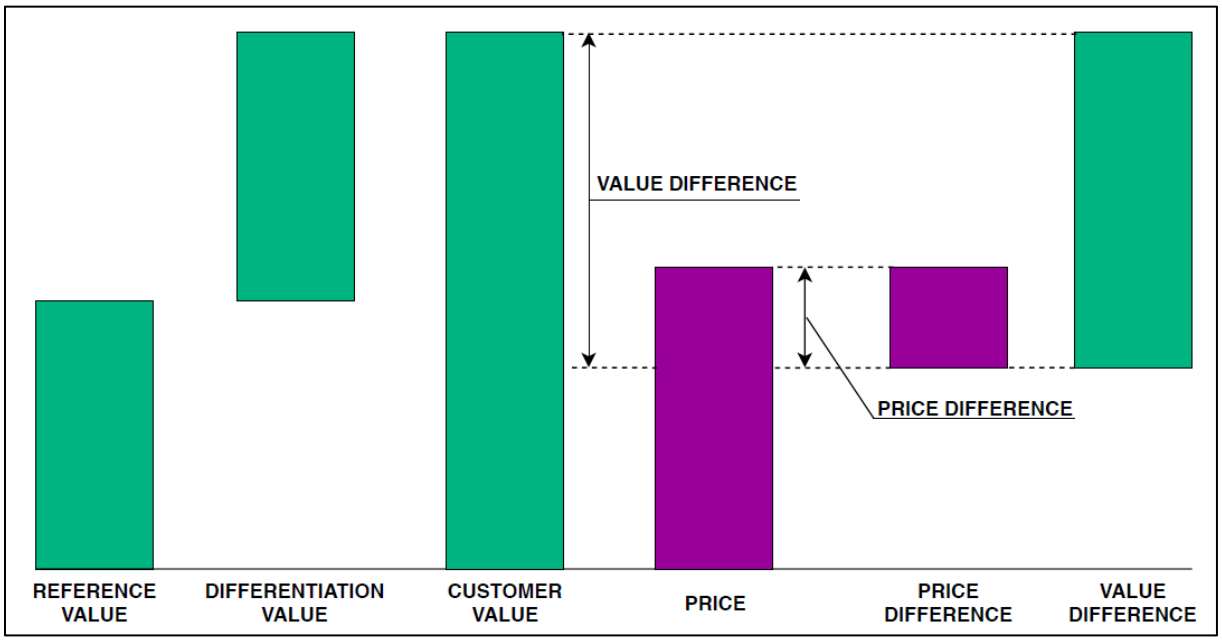

Figure 17: Quantification of value from customer's perspective[308]

How customers perceive value

Definition of value shows that the customers experience it based on benefits they receive in comparison to sacrifices.[309] Customers will perceive value on the following dimensions: strategic, operational, social and symbolic. As this thesis focuses on medical device manufacturers as suppliers and hospitals as customers, only operational and strategic dimensions are relevant. Operational dimension of value indicates the benefits of the offering on operational performance of the customer and it has an impact on processes within the organization. This translates to lower processing costs, higher output or a combination of both.[307] Suppliers can therefore positively contribute to customer`s business model with regards to better products, components, improved reliability, resource efficiency, increased capacities and quality of inputs.[310] Strategic dimension of value on the other hand indicates holistic organizational view. It results in leverage of already available capabilities or it contributes to development of new capabilities and innovations. This dimension requires sharing of knowledge, information and experiences.[310] Both dimensions in the end contribute

[306] Vgl. ANDERSON, J. C.; JAIN. D. C.; CHINTAGUNTA, P. K. (1993), S. 5.
[307] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 2.
[308] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 3.
[309] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 92.
[310] Vgl. ULAGA, W.; EGGERT; A. (2005), S. 84 ff.

to one of the four economic outcomes of value that a customer is interested in: revenues, costs, efficient use of resources and risk management.[311] To properly asses these dimensions of value in a product offering several aspects must be considered, such as that [1] it is the customer`s perception of value which is the most important, that [2] value means a lot more than just price, that [3] focus is on what the product provides instead of what it is, that [4] value has to be considered in a long term time horizon and finally that [5] perceived value is based on customer expectation but performance value impacts the customer's final satisfaction.[312] To conclude, in traditional selling models, sellers defined the value-based on their own perspectives and perceptions. This meant focus on their business model first and treat all customers the same. One of the main things that VBS supports, is defining value-based on customer`s point of view. Value must be presented in a way that customer perceives it as specifically designed for his needs. Defining value-based on customer`s perception will protect the product`s price, while defining it from supplier`s perception will lead to price erosion.[313] Value-adding process therefore concerns both parties, seller and the customer. They are both active roles in the process of value creation and mutual relationship improvement. The seller must initiate the process with superior value propositions that lead to opportunities in value co-creation with the customer.[314] The following table summarizes five different aspects on what customer`s perceived value is.

View of value	Definition
Customer insight	Value is defined in reference to the customer and his own performance indicators.
Collaboration	Value creation is a collaborative process with the customer.
Measurement of business impact	Value is measured as with monetary measurements based on delivered quantitative and qualitative benefits.
Differentiation	Value is considered in relation to best available alternative.
Substantiation	Value is supported with documentation and evidence from previous experiences and successful performance improvements.

Table 9: Basic aspects of customer value[315]

3.3.3.1 Tools for value identification

During the literature review, two tools for identifying value in a product offering were found and are presented in the following.

Value map

A value map is a tool for value assessment in real markets for a specific segment. It functions based on the ratio of perceived price versus customer-perceived benefits and it follows the

[311] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 9.
[312] Vgl. REILLY, T. (2010), S. 12.
[313] Vgl. REILLY, T. (2010), S. 13 f.
[314] Vgl. VARGO, S. L.; LUSCH, R. F. (2004), S. 10 ff.
[315] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 65.

equation: customer value are perceived benefits reduced by the perceived price.[316] Following figure shows a value map and corresponding explanation.

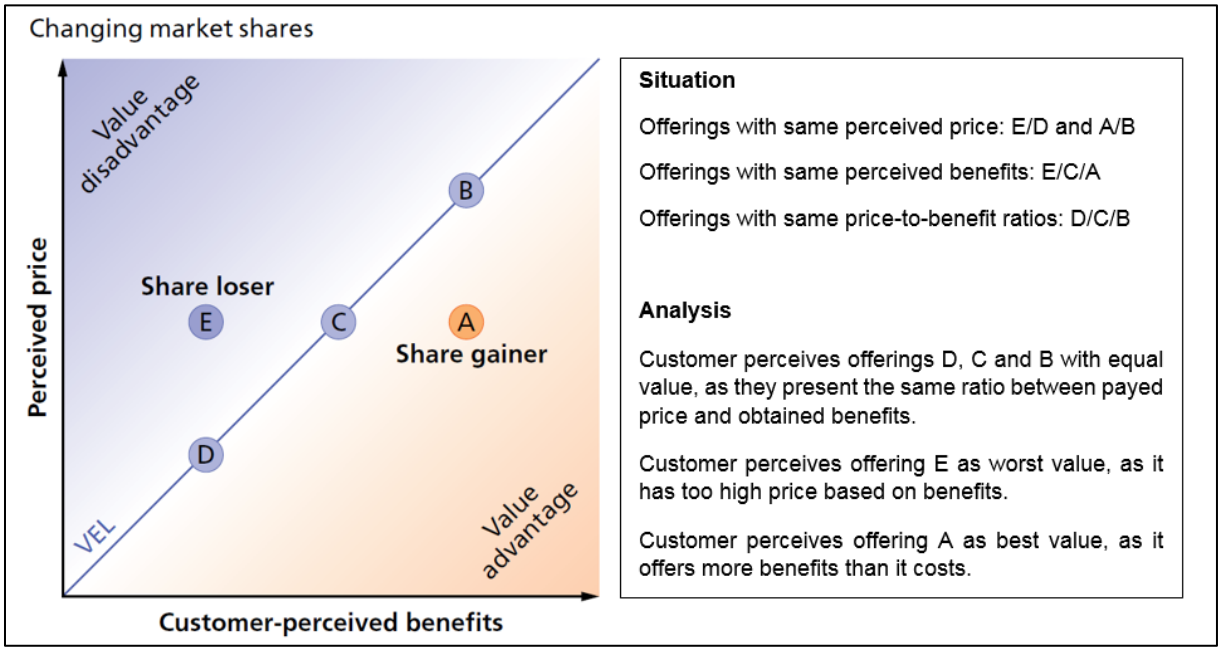

Figure 18: Value map[316]

Value map focuses on to directions, value advantage that leads to increased market shares and value disadvantage that leads to reduced market shares. The value equivalence line (VEL) represents an equal ratio of perceived price and benefits. The positions on the value map can be viewed as offerings (or competitors). All offerings on the VEL will keep constant market shares because they represent the "you get what you pay for" option. They perfectly reflect the benefits in the price. Positions A or E however, will lead to changes in market share. Either a decrease (offering E) or an increase (offering A). Customers will always lean towards positions with the value advantage.[316]

Value proposition canvas

Value proposition is customer-messaging concept that presents a product offering and how it fulfills customer needs.[317] [318] It is essentially how a company forms its offer so it communicates and delivers value.[319] The value proposition canvas is a tool that is formed from organization's business model and it helps to visualize this value proposition by showing [1] how an offering creates benefits and [2] how it can fit the customer. To use the tool, the M&S team must identify both sides of the canvas. The right side represents a customer profile and the left side describes how a product offering intends to create value-based on the customer profile. A value proposition is complete when the left side completely fulfills the requirements on the right side and it can then be used to generate customer messaging.[320] The following figure shows a blank value proposition canvas.

[316] Vgl. LESZINSKI, R.; MARN, M. V. (1997), S. 100 f.
[317] Vgl. MUHTAROGLU, F. C. P. et al. (2013), S. 33.
[318] Vgl. REILLY, T. (2010), S. 52.
[319] Vgl. LANNING, M. C. (2000), S. 4 f.
[320] Vgl. OSTERWALDER, A. et al. (2014), S. 14 ff.

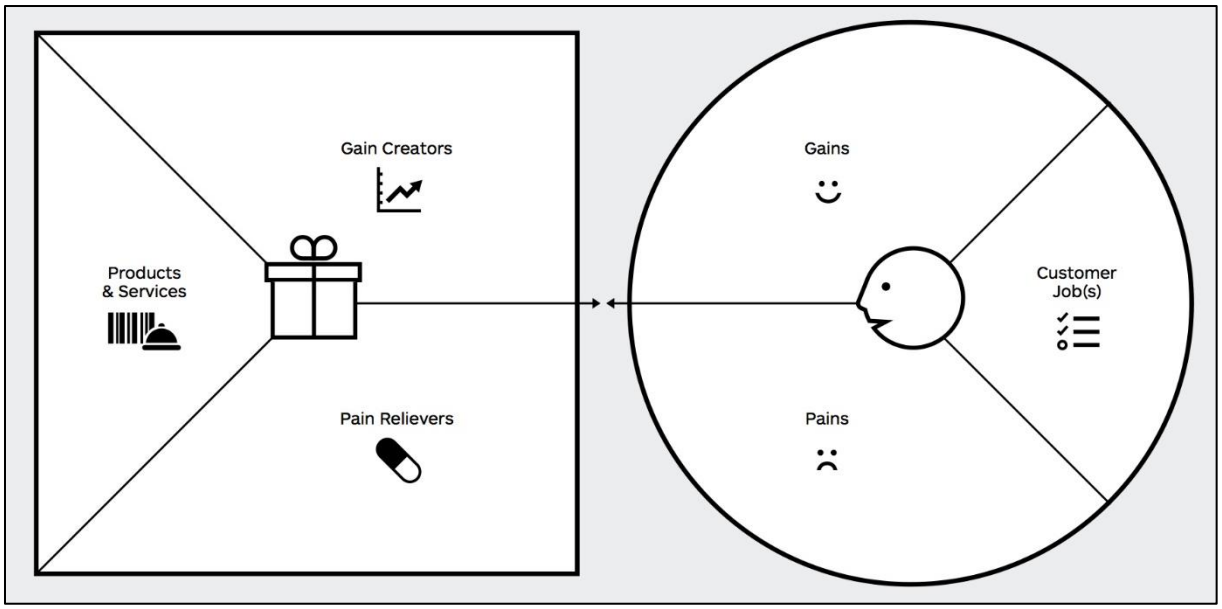

Figure 19: Value proposition canvas[321]

Forming a customer profile (right side) essentially means understanding customer's processes, risks, desires and needs. Following questions apply:

- *Customer jobs:* what are the tasks in customer's line of work?
- *Pains:* what are the risks and bad outcomes associated with customer`s processes?
- *Gains:* what are the outcomes and benefits that the customer is interested in?

Development of a value-based offer (left side) then requires an answer to these questions based on the relevant product. Following questions apply:

- *Products and services:* which products will be offered?
- *Pain relievers:* how do these products alleviate customer pains?
- *Gain creators:* how do these products achieve customer desired outcomes?[321]

3.3.3.2 Sources of added-value

Added-value can be expressed in quantitative or qualitative context and it is everything an organization does to a product from the moment they buy, sell or service it. Quantitative added-value is visible, tangible, measurable, quantifiable and based on performance. It shows in the cost reductions, increasing market shares, improved efficiencies and other key performance indicators. It can be expressed in monetary terms. On the other hand, qualitative added-value is more subjective and intangible. It can be seen in availability of the supplier, management philosophies, brand name, reputation or even in salesperson`s knowledge.[322] Added-value is important because products with greater perceived value can secure a better price and deter price objections.[323] One study found out how managers select key suppliers. The results showed the most important added-value drivers and how they are connected. This is presented in the following table.

[321] Vgl. OSTERWALDER, A. et al. (2014), S. 14 ff.
[322] Vgl. REILLY, T. (2010), S. 47.
[323] Vgl. REILLY, T. (2010), S. 25.

Sources of added-value	Relationship value dimensions	
	Benefits	Costs
Core offering	Product quality Delivery performance	Direct costs
Sourcing process	After sales support Personal relationship	Acquisition costs
Customer operations	Vendor knowledge Time to market	Operation costs

Figure 20: Added-value drivers[324]

The findings of the study confirm many concepts of VBS theory discussed so far in this thesis. Product and product price are becoming less important in buyer-supplier relationships. In order to improve M&S strategies and gain key supplier status, personal interaction, service, knowledge sharing, and other added-value creation are far more important.[325]

3.3.4 Application

In this chapter, the focus was on how VBS is used in practice, how it results in business performance and what concepts can support it. Application of VBS is specifically relevant in the current state on the B2B markets, such as the medical device sector. With a business environment that is facing increased pressures on earnings and a rising price sensitive customer base, selling value is a crucial issue for company's leadership.[328] In addition, the medical device buyers are also encouraged by governing bodies to buy their products with consideration on value, giving advantage to suppliers with VBS and eliminating suppliers that fall behind on adaptation.[326] However, stating that VBS should be used for revenue growth is not capturing the full application scope of this concept. As it was mentioned in the previous chapters, the trend in M&S is to transition from sales volume to sales productivity. It means focusing on sales profitability and not only sheer quantity, which comes from the old ways of transaction-oriented mentality.[327] [328] Applying VBS to M&S efforts results in contribution of value to and extraction of value from the customer in order to improve future relationships.[327] As shown in previous chapters, the pricing pressures in the medical device sectors are growing. This leads to price erosion and the companies that successfully apply the concepts of VBS can protect their pricing levels and maintain profit margins.[328] [329] In practice, a lot of sellers are confronted with customer objections that their product is only a commodity and that the only way they can win the deal, is by lowering the price below competition. Therefore, the first instinctive negotiation strategy of the seller would be to argue on price. However, one study suggests that the sellers with value orientation and higher initial price targets, achieve

[324] Vgl. ULAGA, W.; EGGERT, A. (2006), S. 122.
[325] Vgl. ULAGA, W.; EGGERT, A. (2006), S. 133.
[326] Vgl. EUROPEAN COMMISION. (2018), S. 70 ff.
[327] Vgl. REILLY, T. (2010), S. 39.
[328] Vgl. D`ANDREA, R. (2005), S. 18 f.
[329] Vgl. REILLY, T. (2010), S. 21 ff.

better settlements. It means that the seller who is educated, informed and confident in the value of his solution, will better maintain his desired price levels.[328] Another study focused specifically on the gap between theory of VBS and its application in B2B market where the approach has already relatively matured. Six key concepts that a supplier should follow were identified as crucial for VBS implementation:

1. Focus on finding the appropriate customers that are suitable for M&S strategies based on value. This is especially relevant for highly innovative products.
2. Deploy informed and highly trained sales force that understands customer`s everyday challenges and key drivers for of his business model performance.
3. Maximize interaction with the customer when assessing what product benefits can result in value for his organization.
4. Verify and confirm your value propositions with credible evidence and accurate references from other similar events or process performances.
5. Tie the price to the measurable and verifiable benefits that your offering achieves. This stimulates continuous improvement and results in better customer relationship since the supplier gets directly involved in delivering value on long term.[330]

The same study also provided a step by step process framework for organizations that wish to implement VBS process, as shown by the following figure.

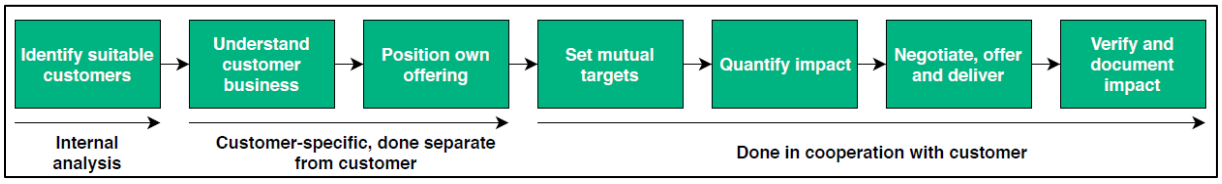

Figure 21: Suggested step by step framework for implementing VBS[330]

To summarize, results of practical application of VBS will bring value to both parties. The supplier will enjoy higher volume of sales, improved negotiations, maintenance of profit margins and maximized closing ratios. On the other hand, the customer will have his needs satisfied, his market and financial performance will improve and he will be on a better path to achieving organizational goals. There are also non-quantifiable benefits, such as customer satisfaction, increased loyalty, reduced price sensitivity and more meaningful partnerships.[331]

3.3.5 Value-based sales process

So far discussed concepts seem to add a lot of additional complexity to buyer-seller interaction, however the goal of VBS selling is not to complicate, but to sophisticate the buyer`s decision making process. A skilled sales representative will push the buyer to think about value on the long term and will turn the interaction into a partnership.[332] There are still challenges in VBS sales process however. The effective VBS requires sales force training and intensive prioritization as it is a resource-intensive approach, based on high level of customer insights

[330] Vgl. TÖYTÄRI, P. et al. (2011), S. 499 f.
[331] Vgl. TERHO, H. et al. (2012), S. 182.
[332] Vgl. REILLY, T. (2010), S. 39 ff.

and results in high upfront investments.[336] [337] In the context of medical devices this could potentially translate to increased resources spent on education about clinical processes, potential adverse events, economic consequences and everyday hospital challenges. Another potential concern could be the late involvement of the supplier when making procurement decisions.[333] One source discovered that customers on average engage with supplier`s sales at 57% of their BDP, meaning that the supplier will not be able to influence in the early stages of the procurement process.[334]

3.3.5.1 Value-based sales force

Sales force is organization`s key actor at the customer and has a direct effect on sales performance and customer satisfaction.[335] One study found out that seller's VBS approach significantly impacts selling performance. Specifically, on how he deals with finding new opportunities to improve customer`s business model, how he develops customized offerings and how he is able to present product`s effects on customer`s process. Customer orientation was described as one of the most important properties of a successful seller.[336] [337]

A VBS oriented salesperson is differentiated from the traditional seller by his ability to integrate concepts of VBS. He will be more trained, informed and experienced and will be able to relate and understand customer`s everyday challenges. He identifies the problem, understands the need derived from that problem and offers a solution that includes clinical evidence and economic impacts. In practice, he will discuss topics like process optimization, cost containment, risk management, worker efficiency and relationship. The advantage of his abilities therefore shows in the opportunity to target hospital stakeholders higher up the hierarchy.[338] [339] To conclude, VBS oriented sales force is a key part of modern M&S department. One study collected key characteristics of this sales force: [1] knowledgeable, [2] professional, [3] thorough, [4] results-oriented, [5] problem-solving, [6] relationship-oriented, [7] customer-focused, [8] responsive, [9] good in communication and [10] dependable.[340]

3.3.5.2 Supporting concepts

To identify concepts that could be potentially used as a support of VBS sales process, literature was also researched for any methods or approaches that go in line with value-added sales argumentation. The first concept found was the idea of Unique Selling Proposition (USP). It means that a product will perform better in improving customer`s perception of value if it can offer a unique benefit and if the sales arguments can leverage this benefit. The USP should be unique, defendable and simple.[341] [342] Another discovered concept was the "SPIN" method, which deals with describing how salespersons should form their questions in customer dialogs. SPIN stands for four topics that can assists with the needs-development process: situation,

[333] Vgl. B. BRAUN MELSUNGEN. (2016), S. 6.
[334] Vgl. CEB. (2012), S. 2.
[335] Vgl. TERHO, H. et al. (2015), S. 14.
[336] Vgl. TERHO, H. et al. (2015), S. 17 ff.
[337] Vgl. TERHO, H. et al. (2012), S. 182 ff.
[338] Vgl. REILLY, T. (2010), S. 77 f.
[339] Vgl. TERHO, H et al. (2012), S. 176.
[340] Vgl. REILLY, T. (2010), S. 15 ff.
[341] Vgl. REILLY, T. (2010), S. 51
[342] Vgl. RILLEY, T. (2010), S. 100.

problem, implication and need-payoff.[343]

The third concept is the idea that selling has to evolve from product-centered to solution-centered selling. It means that focus moves away from transactional sales of individual products and towards bundles of products that offer a broader solution. To achieve this, the suppliers create bundled offerings that satisfy multiple customer needs and that competitors cannot replicate. Positive effects of this concept can be especially useful for the medical device suppliers that sell commodity products (also many products from B. Braun). As commodity products are less differentiating, selling them in unique bundles can protect premium pricing.[344] Following figure shows this shift to solution selling.

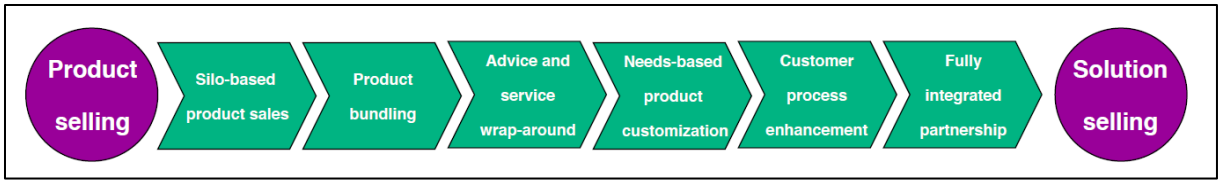

Figure 22: Evolution from product to solution selling[344]

The fourth concept, the concept of “Challenger seller”, is connected to the solution selling and offers an idea of salesperson tendencies that could potentially support practicing of VBS. A “Challenger seller” has in-depth understanding of customer`s business model and uses this knowledge to push customer`s awareness into a desired direction. He essentially educates the customers about new paths that they can follow to increase their competitiveness and business performance.[345] Similar to “Challenger seller”, the idea of consultative selling revolves around a very broad and deep buyer-suppler relationship. Consultative selling is experiencing customer`s everyday challenges as own and understanding their problems in order to build enough knowledge to offer meaningful solutions even if the need was previously not there. Salesperson that employs consultative selling will through customer dialogs study and analyze potential challenges and then teach the customer about how they can overcome them. Finally, he will suggest a relevant solution by pointing out how it satisfies newly discovered customer needs.[346] [347]

The last supporting concept found was the “commercial teaching pitch”. This concept is especially relevant for this thesis as it was used by B. Braun to implement VBS in their sales tools (B. Braun`s application is presented on figure 40). Ultimately, the purpose of “commercial teaching pitch” is to lead the customer`s awareness during the sales presentation from the potential negative consequences in his processes to the potential solutions in offered products. It is a method of leading the sales dialog that comprises many previously discussed VBS concepts.[348] The following figure presents the construction of “commercial teaching pitch”.

[343] Vgl. RACKHAM, N. (1988), S. 76 ff.
[344] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 7.
[345] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 21.
[346] Vgl. https://blog.teamleader.eu (17.04.2019)
[347] Vgl. https://www.managementstudyguide.com (17.04.2019)
[348] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 65 ff.

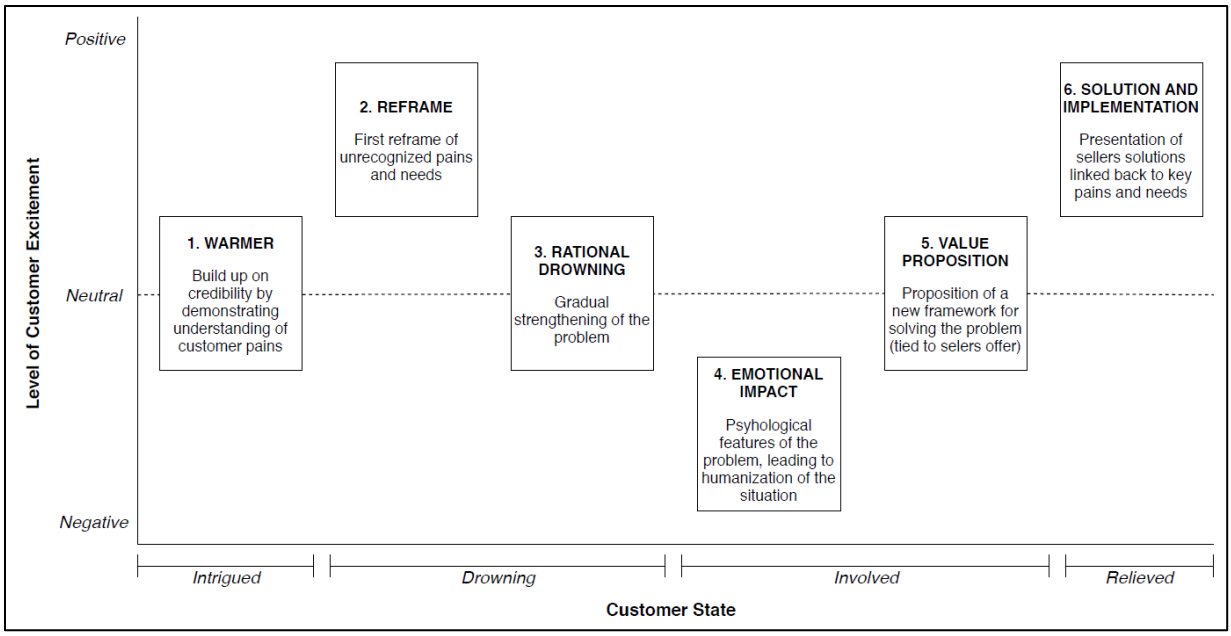

Figure 23: Commercial teaching pitch concept[349]

[349] Vgl. DIXON, M.; ADAMSON, B. (2011), S. 65 ff.

4 Value case

Previous chapters indicated that VBS requires economical and clinical product`s added-value to be sufficiently presented and used. Medical device manufacturers can achieve this by developing sales tools that assist their sales force. These tools are created based on market research and in the end support sales representative`s argumentation at the customer.[350] The goal is to present the best value, where the best value means the ratio between optimal benefits from customer`s point of view and total purchasing costs.[351] How this can be presented is a subject of different approaches, but one of the most powerful concepts is value quantification. With it, medical device suppliers can achieve the following goals:

I. Evidence of significant understanding of customer`s business model.
II. Demonstration of proposed solution`s impacts on that model.
III. Development of sales arguments based on concrete financial effects.
IV. Improvement of decision-making material for the customer when making a purchase.[352]

4.1 Value case as a sales tool

Suppliers can use different value-added models to not only support their own decision making, but to also create efficient tools that aid their selling efforts. One such concept is the value case. The basic definition of a value case is that it is a sales tool that presents added-value received by the usage of a product to the customer.[353] It can be based on previous experiences and data, but it can be also used by the sales representative as a consultative selling model. Such value case is ultimately developed to assist sales with communication and quantification of value.[18] This value quantification tool visualizes the sum of qualitative and quantitative benefits, product`s purchasing price and the costs of other relevant competitor offerings. Another way to describe it is as a ROI calculation, where the ROI comes from the comparison between additional purchasing costs and additional added-value.[354]

Practical examples of this are software applications or value calculators that sales representatives use at the customer to present potential benefits of a certain product.[353] [355] To add practical implications to this research, already existing examples of value cases or added-value calculators in the medical device industry were investigated. In addition to B. Braun`s Product App software (described in chapter 5), two other examples from direct competitors were found and tested. The results can be seen on Appendix 6. Elcam Medical and ICU Medical both offer a product value calculator, which is available on their websites. They are referred to as a “performance calculator” and as a “costs savings calculator”, but they follow the same general structure. Potential customer can insert his own input data, and this allows him to form a customized context for his specific HCO. The customizable variables offered are numbers of beds, products used per patient, processes per year, cost per currently used

[350] Vgl. KOTLER, P.; RACKHAM, N.; KRISHNASWAMY, S. (2006), S. 12.
[351] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 8.
[352] Vgl. KAARIO, K. et al. (2003), S. 96 f.
[353] Vgl. ANDERSON, J. C.; NARUS, J. A. (1998), S. 9.
[354] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 68.
[355] Vgl. ANDERSON, J. C.; NARUS, J. A. (2004), S. 460.

competitor offering and other clinical data. The calculators take this input data and apply some assumptions such as the average length of stay per patient, unit occupancy rate and promoted product`s price. Final result shows an estimate of cost savings per year if the customer used the promoted product.[356] [357] These examples are in line with key findings in the previous chapters, where it was concluded that there is a connection between the ability to present economic benefits and the success of VBS implementation.[358] [359] The following figure presents a summarized overview on the position of VBS and the value case, in relation to medical device sector market environment and relevant parties.

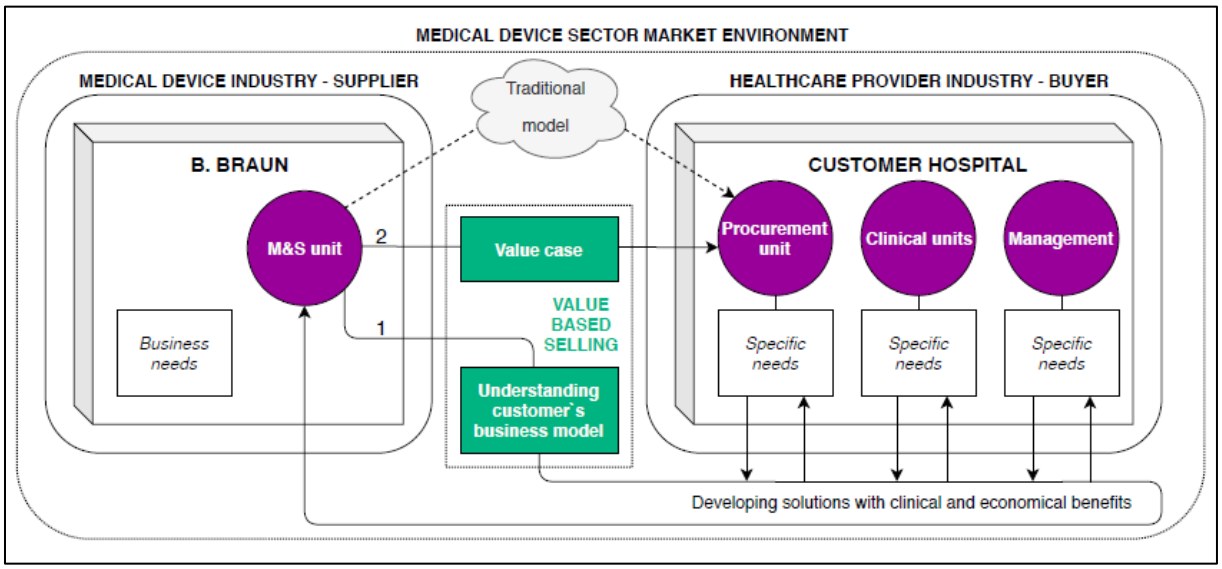

Figure 24: Overview on the position of VBS and the value case

4.2 Creating a value case

Creating a quantifiable model of customer`s benefits is perceived as one of the most demanding aspects when developing M&S strategies.[360] However, it is also one of the most rewarding. Properly made value case will shift the focus in the relationship from prices towards business outcomes.[361] This proves to be especially useful for the relevant sector, where the challenges of increasing pricing pressures are significantly present. To assist sales representatives and to allow them to target higher stakeholders in the hospital hierarchy, solutions that show how a particular offering supports customer`s competitiveness must be presented.[362] Recommendations on how a value case should be developed and how it should function were collected and will be considered in the practical part:

I. The value case should be relevant to customer`s specific situation.
II. The value case should be relevant to the specific offered solution.

[356] Vgl. http://www.icumed.com (28.03.2019)
[357] Vgl. https://www.elcam-medical.com (28.03.2019)
[358] Vgl. TERHO, H. et al. (2012), S. 178.
[359] Vgl. HINTERHUBER, A.; SNELGROVE, T. C. (2017), S. 3.
[360] Vgl. KAARIO, K. et al. (2003), S. 95.
[361] Vgl. KAARIO, K. et al. (2003), S. 96 f.
[362] Vgl. KAARIO, K. et al. (2003), S. 32 f.

III. It must include financial projections and estimates, expressed in monetary values.
IV. The calculation values do not have to be completely precise, as sometimes several assumptions (optimistic or pessimistic) must be made.
V. The content should focus on the main economic changes that will come as a result of the solution`s implementation.
VI. Ideally it should encourage customer to perform his own investigation and more precise financial analysis.
VII. The customer`s perspective should be significantly involved into the value case development process.
VIII. Value case should be able to compare the offered solution to a competitor`s offering.[363]

The logic behind the value case can be best seen in the following figure. This concept, together with previously collected recommendations, will serve as basis for the practical part of this thesis when developing a value case for B. Braun`s product.

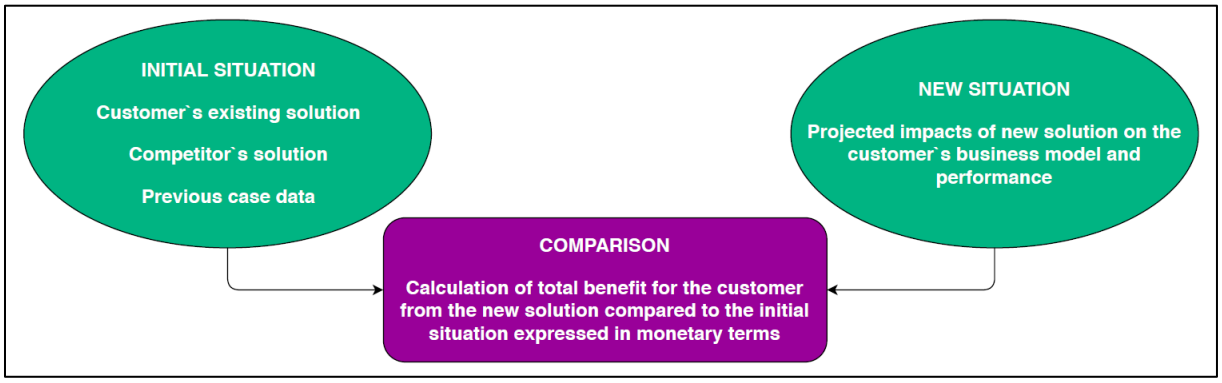

Figure 25: Main concept behind value case calculation[364]

4.2.1 Total Cost of Ownership method

An effective and quantifiable way to present financial benefits, and therefore satisfy value case requirements, is through reduction of costs in the customer`s business. The customer will always have high interests in their total occurred costs over a long term period of time.[365] [366] The value case model should therefore be adaptable to each customer's cost structure and offer an option for future modifications.[367] To satisfy these interests and provide a concrete value case development example, it was decided that Total Cost of Ownership method (TCO) will be used as a basic method for the calculations in the practical part.

The concept of TCO is also highly relevant because of previously mentioned trends in the hospital procurement chapter, where it was discovered that TCO can be used as a method of supplier selection. Previous chapters on the topic of value-based procurement also showed that procurement teams should consider a much more holistic view on the costs of a product

[363] Vgl. KAARIO, K. et al. (2003), S. 96 f.
[364] Vgl. KAARIO, K. et al. (2003), S. 99.
[365] Vgl. KAARIO, K. et al. (2003), S. 32 f.
[366] Vgl. KAARIO, K. et al. (2003), S. 100.
[367] Vgl. ELLRAM, L. M.; SIFERD, S. P. (1993), S. 73.

than just the initial vendor price. EU directive on public procurement (2014/24) has explicitly mentioned the TCO method along with the price to quality ratio as two key aspects in choosing the best supplier`s offer. This allows public procurement departments, such as those in a hospital, to consider more than just the purchasing price and look at all relevant expenses during the product life cycle.[368] [369] The first goal of this sub-chapters is to explain what TCO means and how the method functions, the second goal is to put it in the context of the medical device sector and the third goal is to show how it will assist the value case development.

4.2.2 Concept behind Total Cost of Ownership method

TCO is a concept for costs calculation and it implies that all costs should be considered when evaluating an item instead of just the initial product price.[370] In literature other definitions can be found following a similar concept. One source describes TCO as “an innovative philosophy aimed at developing an understanding of the true cost of doing business with a particular supplier for a particular good or service”.[371] Another source defines it as “an application of activity based costing (ABC) that quantifies the costs that are involved in acquiring and using purchased goods and services.”[372] Application of TCO is important when managing expenditure decisions. Buying organizations must define which costs are most relevant for their business and have the biggest effect. These different types of costs can be attributed to multiple areas such as acquisition, ownership, usage, disposition, ordering, transportation, inspection, storage and disposal. In the end, a TCO analysis will support the selection of appropriate supplier and evaluate procurement decisions and is therefore a part of the strategic cost management.[373] [374] One study researching applications of TCO found out that companies mainly perceived TCO with regards to two themes. First, TCO is deployed to support already active operations and secondly to enable understanding and framework for improvement.[375] Following figure shows three layers of decision types that TCO model supports.

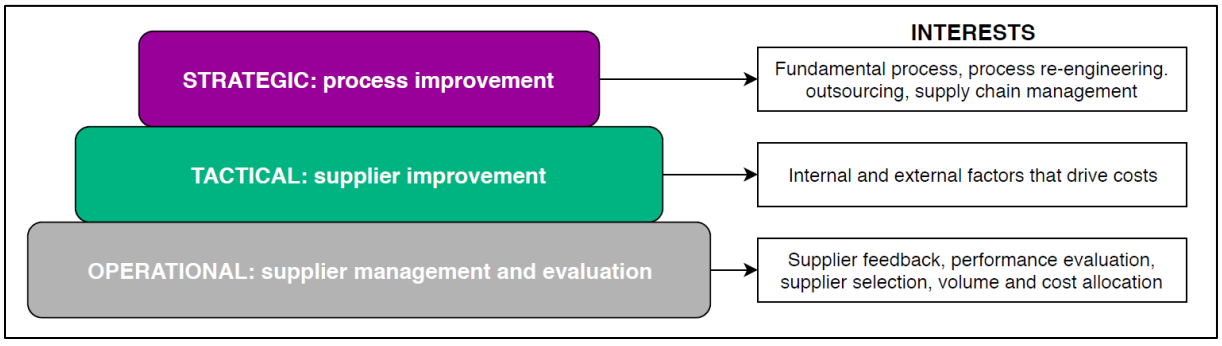

Figure 26: Layers of TCO analysis[376]

[368] Vgl. CAVLAN, O. et al. (2018), S. 2.
[369] Vgl. EUROPEAN COMMISION. (2018), S. 70 ff.
[370] Vgl. ELLRAM, L. M.; SIFERD, S. P. (1993), S. 57.
[371] ELLRAM, L. M. (1994), S. 171.
[372] WOUTERS, M. (2005), S. 167.
[373] Vgl. ELLRAM, L. N.; SIFERD, S. P. (1998), S. 56 f.
[374] Vgl. ELLRAM, L. N.; SIFERD, S. P. (1998), S. 59.
[375] Vgl. ELLRAM, L. N.; SIFERD, S. P. (1998), S. 62.
[376] Vgl. ELLRAM, L. N.; SIFERD, S. P. (1998), S. 67.

4.2.3 Medical device Total Cost of Ownership

Relevant time period

Definitions of TCO indicate that relevant costs are numerous and span across a larger timeline of product`s life than just the purchasing activity. They also indicate that TCO method requires a defined time period in which costs occur. Literature on the topic was researched for an already used time period in which medical device related costs can be calculated. It was found that a joint initiative of the OECD and the EU (SIGMA) provided the term “life-cycle costing” (LCC) in its public procurement guidelines. LLC is a methodology that looks at all costs that are a result of product usage over product`s entire life. It is used to evaluate supplier offerings by taking into account not only purchasing costs, but also all costs occurred during the operation of the product.[377] From the perspective of hospital procurement as a customer, this means that they evaluate costs of a medical device in the context of total costs of care based on entire patient pathway.[378] [379] The same time period as in LLC was used in this thesis as the relevant period in which costs occur.

Costs occurred in a hospital

To understand the customer`s processes, factors on hospital costs had to be analyzed. From analysis so far it was concluded that the initial acquisition costs are of great importance and are therefore the first factor in TCO of a medical device.[377] Secondly, following the definition of LLC, operational costs have to be taken into account. As defined previously, these are all costs that will occur additionally because of product usage. One study confirmed the importance of cost reduction for the customer`s perception of product`s added-value, but also mentioned risk reduction having the same effect.[380] A hospital will consider its costs based on two dimensions: average total length of stay (ALOS) and the rate of hospital acquired complications (HACs). One presents planned and one unplanned operational costs (risks).[381] [382] ALOS is the average time that a patient stays in the hospital and HACs are unwanted adverse events that happen during patient`s stay in the hospital. Both result in increased total costs for the hospital.[383] [384] One study concluded that successful reduction of ALOS leads to a decrease in average costs for the hospital.[381] In addition, two studies were found concerning HACs (also referenced as adverse events), with one stating that 12,7% of patient experience a HAC while being treated and the other one confirming that these events lead to higher total hospital costs.[384] [385] Medical device suppliers can therefore also show added-value by targeting these two dimensions. The following represents a summary on the theory behind both discussed topics, the value case and the TCO method, and serves as basis for the practical part of the thesis:

I. Value case can support the implementation of VBS into M&S strategies.

[377] Vgl. SIGMA. (2016), S. 2.
[378] Vgl. GRAVES, K. (2011), S. 101.
[379] Vgl. MANGAN, B.; LUDBROOK, M. (2018), S. 3 ff.
[380] Vgl. TÖYTÄRI, P.; RAJALA, R.; ALEJANDRO, T. B. (2015), S. 9.
[381] Vgl. STOCK, G. N.; MCDERMOTT, C. (2011), S. 154.
[382] Vgl. BOHLOULI, B. et al. (2017), S. 5 ff.
[383] Vgl. THOMAS, J. W. et al. (1997), S. 489.
[384] Vgl. FORSTER, A. J. (2004), S. 1236 f.
[385] Vgl. BOHLOULI, B. et al. (2017), S. 7.

II. Using a value case can improve the argumentation of sales representatives. This is achieved by presenting financial effects on customer's business model.
III. Customer (hospital) is concerned with the total costs of procured products. In addition, three main areas where costs can occur were defined: acquisition costs, ALOS-related costs and HAC-related costs.
IV. Effective value case can show how the offered product decreases costs in one or more of these areas.
V. TCO method can serve as basis for developing a value case.

5 Value case development

In this part of the thesis a value case on a concrete example was developed. This was performed with the cooperation of the industry partner (B. Braun). The goal was to connect the previously discussed theoretical base with an application from the medical device sector. As previous chapters indicate, VBS can be supported by presenting real life economic benefits expressed in monetary value. This assists the sales representatives with their sales argumentation and enables them to steer customer dialog towards product`s added-value.

The creation of the value case is sectioned into three parts. Firstly, context for the product had to be provided. To achieve this, the example product and its corresponding application were analyzed. Secondly, the actual calculations were performed based on the TCO method. In this part, all costs occurred by the product usage during previously defined LCC time period were considered. Therefore, not only purchasing costs, but also costs generated by operational use and potential clinical complications were analyzed. All calculations were done with a software tool Microsoft Office Excel 2013. The final task was to discuss the results of the calculations and to make conclusions about the possibilities of value case creation and implementation. To set a framework for the practical part, three hypotheses were constructed. They are discussed in the conclusion of the thesis.

H1: Clinical and operational benefits of the example product lead to cost savings in hospital`s daily operations.

H2: Calculations on this example can show that the example product has a lower TCO value compared to the reference product.

H3: Results of the calculation can be used to form a value case, where it can be shown how example product improves customer`s business potential.

Some amount of clinical data had to be collected to support the claims behind the calculations and to develop the product profile. Therefore a literature review was performed on available clinical studies in medical databases PubMed, MEDLINE and ClinicalTrials.gov. Studies examined were in the field of infusion therapy, specifically focusing on medical complications in drug administration during this treatment.

5.1 Product profile

Understanding the product`s features and benefits is the first step in presenting its added-value and forming a concrete value case. Product profile was therefore developed to explain the corresponding therapeutic area, the product itself and finally to analyze the most important product`s clinical and operational benefits.

5.1.1 Infusion therapy

Infusion therapy is the relevant therapeutic area for the example product offered by B. Braun. Around the world, 80% of the patients will at some point receive an infusion therapy during their stay in the hospital and it is therefore widely used clinical procedure.[386] Infusion therapy, is a type of medical treatment based on the administration of medication through a catheter in the patient`s vein (intravenous access). Conditions requiring infusion therapy to be administered are cancer, immune deficiencies, dehydration, electrolytes or water volume depletion, blood volume depletion and different types of infections.[387] [388] [389] In a hospital it represents one of the main activities concerning nurses, which have to be skilled in all aspects of the therapy: clinical indications, expected patient results, side effects, adverse reactions and operational interventions.[390] Since infusion therapy is administered intravenously (through the skin and into the vein), it allows for multiple risks and adverse events, such as patient pain and irritation, phlebitis, catheter occlusion, infiltration, extravasation, venous spasm, infections and thrombosis.[391] HACs like these lead to longer ALOS and can sometimes cause patient`s death.[392] One study suggested that a hospital stay of 5 nights represents a 5,5% occurrence risk of an adverse event related to drugs and 17,6% occurrence risk of getting an infection. Every day that the patient has to stay in the hospital additionally increases the chances of adverse drug event by 0,5% and hospital acquired infection by 1,6%.[393] This data is relevant because these complications negatively affect the hospital as a business and it can therefore be used to present added-value from a product that addresses these risks.

5.1.2 Stopcocks and needle-free connectors

The example product provided by B. Braun is called Discofix® C with Safeflow (also called Discofix® C CS) and is used in the therapeutic field of infusion therapy to help with administration of intravenous fluids and medication.[394] Discofix® C with Safeflow is a device that directs the flow of medication through an infusion set, while enabling multiple drug solutions to be infused at the same time. A nurse or a physician can turn the handle on the product in order to choose which combination of ports will be open/closed (valve-like functionality).[395] The second implication of the product is that it allows for needle-free medication injections, eliminating the need for needles.[396] The product can be broken down into two main components: stopcock and a needle-free connector (NFC). “Discofix® C” is B. Braun`s name for the stopcock and “Safeflow” for the NFC. Both parts offer certain clinical features and benefits for the user.

[386] Vgl. MILLAM, D. A. (1988), S. 34 ff.
[387] Vgl. https://www.health.harvard.edu (29.03.2019)
[388] Vgl. https://www.bbraun.com (29.03.2019)
[389] Vgl. https://www.nhia.org (29.03.2019)
[390] Vgl. JOSEPHSON, D. L. (2004), S. 3.
[391] Vgl. JOSEPHSON, D. L. (2004), S. 92 ff.
[392] Vgl. WAITT. C.; WAITT, P.; PIRMOHAMED, M. (2004), S. 4 f.
[393] Vgl. HAUCK, K.; ZHAO, X. (2011), S. 1071 f.
[394] Vgl. HADAWAY, L. (2018), S. 31.
[395] Vgl. HADAWAY, L. (2018), S. 24.
[396] Vgl. HADAWAY, L.; RICHARDSON, D. (2010), S. 22 ff.

Stopcock

The stopcock is the component that directs the flow of medication fluid through the infusion line and enables multiple connections. It has three main components, body, handle and connection port.[397] First potential complication related to stopcocks is stress cracking. One study showed that stopcocks made from standard materials like polycarbonate presented a risk of material cracking, which could potentially lead to leakage of medications.[398] The reason behind it is the phenomenon of environmental stress cracking (ESC), where chemical agent (eg. medication) together with mechanical stress results in material degradation. ESC is related to 25% of plastic part failures (such as stopcocks).[399] [400] The following figure shows B. Braun`s stopcock (Discofix® C).

Figure 27: Stopcock for infusion therapy[401]

NFC

Second risk for potential complications is microbial (bacterial) ingress. A stopcock is in infusion therapy considered an open system which means that there is risk of bacteria entry, leading to patient suffering from bloodstream infections.[402] Current trends at companies like B. Braun and other competitors in this segment have addressed this issue by combining the stopcock with a NFC which creates a closed system.[402] According to NIOSH, a closed system is defined as any medical device that prevents the exchange of unfiltered air or other contaminants between itself and the environment.[403] The NFC component on Discofix® C with Safeflow serves the purpose of enabling the nurse to inject additional medication without the use of the needle.[404] Because they are considered a closed system, they also minimize or completely prevent the risk of blood stream infection, caused by entry of bacteria.[405] In addition they also provide protection against needle stick injuries and simplify the handling process.[406] The following figure shows B. Braun`s stopcock with the combined NFC technology (Discofix® C with Safeflow).

[397] Vgl. HADAWAY, L. (2018), S. 24.
[398] Vgl. OHAYON, E. (2018), S. 3.
[399] Vgl. JANSEN, J. A. (2004), S. 50.
[400] Vgl. ALTSTÄDT, V. (2005), S. 105.
[401] Vgl. https://www.bbraun.com (01.04.2019)
[402] Vgl. HADAWAY, L. (2018), S. 25.
[403] Vgl. NIOSH. (2004), S. 44.
[404] Vgl. HADAWAY, L.; RICHARDSON, D. (2010), S. 22 ff.
[405] Vgl. CURRAN, E. (2016), S. 2 f.
[406] Vgl. https://www.bbraun.com (02.04.2019)

Figure 28: Stopcock for infusion therapy with NFC[407]

Stopcock with NFC

Discofix® C with Safeflow is B Braun`s stopcock with NFC and is sold to assist the customers in following applications: nutrition therapy, anesthesia, chemotherapy, immunotherapy and neurology. The product combines both previously described technologies of a stopcock and NFC, where the NFC is integrated into the stopcock`s housing as seen on figure 28. It combines the advantages of both components and it therefore forms a closed system, offers resistance to ESC and protects against leakage, contamination and entry of air into the patient`s vein.[408]

5.2 Total Cost of Ownership value calculation

The goal of this calculation was to quantify value that Discofix® C with Safeflow adds to the customer in comparison to another offering. In order to perform the TCO calculation, a framework had to be constructed first. The general concept follows what was already analyzed in the literature review on the topic of value case, best summarized on figure 25. Two potential offerings were compared based on their TCO value. One from B. Braun (Discofix® C with Safeflow) and one from customer`s hypothetical current solution with a standard stopcock. Standard stopcock is defined in the next section. Relevant TCO elements were constructed based on previous conclusions on factors for TCO in a hospital and were grouped in three areas: [1] purchasing costs, [2] operational costs and [3] costs occurred by adverse events. Differentiation between two offers in any of these three areas will lead to a different TCO value. The following figure shows the constructed framework for TCO calculation.

[407] Vgl. https://www.bbraun.com (02.04.2019)
[408] Vgl. https://www.bbraun.com (01.04.2019)

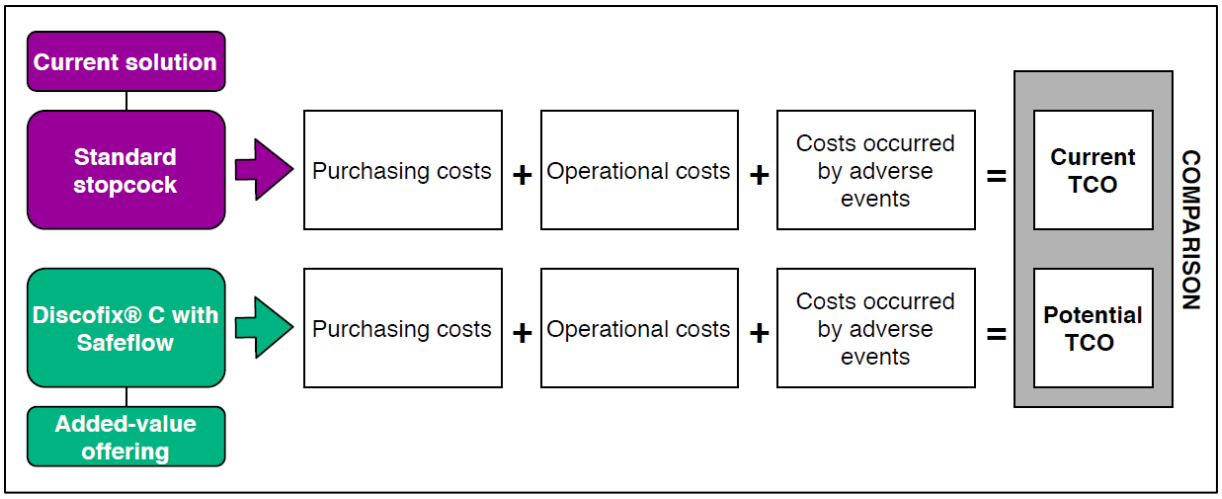

Figure 29: Framework for TCO calculation

5.2.1 Differentiation factors

Literature review on the topic of VBS already showed that this concept needs in-depth knowledge about customer processes and sufficient clinical evidence to support the M&S tools development. To create this value case, the basic requirement was to collect sufficient clinical, operational and economic data about B. Braun`s product. Product marketing brochures and product specification documents were reviewed and the available e-learning module on B. Braun`s intranet was completed. The purpose was to compare the Discofix® C with Safeflow with a standard stopcock solution. Two key features of B. Braun`s offering were identified: [1] stress cracking resistant material and [2] NFC technology. It was therefore concluded that these two product features can contribute to different TCO values of both offerings. The following table summarizes these factors and forms an overview for further calculations.

Costs	Differentiation factor	Predicted effect on TCO
Purchasing	**Selling price**	At the same quantity, lower/higher selling price leads to lower/higher overall purchasing costs.
Operational	**Handling time**	Different product handling times lead to HCWs having to spend less/more time on handling. This generates lower/higher efficiency of staff, impacting the costs.
	Replacement time and costs	Any product failure leads to replacement costs and to higher operating times for HCWs.
Occurred by adverse events	**Rate of HAC**	HACs can lead to longer ALOS, which generates additional treatment costs. Product that prevents risk of HACs can reduce or eliminate this consequence. An example of HAC is microbiological contamination.

Table 10: Overview on differentiating factors that impact TCO value

The reference offer (standard stopcock) was defined as a stopcock, without stress cracking resistant material and without NFC technology. All other properties and features are equal. The standard stopcock is still targeting customers with relatively high safety awareness, by providing needle-free access.

5.2.2 Costs in customer process

This chapter along with its three sub-chapters focuses in detail how the two key product features impact the four main differentiating factors. These impacts will bring either positive or negative results on the TCO of each offering. All TCO calculations that follow were constructed based on the same question: “How does the customer`s TCO change if he switches to Discofix® C with Safeflow from the current solution (standard stopcock)?”. One of the basic preconditions that was set, was that the calculations have to enable customization. This means that the inputs can be changed based on the customer`s specific situation and hospital´s context (eg. annual product demand and nursing salary). Which variables are customizable is described before each part. Each calculation area is also followed by a short analysis of results. All calculations are performed on an annual basis (TCO occurred in one year). Other expenses like storage costs, transportation costs or maintenance costs were not taken into account, because the products are approximately the same size and weight, come in very similar packaging and do not require maintenance. It is also important to note the following assumption that was set from the start: the residual value of both offerings is zero. This is because the devices are intended for single use and for just one patient and always get discarded after the treatment. The following figure shows when different costs occur during the product usage.

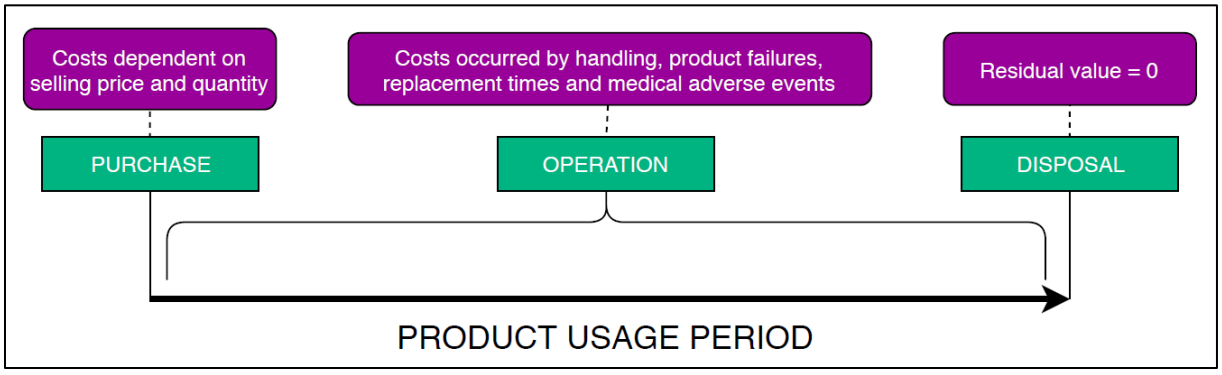

Figure 30: Costs occurred during the product usage period

5.2.2.1 Purchasing costs

The first area of costs that the hospital experiences when operating with Discofix® C with Safeflow are the purchasing costs. These are the most straight forward expenditure in this calculation. The differentiating factor, as shown in table 10, is the selling price. Since the customer buys the same quantity of both offerings, selling price is also the only differentiating factor. B. Braun`s internal data on Average Selling Prices (ASP) was examined and the following was found: the ASP for Discofix® C with Safeflow is 0,95 EUR and the ASP for an average standard stopcock is 0,25 EUR. The customizable variable is annual stopcock demand, which in practice differs based on the hospital size. For the purpose of this calculation,

it was assumed that the hospital uses 10.000 units per year (approximate annual demand of a medium-sized hospital). The following figure shows the result for both offerings.

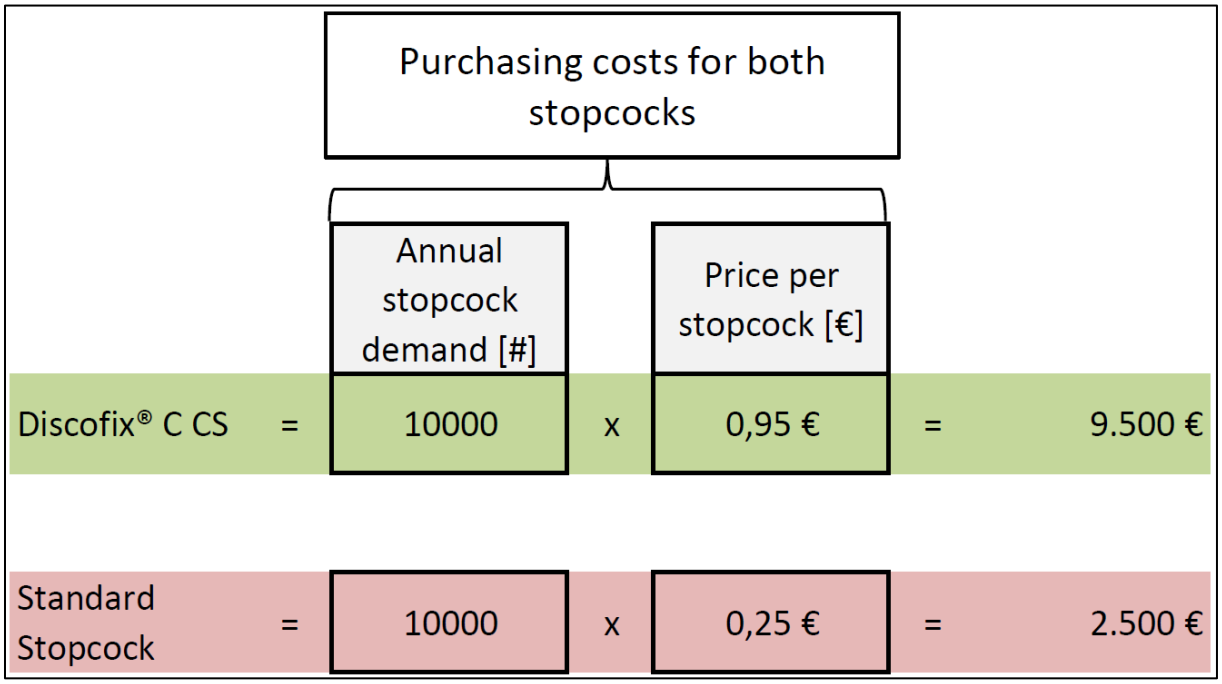

Figure 31: Purchasing costs calculation

Analysis of results

This simple calculation of purchasing costs emphasizes the challenge that B. Braun faces. With a significantly higher ASP compared to the standard stopcock, they are not able to produce effective sales argumentation based on lower purchasing costs alone. If the customer is not aware of distinctive product benefits that B. Braun`s product brings, the standard stopcock will at first seem like the better buying decision as it generates 2500 EUR compared to 9500 EUR in purchasing costs.

5.2.2.2 Operational costs

For the context of this thesis, the operational costs are all costs that the hospital experiences additionally as a result of the product usage. In practice, the product is used for a short amount of time and discarded immediately after use (no maintenance costs or residual value).[409] However, the key differentiating features of Discofix® C with Safeflow can still impact costs compared to a standard stopcock solution. Operational costs were divided based on the two key features of B. Braun`s offering (stress cracking resistant material and NFC technology).

Operational costs reduction because of stress cracking resistant material

Discofix® C with Safeflow can prevent product failure because of its superior material (ESC resistant). Relevant to the hospital setting, one study showed, that some standard stopcocks will crack at the hospital usage. The study compared polycarbonate stopcocks to stress cracking resistant material stopcocks and exposed both groups to different drugs. Results show that polycarbonate stopcocks cracked after 48 hours in 9,4% of the cases when exposed

[409] Vgl. VON AU, F. et al. (2013), S. 2.

to intralipids, in 12,5% cases when exposed to phenytoin and in 100% cases when exposed to aggressive drugs, such as cyclosporine.[410] For the use of this example, the lower, more conservative value (9,4%) was taken.

Every cracked stopcock is a product failure and presents an additional challenge for the hospital and its workers. A cracked stopcock has to be replaced in order to prevent drug leakage, which leads to new purchasing and replacement time costs. Total additional costs of product failure are therefore costs of a new product plus replacement costs. The ASP of the new product is already known and the replacement time was measured at the company`s headquarters with a nursing expert. He was timed and filmed while performing the replacement of a failed stopcock according to appropriate nursing guidelines from center for disease control and prevention (CDC).[411] The average time of 10 simulations was 82 seconds.[412] The customizable variables in this calculation are [1] annual stopcock demand and [2] salary of a nurse per hour, both varying depending on the specific hospital. For this calculation it was assumed that the annual demand is 10.000 (mid-sized hospital) and the salary of a nurse is 20 EUR per hour (hospital in a developed country). The following figure shows the detailed variables and the calculation result for both offerings.

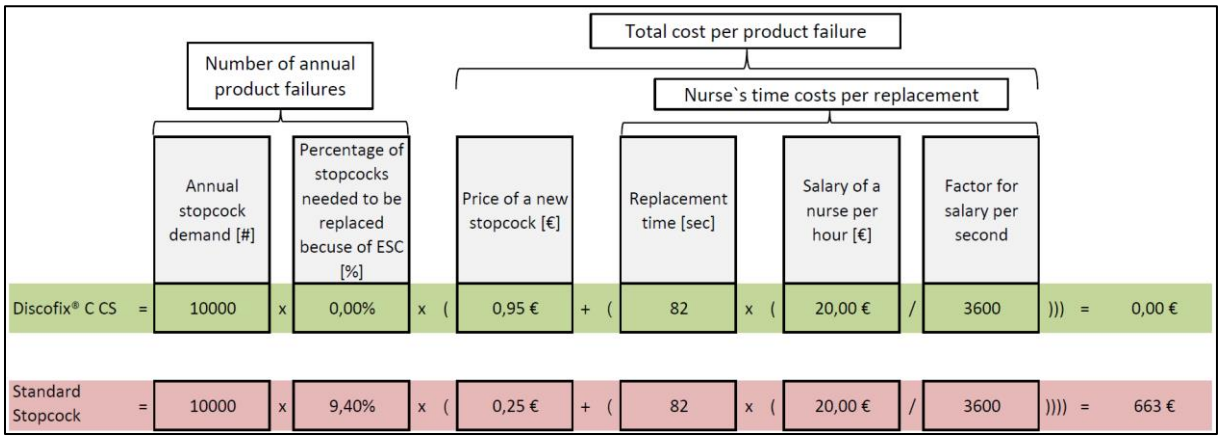

Figure 32: Operational costs (because of product failure)

Operational costs reduction because of NFC technology

Discofix® C with Safeflow can also improve product handling efficiency because of its NFC technology feature. As stated before, the product is used for additional injections of medication during the therapy. Two clinical studies have shown that the average patient receives 13 medications per hospital stay.[413] [414] At each of these medication injections, the stopcock will be used and the nurse will have some amount of a workload. Another internal test was performed with a nursing expert at the B. Braun headquarters to measure this workload. All medical device handling was performed based on official current guidelines (CDC).[415] The first simulation was an injection of an additional medication using the standard stopcock and the

[410] Vgl. OHAYON, E. (2018), S. 3 f.
[411] Vgl. CDC. (2011), S. 54 f.
[412] Based on internal testing with Roell Manuel, Therapy Specialist - Infusion, 14th March 2019, B. Braun Werk P
[413] Vgl. CARVALHO, R. E. F. L. et al. (2013), S. 152.
[414] Vgl. THOMAS, D. (2013), S. 65.
[415] Vgl. VON AU, F. et al. (2013), S. 2.

second one with Discofix® C with Safeflow. After 10 simulations, the average measured total time needed for one medication injection using the standard stopcock was 43 seconds.[416] Additionally, because the standard stopcock lacks the NFC feature, the open port has to be closed with a closing cone to comply with the nursing guidelines (open stopcock would increase the chance of microbial ingress).[417] If the average patient on average receives 13 drugs, this leads to an additional costs of 13 closing cones. The next 10 simulations were done on Discofix® C with Safeflow and the average measured time for medication injection was 33 seconds.[418] No closing cones are needed because of the NFC technology, where the port closes itself automatically.[419] The simulation results therefore show that Discofix® C with Safeflow reduces the handling time from 43 seconds to 33 seconds, leading to process time savings.

In this calculation, the customizable variables are [1] the annual stopcock demand (assumed to be 10.000) and [2] salary of a nurse per hour (assumed to be 20 EUR per hour). The demand for closing cones was taken from the previous mentioned studies (13) and the cost per cone was retrieved from B. Braun`s internal data. Combi Stopper is B. Braun`s closing cone with an ASP of 0,03 EUR. The following figure shows the detailed variables and the calculation result for both offerings.

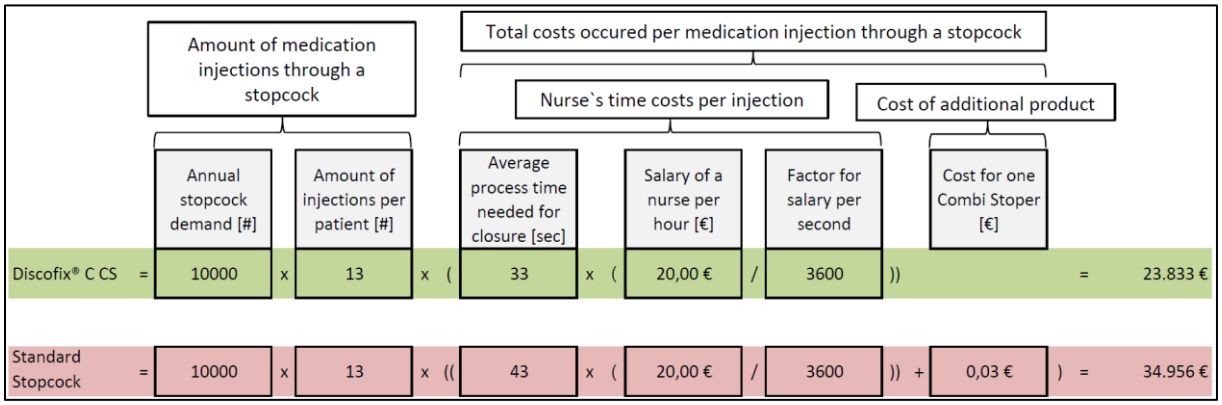

Figure 33: Operational costs (because of handling time savings)

Analysis of results

The two calculations indicate that Discofix® C with Safeflow is able to reduce operational costs in the customer`s processes. Firstly, customer`s current solution (standard stopcock) will potentially have to be replaced with a new one because of product failure. With the set preconditions, the costs occurred in this case are on annual basis 663 EUR for the standard stopcock. Discofix® C with Safeflow completely eliminates these costs. While it could be argued that this savings are not significantly large (at a medium-sized hospital second with an annual stopcock demand of 10.000 units), the potential cost savings generated by higher handling efficiency are much higher. Here, the second calculation showed that handling Discofix® C with Safeflow generates costs of 23.833 EUR, while a process with standard stopcock results in annual costs of 34.956 EUR. The difference occurs because with a

[416] Based on internal testing with Roell Manuel, Therapy Specialist - Infusion, 15th March 2019, B. Braun Werk
[417] Vgl. CDC. (2011), S. 54 f.
[418] Based on internal testing with Roell Manuel, Therapy Specialist - Infusion, 15th March 2019, B. Braun Werk
[419] HADAWAY, L.; RICHARDSON, D. (2010), S. 27 f.

standard solution, every additional medication injection requires not only higher handling time, but also an additional product (the closing cone). The total operational costs at these preconditions are 23.833 EUR for Discofix® C with Safeflow and 35.619 EUR with the standard stopcock solution.

5.2.2.3 Costs occurred by adverse events

The developed product profile shows that Discofix® C with Safeflow enables certain beneficial clinical features to the final user. According to the product`s marketing brochure this features reduce the likelihood of several HACs.[420] Previous conclusions from the theory showed that the rates of HACs impact total hospital costs. According to the product`s brochure (its extract can be seen on Appendix 7) it was concluded that the following HACs can be used to analyze B. Braun product`s advantages: medication error, chemical contamination, microbiological contamination and air embolism. Each of these areas was analyzed to show how exactly Discofix® C with Safeflow affects the occurrence rate and how does this reduced rate affect hospital costs. The following table provides an overview on all adverse events and how B. Braun`s product affects them.

Adverse event	Relevant differentiating feature	Feature benefit
Medication error	Stress cracking resistant material	Prevents drug leakage
Chemical contamination	Stress cracking resistant material	Prevents drug leakage
Microbiological contamination	NFC technology	Forms a closed system
Air embolism	Stress cracking resistant material	Prevents entry of air

Table 11: Overview on relevant adverse events[420]

To produce up to date results, all data on hospital treatment costs was multiplied by an inflation adjustment factor, which was retrieved from the StatBureau (Bureau of Statistics) website.[421] This factor was taken for the period from the published date of the study data to December 2018. The same customizable variable applies in all following calculations is the annual stopcock demand, which was again assumed to be 10.000 units (medium-sized hospital) and is also assumed to be the actual numbers of stopcock used.

Medication error

According to the product brochure, Discofix® C with Safeflow is able to reduce the rate of medication error in infusion therapy. Because of its stress cracking resistant material, cracks in the product`s housing will be prevented, which will eliminate the possibility of medication leakage out of the product.[420] This unique benefit can add value to the customer`s process, as hospitals have to deal with the consequences of medication errors.[422] One study analyzing such errors in 36 USA healthcare facilities determined an incidence rate as high as 1 out of every 5 medication doses, with on average 7% of the errors being potentially harmful to the

[420] Vgl. B. BRAUN MELSUNGEN AG. (2019), S. 9.
[421] Vgl https://www.statbureau.org (15.04.2019)
[422] Vgl. WALSH, K. E. et al. (2009), S. 893.

patient.[423] These medication errors might originate from many different sources. For example 8,7% of medication incidents occur because of wrong medication quantity, however using a Discofix® C with Safeflow cannot affect or prevent this occurrence.[424] Only the relevant medication errors were therefore used for this calculation. Such errors are those that resulted from wrong dosage and they occur in 3,2% of medication doses, according to the study done in USA. Only 15% of the relevant errors were identified to have potential clinical significance, leading to an incidence rate of relevant medication errors with potential clinical complications of 0,48% (15% of 3,2% of all errors).[423] When a medication error occurs it can lead to an adverse drug event, which on average results in 3060,7 EUR additional hospitalization costs.[425] These costs were adjusted for inflation (factor of 1,04) in the period from December 2015 to December 2018.

As already mentioned, the standard stopcock crack rate is 9,4%, while B. Braun`s product eliminates this occurrence completely. For this reason, it was assumed for the purposes of this calculation, that Discofix® C with Safeflow reduces the likelihood of medication errors by at least this amount. This results in a decreased factor for risk of medication error of 0,906 compared to an unchanged factor of 1 for the standard stopcock. The following figure shows the detailed variables and the calculation result for both offerings.

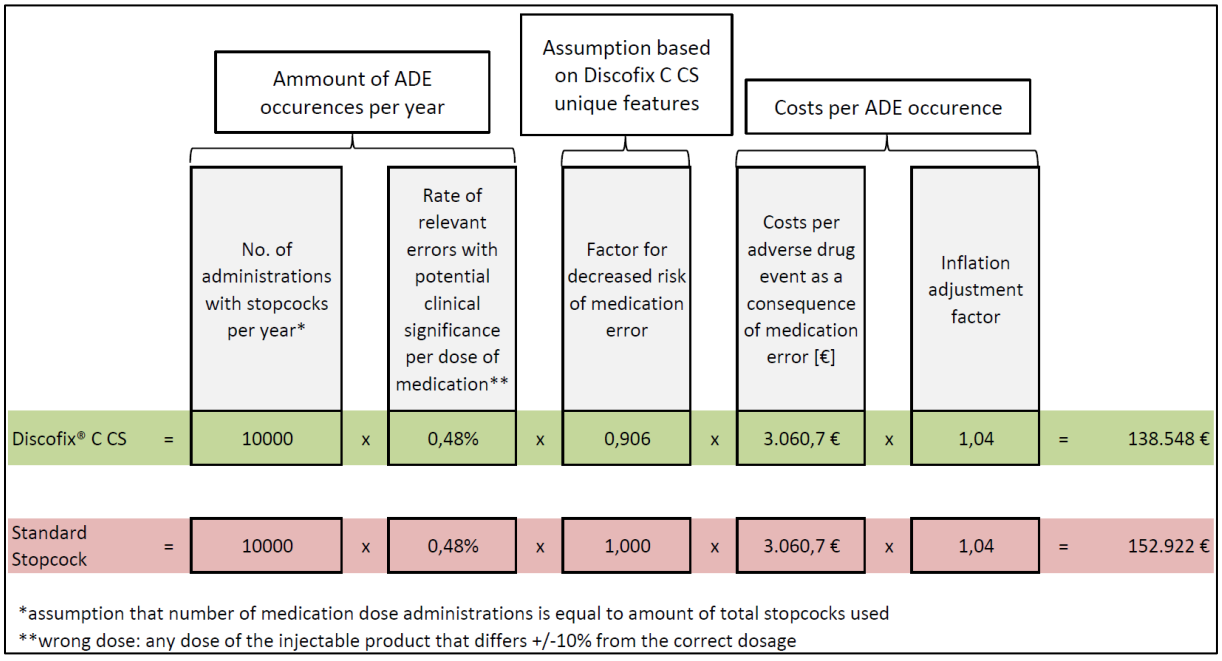

Figure 34: Costs occured by medication error

Chemical contamination

The calculation of costs occurred by chemical contamination was based on the same differentiating product feature of Discofix® C with Safeflow. Prevention of leakage is beneficial because it offers higher safety for the nurse or physician when handling drugs.[426] As not all drugs used are harmful or aggressive, only the hazardous drugs have to be taken into account

[423] Vgl. BARKER, K. N. et al. (2002), S. 1900 ff.
[424] Vgl. NHS. (2007), S. 8.
[425] Vgl. SOUSA-PINTO, B. et al. (2018), S. 7.
[426] Vgl. B. BRAUN MELSUNGEN AG. (2019), S. 9.

to form a realistic image. According to CDC, working with or near HDs (antineoplastics) in healthcare settings may cause skin rashes, infertility, miscarriage, birth defects, leukemia or other types of cancer.[427] Therefore, an additional customizable variable was set instead of the annual stopcock demand. This is the number of HCWs handling hazardous drugs (antineoplastics), which was assumed to be 50 to represent a medium-sized hospital. Clinical research has shown that there is an 10,65-fold increase in risk of cancer development by population exposed to these drugs, such as nurses that operate with cytostatics.[428] To calculate the amount of cancer occurrences per year, a risk rate for cancer development in non-exposed population had to be defined. Based on official data from a GLOBOCAN 2018 report on cancer incidence rate, the risk rate in non-exposed population was determined to be 0,24%.[429] If the healthcare worker suffers from developing cancer because of antineoplastic exposure, this will on average lead to 26.600 EUR in treatment costs.[430] These costs were adjusted for inflation (factor 1,11) in the period from December 2010 to December 2018. The same statistical data about leakage applies as with the medication error calculation (9,4% cracked stopcocks). It was therefore determined that the factor for decreased risk can be calculated by the same principle (0,906). The following figure shows the detailed variables and the calculation result for both offerings.

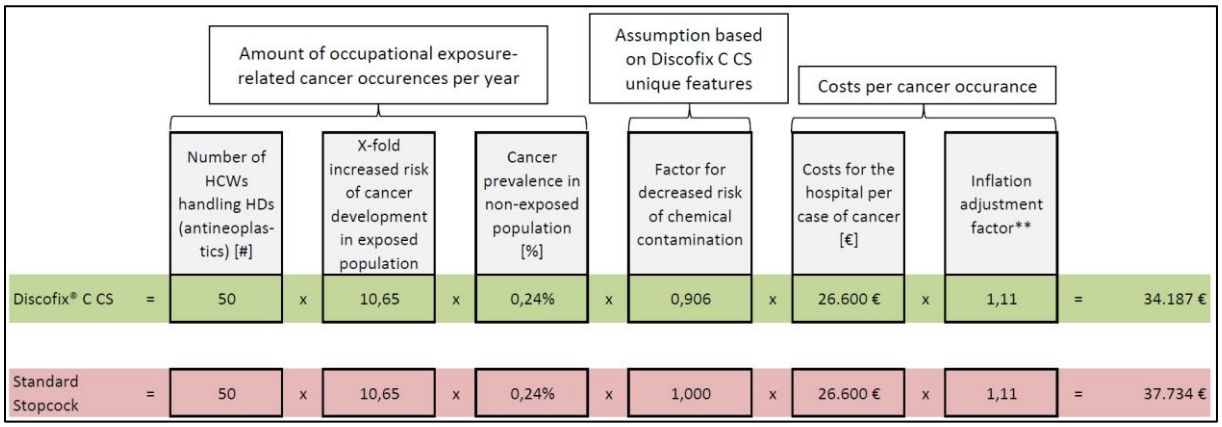

Figure 35: Costs occured by chemical contamination

Microbiological contamination

Microbiological contamination in this context is defined by WHO as “an infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility.”[431] Specific HACs, which are relevant to infusion therapy products, are the central line associated bloodstream infections (CLABSI). An occurrence of CLABSI leads to additional ALOS of 4 to 14 days and generates average additional hospital costs of 8615 EUR as data for European countries suggests.[432] These costs were adjusted for inflation (factor 1,14) based on the period from December 2008 and December 2018.

[427] Vgl. CDC. (2004), S. 2 ff.
[428] Vgl. SKOV, T. et al. (1992), S. 855.
[429] Vgl. BRAY, F. et al. (2018), S. 5.
[430] Vgl. https://www.bbraunforsafety.com (18.04.2019)
[431] WHO. (2002), S. 1.
[432] Vgl. WHO. (2011), S. 21.

Because of the NFC technology, Discofix® C with Safeflow forms a closed system, while a standard stopcock is considered as an open system.[433] An open system in infusion therapy is associated with higher risk of infections. One recent study from 2015 suggests that using an open system leads to 10,545 times increased risk of patient contracting CLABSI.[434] A report from National Healthcare Safety Network suggests an average CLABSI incidence rate of 0,8 per 1000 days of central infusion line connection usage.[435] The difference in both offers was calculated based on the average CLABSI incidence rate multiplied by increased risk of both offerings (1 for Discofix® C with Safeflow and 10,545 for standard stopcock). The customizable variable set was number of device-days with central line connection, which was assumed to be 2000 (an approximation for a medium-sized hospital). The following figure shows the detailed variables and the calculation result for both offerings.

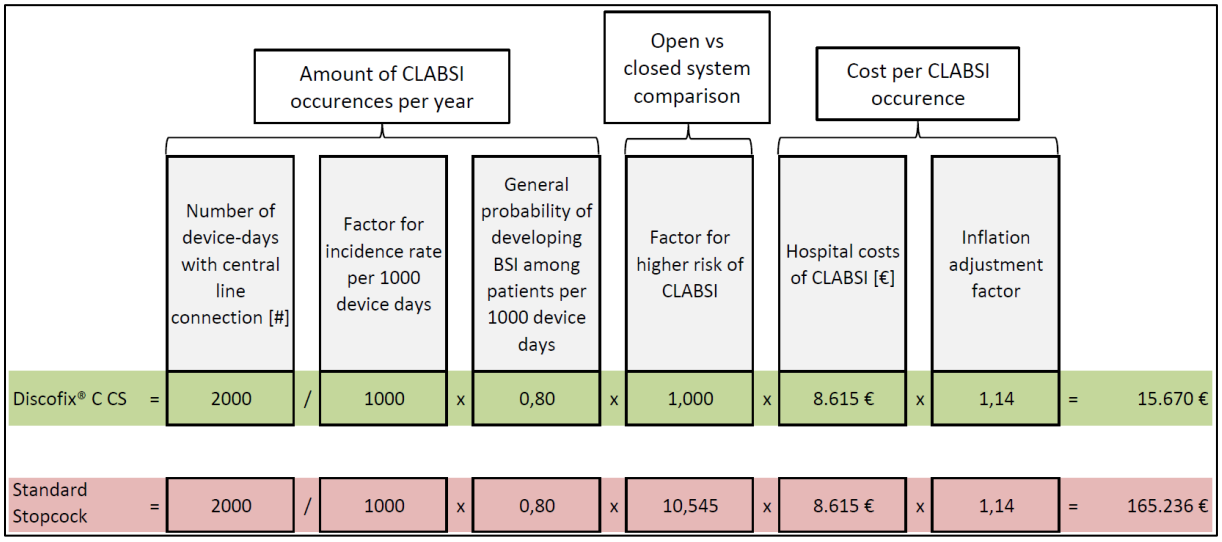

Figure 36: Costs occured by microbiological contamination

Air embolism

The final area of HACs concerns vascular air embolism which is a result of air entering the patient`s vascular system where it then travels towards the heart. This can lead to cardiovascular collapse or death, however it is considered as a rare event.[436] The stress cracking resistant material of Discofix® C with Safeflow offers safety benefits as it eliminates the possibility of air entering because of the cracks in the material.[437] One study showed that the incidence rate of air embolism amounts to 0,2% (data for prevalence among all hospitalized patients).[438] Some example diagnosis associated with air embolism symptoms can be pulmonary thromboembolism, pulmonary edema, septic or cardiogenic shock, stroke and others. A large entry of air (above 50 mL) is generally lethal for the patient.[439] Average relevant hospital costs per case of acute pulmonary embolism are 8764 dollars.[440] These costs were adjusted for inflation (factor 1,11) based on the period from December 2010 and December

[433] Vgl. HADAWAY, L. (2018), S. 25.
[434] Vgl. RUNDJAN, L. et al. (2015), S. 4.
[435] Vgl. DUDECK, M. A. et al. (2011), S. 800.
[436] Vgl. GORDY, S.; ROWELL, S. (2013), S. 73.
[437] Vgl. B. BRAUN MELSUNGEN AG. (2019), S. 9.
[438] Vgl. ANDERSEN, D. K. et al. (2015), S. 381.
[439] Vgl. COOK, L. S. (2013), S. 30.
[440] Vgl. FANIKOS, J. et al. (2013), S. 128.

2018. As the data was expressed in dollars, a currency factor of 0,85 was added to generate results in EUR (average exchange rate in 2018).[441]

The same statistical data about leakage applies as with the medication error and chemical contamination calculation (9,4% cracked stopcocks). It was therefore determined that the factor for decreased risk can be calculated by the same principle also for air embolism (0,906). Because the study on incidence rate (0,2%) is based on the number of hospitalized patients, another customizable variable was used: average number of stopcocks used per patient. It was assumed that on average 3 stopcocks are used per patient (represents a non-specialized hospital setting). The following figure shows the detailed variables and the calculation result for both offerings.

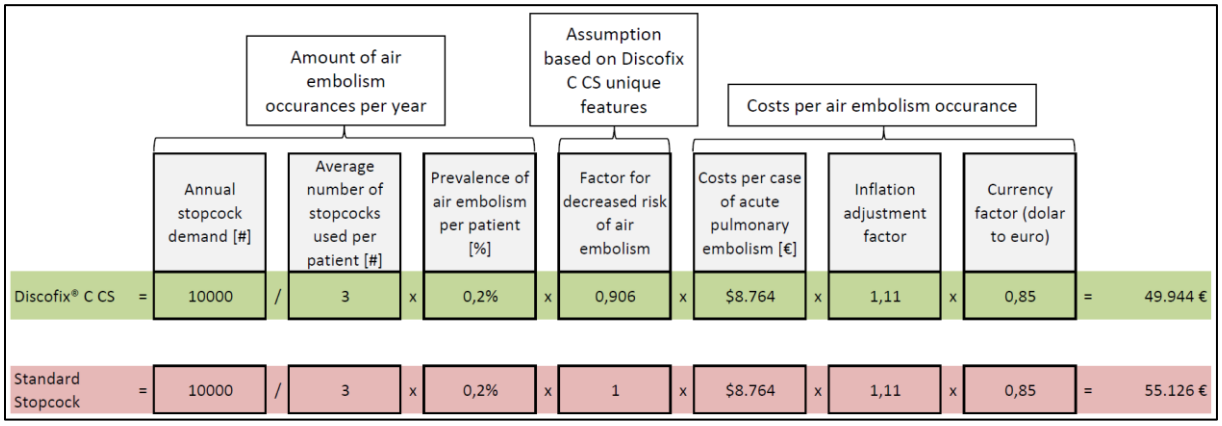

Figure 37: Costs occured by air embolism

Analysis of results

The negative effects on costs from adverse events can be seen in each of the calculations. With expensive treatments, even the relatively low incidence rates can potentially lead to significant financial consequences. All four calculations showed that Discofix® C with Safeflow eliminates some portion of these additional costs.

Three out of four HAC areas showed similar results in terms of proportion. Medication error, chemical contamination and air embolism results all had a difference of about 10% between the two TCO values. This was because they were all influenced by the same product feature which eliminated their incidence rate by the same amount (stress cracking resistant material). However, in the area of medication errors, the two products showed the biggest difference in absolute numbers (138.548 to 152.922 EUR), compared to air embolism (49.944 to 55.126 EUR) and chemical contamination (34.187 to 37.734 EUR). Chemical contamination in this case showed the smallest impact, even though the consequences are the most expensive (26.600 EUR per cancer case). This was because the preconditions were set as a medium-sized hospital with only 50 nurses handling HDs. In a chemotherapy-specialized unit such as oncology ward, this area of HACs would have a much larger impact.

The one area of HAC that stood out was microbiological contamination. Here, the NFC

[441] https://www.exchangerates.org.uk (18.04.2019)

technology of Discofix® C with Safeflow prevented a significant, more than a 10-fold increase in rate of incidence that occurs with a standard (open system) stopcock. The final results show, that with the set preconditions, the B. Braun`s offer leads to 15.670 EUR and the reference offer to 165.236 EUR additional annual microbiological contamination (CLABSI) related costs. The difference could be argued as very high, but the impacts of hospital acquired infections were already emphasized by WHO. These infections affect a large number of patients, they produce longer ALOS values, lead to more patient deaths and present high excess costs. In Europe alone, hospital acquired infections (like CLABSI) generate approximately 7 billion EUR additional costs annually.[442] To confirm the usability of generated results, other competitors of B. Braun were also researched. The goal was to find similar calculations by another manufacturer in this segment and therapy. It was discovered that a direct competitor from USA, Becton Dickinson (BD), performed a similar calculation on the topic of microbiological contamination and its corresponding infections. Their product`s website for MaxPlus™ clear needle-free connector has a clinical information brochure that shows a study performed on the rate of bloodstream infections in 350-bed healthcare facility. They show that their product with NFC technology reduces infection rates and generates 241.000 EUR cost savings over a half year period (measured in 2007 in an intensive care unit).[443] The extract from the Becton Dickinson calculation can be seen on Appendix 8.

5.2.3 Analysis of Total Cost of Ownership values

Based on the results, it can be concluded that using Discofix® C with Safeflow leads to a lower TCO value in product usage compared to the standard stopcock. The annual TCO value for B. Braun`s offering was 271.682 EUR compared to 449.137 EUR for the standard solution, resulting in 177.456 EUR annual TCO difference (with the set preconditions). In comparison to both, purchasing and operational costs, the costs occurred by adverse events (HACs) were the largest hospital expenditure for both offerings. The following figure shows the result of calculated TCO values.

		Purchasing costs		Operational costs			Costs occured by adverse events							
		Purchasing costs		Process time savings		Product failure	Microbiological contamination		Medication error		Air embolism		Chemical contamination	TCO value difference
Discofix® C CS	=	9.500 €	+	23.833 €	+	0 €	+ 15.670 €	+	138.548 €	+	49.944 €	+	34.187 €	= 271.682 €
Standard Stopcock	=	2.500 €	+	34.956 €	+	663 €	+ 165.236 €	+	152.922 €	+	55.126 €	+	37.734 €	= 449.137 €

Figure 38: Final results of TCO calculation

The results show that the only area where B. Braun`s product led to higher costs was purchasing (9500 EUR to 2500 EUR). This was due to higher ASP of Discofix® C with Safeflow, which was in this case above the alternative product`s ASP and it could be argued that it is a much more expensive product. Procurement officer that looks only at the short term

[442] Vgl. WHO. (2011), S. 21.
[443] Vgl. BECTON DICKINSON. (2019), S. 4.

purchasing costs, would likely reject B. Braun`s offering. However, all other elements in this calculation go in favor of B. Braun.

Most significant contributor to the difference of medical device`s TCO value were costs occurred by adverse events (in total 238.348 EUR to 411.019 EUR). With these preconditions, just one incidence of CLABSI, air embolism or a cancer case, can eliminate the whole difference from initial purchasing costs. While B. Braun`s offering does not completely eliminate the risk for adverse events, it offers a reduction of HAC incidence rates compared to the alternative in every area. Why adverse events resulted in by far the biggest absolute costs savings could be explained by the ratio of product`s price point to the costs of HACs consequences. In the big picture of a hospital, both products could be considered cheap (compared to other medical equipment). However, they still have an influence on much larger treatment costs. Ultimately, a product that costs 0,25 – 0,95 EUR has an impact on the likelihood of a HAC that leads to several thousand EUR additional treatment costs.

The second largest beneficial area for B. Braun`s offering were operational costs based on the product handling efficiency. This part of the calculation showed a difference between both products of 11.112 EUR (23.833 EUR compared to 34.956 EUR). A sales representative arguing on this costs alone could already show a lower TCO value of Discofix® C with Safeflow. Finally, operational costs resulting from product failure did not provide a high advantage for B. Braun`s product. While this was the only area where B. Braun`s product managed to completely eliminate costs (0 EUR to 663 EUR), these costs savings would not generate a good enough sales argumentation to compensate for the higher purchasing costs.

Customer customization and personalization

The TCO calculation followed recommendations from the theory, therefore customizable variables were enabled. Changing these variables enters different input values into the calculation and generates different results. As every customer is different, it is highly likely that variables would be changed at every sales pitch. These changes would most reflect the size, country of origin and the purpose of the hospital. To see these effects on the final TCO result, multiple customizable variables were modified. This allows for a representation of different potential customer`s situations. The variables changed were based on the hospital size (affects annual stopcock demand), hospital`s country of origin (affects salary of a nurse per hour) and purpose (affects number of HCWs handling HDs). The following list represents 12 different hypothetical hospitals (customers). Hospital 8 is based on the performed example.

a) Small-sized hospital in a developing country without oncology unit (Hospital 1)
b) Small-sized hospital in a developing country with oncology unit (Hospital 2)
c) Small-sized hospital in a developed country without oncology unit (Hospital 3)
d) Small-sized hospital in a developed country with oncology unit (Hospital 4)

e) Medium-sized hospital in a developing country without oncology unit (Hospital 5)
f) Medium-sized hospital in a developing country with oncology unit (Hospital 6)
g) Medium-sized hospital in a developed country without oncology unit (Hospital 7)
h) Medium-sized hospital in a developed country with oncology unit (Hospital 8)

i) Large-sized hospital in a developing country without oncology unit (Hospital 9)
j) Large-sized hospital in a developing country with oncology unit (Hospital 10)
k) Large-sized hospital in a developed country without oncology unit (Hospital 11)
l) Large-sized hospital in a developed country with oncology unit (Hospital 12)

Different TCO calculations were performed on the basis of these 12 hypothetical hospitals to analyze which factors most contribute to the TCO difference. The chosen variables and final TCO results can be seen in the following table.

Hospital	Annual stopcock demand	Salary of a nurse/hour	Number of HCWs handling HDs	Annual TCO value	
				Discofix® C CS	Standard stopcock
Small-sized hospitals					
Hospital 1	1.000	10 €	0	22.558	39.566
Hospital 2	1.000	10 €	20	36.233	54.660
Hospital 3	1.000	20 €	0	23.749	41.140
Hospital 4	1.000	20 €	20	37.424	56.234
Medium-sized hospitals					
Hospital 5	10.000	10 €	0	225.578	395.661
Hospital 6	10.000	10 €	50	259.765	433.396
Hospital 7	10.000	20 €	0	237.494	411.403
Hospital 8	10.000	20 €	50	271.682	449.137
Large-sized hospitals					
Hospital 9	100.000	10 €	0	2.255.777	3.956.613
Hospital 10	100.000	10 €	500	2.597.649	4.333.955
Hospital 11	100.000	20 €	0	2.374.944	4.114.032
Hospital 12	100.000	20 €	500	2.716.816	4.491.374

Table 12: TCO results at different inputs

When customized for different customer contexts, costs follow a predictable pattern by rising linearly with the size of the hospital. This means that the TCO value with both products will be the highest in the large-sized hospitals, because the products are used in a higher quantity. Salary of the nurse per hour was assumed to be twice as high for a hospital in a developed country compared to the developing country, however it had the lowest effect on the final TCO values. This is because it only comes into question at the operational costs and does not affect the biggest expenses, which are the costs occurred from adverse events. Finally, the number of HCWs handling HDs (hospitals with chemotherapy units) also visibly contributes to the final result and can therefore be concluded as an important variable when performing sales pitches at the hospitals with an oncology (or other HD-handling sections) unit.

It could be argued that the most important pattern is how the absolute difference between TCO values changes when the hospital size, which affects annual stopcock demand, increases. For example, taking three differently sized hospitals, with all three having a chemotherapy unit and the same country of origin (number of HCWs handling HDs and nurse`s salary per hour are equal), major differences in savings can be noticed. Hospitals 4, 8 and 12 are such an example. The difference between usages of both products in case of hospital 4 is 18.810 EUR (standard stopcock TCO value reduced by Discofix® C with Safeflow TCO value). When looking at the context of a medium-sized hospital with an already larger product usage, such as hospital 8, this difference does not stay the same but actually increases proportionally to 177.455 EUR. Even larger savings occur when calculating for a large-sized hospital, where the difference of TCO values equals to 1.774.558 EUR. Even though the hospitals in this analysis were hypothetical and the actual variables would vary on an even bigger scale, it can be concluded that the bigger the product usage, the bigger the savings generated from switch to B. Braun`s product.

5.2.4 Value case formation

This chapter serves as the basis for the value case implementation. The goal was to confirm if the results of TCO analysis go in line with the conclusions from the literature review on the topic that was done the in previous chapters. As it was suggested in the theoretical part, a value case needs to be presented from the customer`s perspective and has to offer evidence of significant understanding of customer`s business model. The TCO calculation fulfills these requirements because it directly calculates customer costs, occurred in his own daily processes. All cost areas were calculated from the hospital`s perspective and clinical evidence gained from previous medical experience was used to support the facts. The next requirement was that the calculations in the value case need to include financial projections expressed in monetary value. On top of that, theory also suggests that the content should focus on main economic changes that will come as a result of the solution`s implementation. How this was fulfilled can be best visualized on figure 39 (results based on the original TCO calculation). The graph presents how B. Braun`s product generates quantifiable economic benefits in the form of reduced total costs. The green part of the bar corresponds to the final cost savings for the customer.

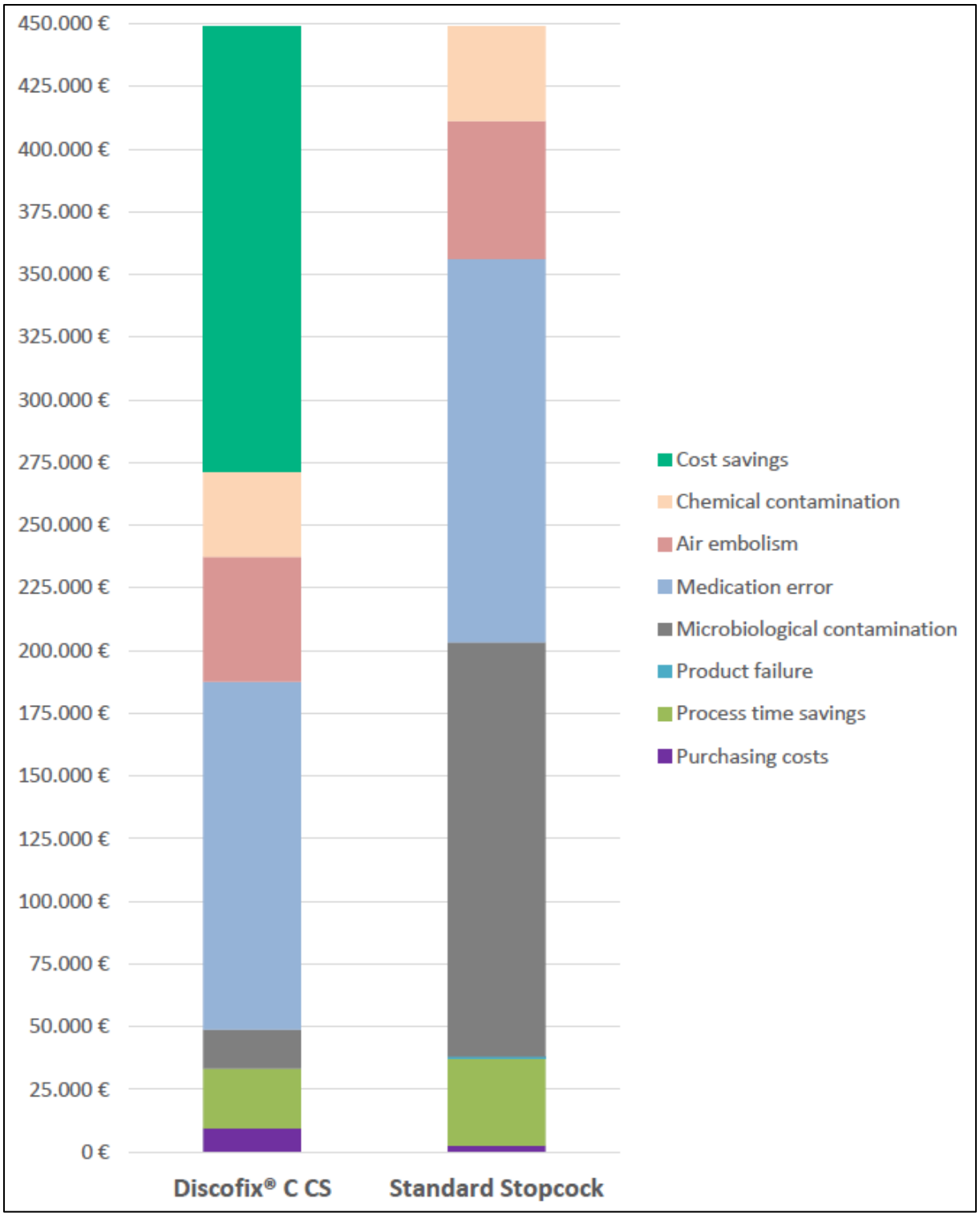

Figure 39: Visualization of TCO results

Next suggestion from the literature review is that the calculation values do not have to be completely precise, but that they need to encourage the customer to be interested in discussions based on value of the product. The TCO analysis shows that the results can aid the sales representative in keeping the customer`s interest even after initial price discussions. The higher purchasing costs of B. Braun`s product is the only area where the offer seems less attractive. All other areas, especially the costs occurred because of adverse events, could potentially assist the sales representative with steering the conversation to total added-value

of the product. The final literature recommendation was that a value case should enable comparison between company`s product and the similar alternatives. The example in this thesis showed how Discofix® C with Safeflow performs in direct comparison with a standard stopcock. The standard stopcock offer can be replaced by any other competitor or even multiple competitors. As long as the B. Braun`s offer has unique benefits (like the two in this example), it can be calculated that it has a different TCO value.

5.3 Value case implementation

The goal of this chapter is to define how a value case can be implemented to serve the larger purpose of VBS oriented M&S strategies. Firstly, it should be noted that arguing on value and performing TCO calculations is not exclusively limited to B. Braun. During the research for the practical part of this thesis, at least three other direct competitors were found to employ a similar approach: ICU Medical, Becton Dickinson and ELCAM Medical (this can be seen on Appendix 6 and 8). Implementation of VBS and value-based sales tools is also not limited specifically to the medical device industry.[444]

One study analyzed different companies with already established success in VBS and proposed practical framework how a company can integrate this philosophy into sales tools. It was suggested that there are two stages: planning and implementation. For the example value case, the most relevant tasks within these stages are [1] value analysis, [2] value proposition development, [3] sales tools preparation, [4] value quantification and [5] value proposition communication.[445] Another study suggested that companies should invest resources and effort in VBS research by emphasizing that expenses spent on acquisition of customer-related data, their operations and business models, serve as an asset for sales tools improvement. These tools, such as a value case, also allow the sales representatives to communicate value more effectively.[446] A challenge in producing such sales tools concerns the ability to quantify the features and benefits of a product. It has to be shown how and where the product has a substantial potential to impact customer`s business success. The conclusion of this study was that even when it is impossible to precisely quantify the value of a product, a potentially more important aspect of VBS sales tools is making the value opportunity visible and interesting to the customer.[447] Literature also suggests other similar methods as performed in this thesis. Two studies researching industry practices identified that the terms “value calculators”, “quantified reference stories”, “lifecycle calculations” and “return-on-investments studies” were used by multiple industry experts as descriptions of their own VBS-supporting methods.[447] [448] Another research also contributed to this topic by presenting, implementing and testing a sales tool based on the rate-of-return value for the customer`s process. It emphasized that quantified customer benefits can be divided into direct, indirect and hard-to-estimate categories. In addition, the researchers argued that these kind of sales tools can aid targeting customer

[444] Vgl. TÖYTÄRI, P.; RAJALA, R. (2015), S. 102 f.
[445] Vgl. TÖYTÄRI, P.; RAJALA, R. (2015), S. 104.
[446] Vgl. TERHO, H. et al. (2012), S. 183.
[447] Vgl. TERHO, H. et al. (2012), S. 180.
[448] Vgl. TÖYTÄRI, P.; RAJALA, R. (2015), S. 106.

stakeholders who are higher in the organizational hierarchy and found out that especially hesitant buyers appreciate the concrete visualization that the sales tools can provide.[449]

B. Braun`s digital sales tool

The example value case, and its corresponding TCO analysis, that was done in the practical part of this thesis will in the end be used as a part of the VBS-supporting sales tool at B. Braun. In order to show how this integration works and benefits their sales process, this tool was analyzed. To complete this task, the B. Braun`s intranet was researched, specifically the “B. Braun Knowledge Center”. All following information was collected at company`s headquarters and on their intranet.

To support sales performance and use VBS in practical implications, the company developed innovative digital sales tools. Their goal is to increase sales force productivity and quality of customer interactions. A sales representative can use these tools before or during the sales pitch to potentially improve outcomes. B. Braun has so far identified many benefits in using these digital sales tools, such as [1] increased consulting quality, [2] real-time information, [3] up-to-date visualization, [4] ability to consult on a customer`s process and [5] interactive functions at the sales pitch. The tools are basically a knowledge platform for the sales representative, with multiple databases such as benchmarking data, product data, local documents, handling instructions, reports and others. This goes in line with the conclusions on the importance of customer-centered data from the literature review on VBS.

The relevant digital sales tool for the value case in this thesis is called the “Product App”. It is a tablet-based application that the sales representative uses at the customer to retrieve important data and argumentation. The sales representative can use it on his electronic device (eg. iPad) and it enables him to retrieve product-specific data to support his sales pitch. Within the Product App, there is a specific type of messaging, intended to lead and steer the conversation. This messaging is in B. Braun known as the “Insights4Value” and it is a cross-divisional marketing and sales methodology that improves customer dialogs. The purpose behind it is to identify the hidden problems within customer`s everyday process and then offer a unique solution with a certain product. Ultimately, it enables the sales representative to deliver the right message, at the right time and for the right person. Figure 40 shows the messaging behind the Product App and offers an overview on the structure of the content. It can be seen how the messaging influences customer`s excitement level as the sales pitch progresses. The concept behind “Inisghts4Value” was developed based on the idea of a “commercial teaching pitch”, which was also presented in the theoretical part as one of the potential supporting concepts of VBS.

[449] Vgl. LINDSTRÖM, J. (2014), S. 87 ff.

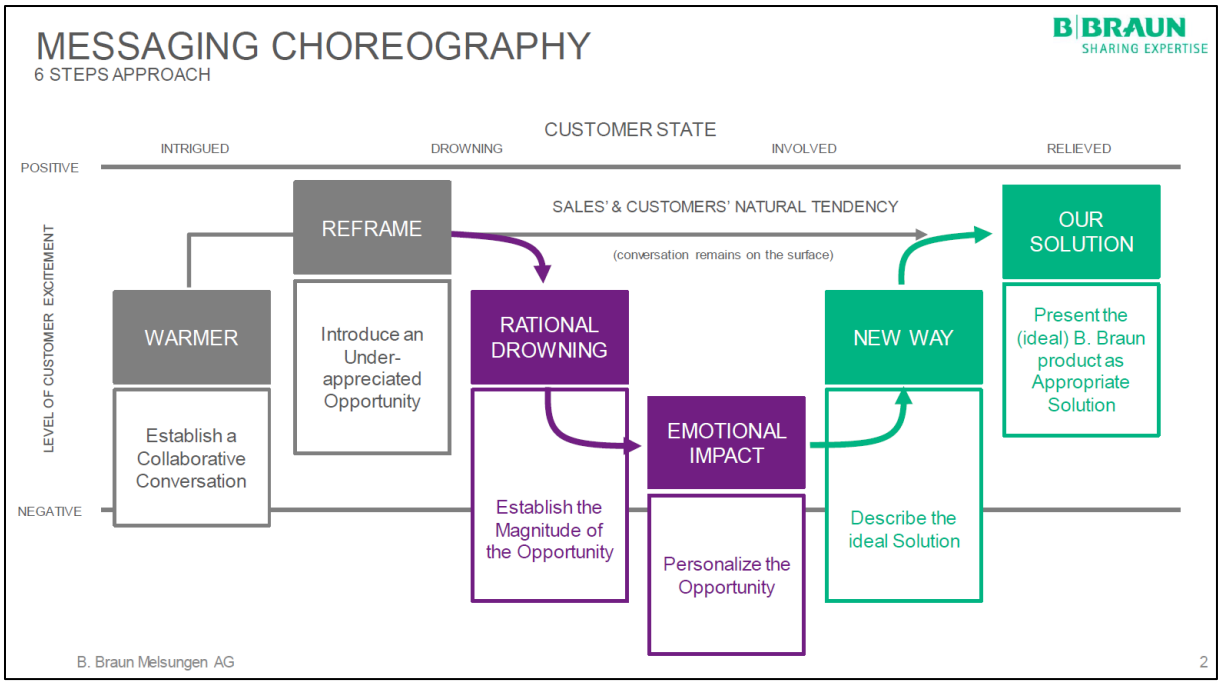

Figure 40: Messaging behind the Product App (Insights4Value)

The value case is therefore not the only part that the sales tool focuses on. B. Braun`s database was analyzed for already existing examples of products integrated into the digital sales tools. Figures 41 and 42 show example screenshots from the Product App. It can be seen that this sales tool offers multiple options in terms of available data for the sales representative. First, he can present to the customer exactly what the potential risks are and then follow with how a product offers a solution (figure 41). When the customer is aware of the risks that lead to costs and negative effects in his own process, the sales representative can go in detail about the product`s features and benefits. If needed, competitor solutions can also be discussed as the Product App offers access to benchmarking data (figure 42).

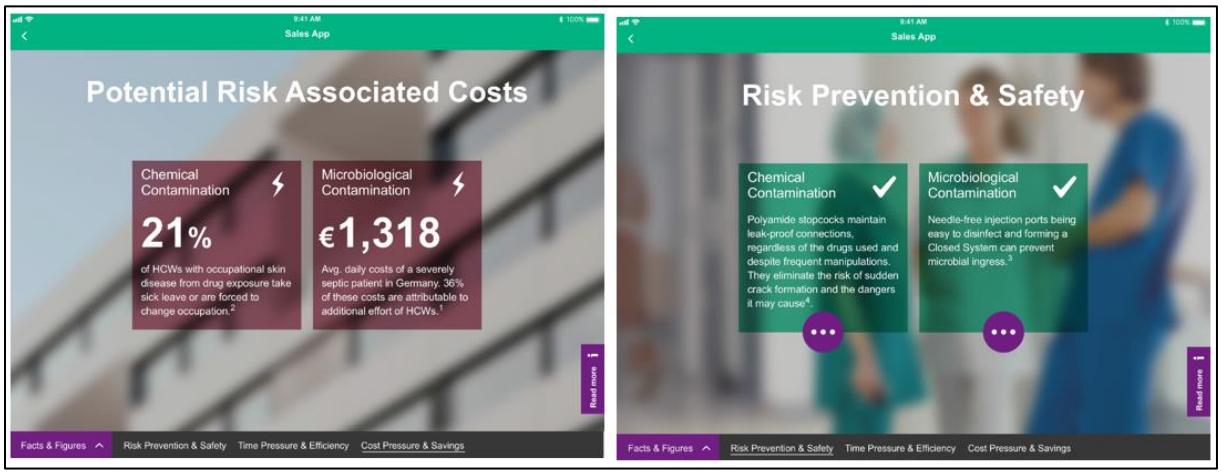

Figure 41: Example screenshot from Product App (part 1)

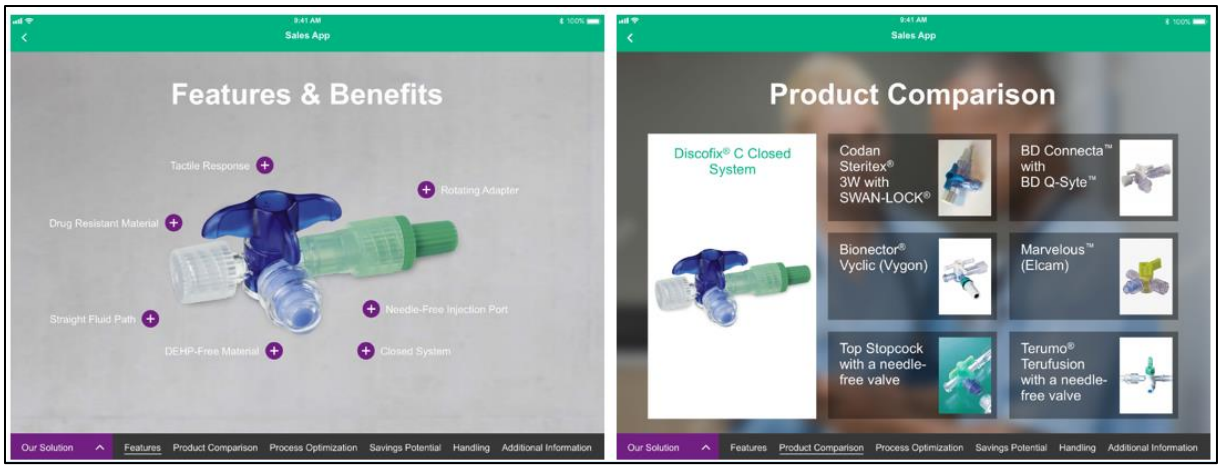

Figure 42: Example screenshot from Product App (part 2)

The practical implications for the calculated value case on Discofix® C with Safeflow are in the last part of the Product App. Following the messaging structure behind the app, the last stages help the sales representative in offering a new way for the customer with the B. Braun`s solution. In this part, the value quantification becomes useful. The TCO analysis that helped to create a value case will be used to implement a “Savings Potential” calculator, as a part of the “Our Solution” section in the Product App. The following figure shows the relevant screenshot, where the sales representative will be able to access the calculator.

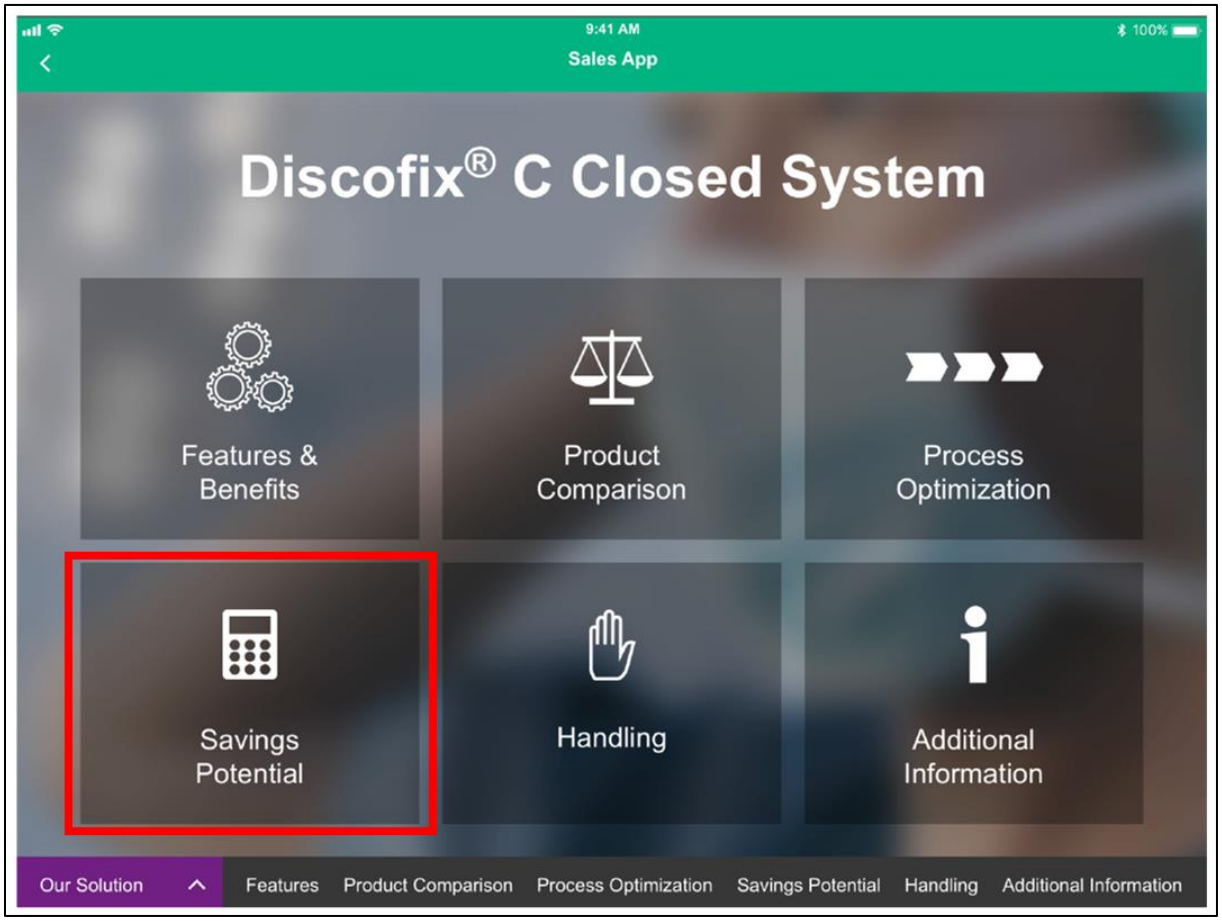

Figure 43: Example screenshot from Product App (part 3)

In order to provide an explanation to how the “Savings Potential” calculator works, the topic of preconditions from the calculations part have to be addressed again. In the TCO analysis, customizable variables were defined as those variables that represent customer`s input. In the actual Product App, this feature will be integrated to enable customer personalization. As it was also suggested by the literature in previous chapters, the value case should concern each customer directly and should enable adaptation to actual customer`s needs. In practice, this means that the “Savings Potential” calculator will be adjustable based on certain hospital characteristics. The first adjustable variable is the annual stopcock demand (10.000 in example calculation). The second variable is the salary of a nurse (20 EUR per hour in example calculation). The last two adjustable variables are prices of both offerings. For example, the price of 0,35 EUR for the standard stopcock was taken as the average ASP of all offerings with those features, but the customer will be able to select on his own how much he currently pays for his existing solution. The following figure presents an example of interface in the Product App, where the customer could customize his input variables. The example is taken from another product in B. Braun`s infusion therapy portfolio.

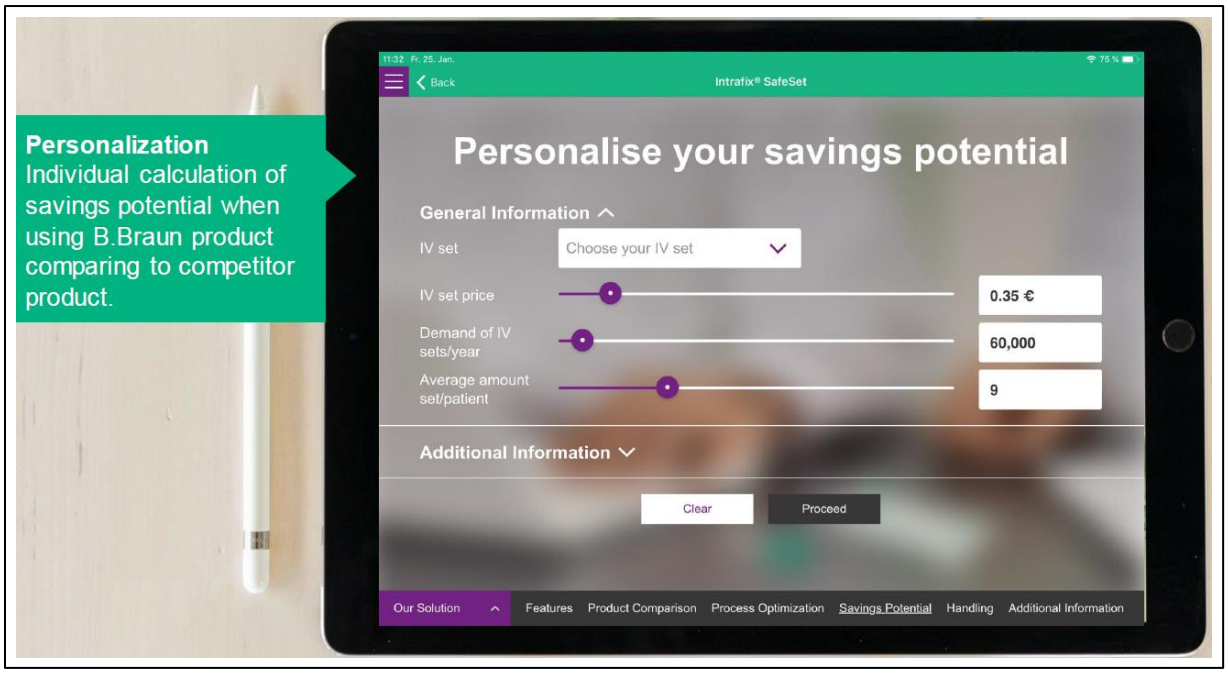

Figure 44: Example screenshot from Product App (part 4)

After the customer`s input of his hospital characteristics, the software of the Product App generates results of potential cost savings for his process. This is where the TCO analysis plays the biggest role, as the calculations set in the practical part will run in the background and generate these results. Sales representative will then be able to go through specific comparisons between B. Braun`s offer and the current solution. As set in the TCO analysis, the areas will be [1] purchasing costs, [2] operational costs and [3] costs occurred by adverse events. The Product App will also show how the calculation is structured, as represented by figures 31 to 38, and enable the customer to see sources behind it (clinical studies). For a clearer outlook on the entire cost savings potential, an overview of the results will be added. Such a presentation will enable the sales representative to visualize the total impact of the offering. The following figure presents an example of interface in the Product App, where this

visualization of total cost savings can be seen. The green part of the bar represents the TCO difference or cost savings of B. Braun`s offer (example from another product in infusion therapy portfolio, with some set preconditions). Figure 39 shows this visualization for Discofix® C with Safeflow.

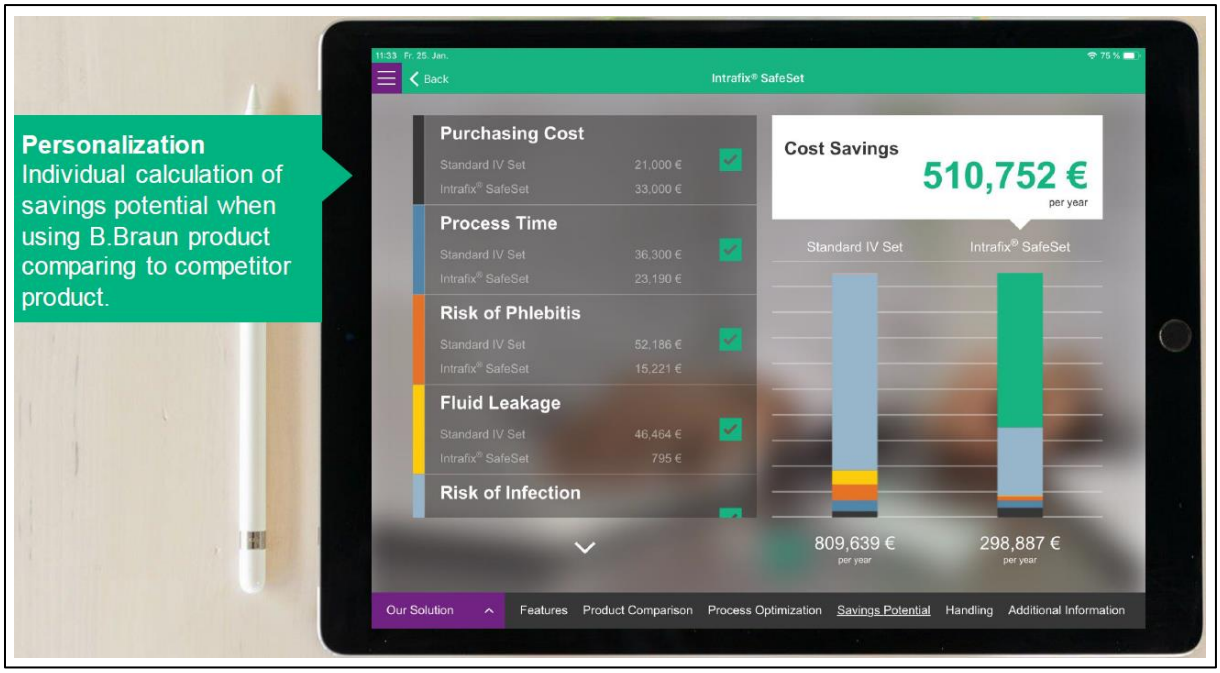

Figure 45: Example screenshot from Product App (part 5)

The integration of Discofix® C with Safeflow value case into the B. Braun`s digital sales tools was the final purpose of the practical part in this thesis. The calculations also support the “Savings Potential” calculator module, follow the messaging structure of the content (figure 40) and provide a logical conclusion to the B. Braun`s digital sales tool. To summarize, the value of the practical part lies within the usability of its results to improve value-based sales arguments.

6 Conclusion

From a theoretical perspective, this thesis offers an insight into what it means to compete in the medical device market today and discusses VBS as the potential measure to be taken when pursuing improvement and adaptation of M&S strategies. In the practical sense, it presents real industry application of VBS into the sales tools of a medical device manufacturer.

At first, several challenges and opportunities were identified when presenting the perspective of medical device manufacturers that are competing with high quality products with relatively high profit margins, like B. Braun (goal A). The industry sees a growing barrier in legislative shifts and new regulatory requirements, which puts a strain on new technology launches and expenses occurred from the effort to comply with the standards. It was also identified that customers use the advantages of collective buying power to negotiate lower purchasing prices by joining GPOs. This centralized purchasing strategy concerns the majority of hospitals and the strength of GPOs can be seen in the fact that the product price negotiated through this effort becomes the de facto price in the whole market. Combined with the ever-growing healthcare expenditure which leads to tightening hospital budgets, a medical device supplier is highly likely to come across constant pricing pressures when trying to close sales contracts. It was concluded that pricing pressures are currently the biggest general challenge for a manufacturer like B. Braun, especially because the company has a large commodity products portfolio and relies on higher profit margins to maintain profitability. During the research on opportunities in the sector, a more positive image for the future was discovered. Multiple sources and consultancy reports predict a growth in the medical device market for the following years. The CAGR value projections found during the research were between 4 to 6%. Drivers behind this growth are predominantly demographic shifts that are a reality all around the world. On top of annually rising world population, an even stronger effect is aging of people which leads to larger need for healthcare services. In terms of markets with strong potential, the emerging markets like China are turning out to be the best opportunities for the future.

The next major goal of this research was to provide insights into the procurement process of the relevant customer base (goal B). Several regulations and official recommendations were found to support the evolution from price-based procurement to VBP. However, this trend is getting adopted slowly as many procurement teams still prioritize short term pricing cuts. As the main customer was identified as a hospital, the medical device supplier selection process had to be analyzed. The key finding was that the hospital BDP is largely dependent on several stakeholders and influencers with varying interests. While the procurement officer may sign the contract, the physicians and nurses can many times significantly influence the decisions.

To assist M&S efforts in these environment, VBS was recommended as the potential solution to the problems (goal C). It provides a logical conclusion to the evolution in M&S approaches, which are moving from product-based to solution-based sales argumentation. Literature review describes VBS as the top layer of feature/benefit/value-based selling, where VBS is defined as a value-driven sales philosophy that seeks to improve customer`s perception of value. It was concluded that this perceived value is the main impact behind customer`s perception of

the offered product and ultimately affects his buying decision. The next conclusion on this topic was, that practicing VBS does not relate to a one-time event or a simple solution. It requires a changes in the mindset, sales force training, M&S tools and buyer-supplier relationship. M&S approach based on this philosophy will produce trained sales representatives that understand the customer`s internal process and everyday challenges. Their sales arguments will be based on how exactly a product provides added-value. Literature has shown that added-value can be presented as all positive effects of the supplier`s solution on customer`s performance in terms of profitability, operational efficiency, safe handling and cost reductions. If implemented successfully, VBS can lead to many benefits for the supplier, such as increased customer satisfaction, protection against price erosions, shifting the sales dialog away from prices and the ability to target stakeholders higher up in the customer hierarchy.

In order to present actions needed to implement VBS into the sales tools, a value case was proposed as a possible solution (goal D). Literature review showed that a value case follows many concepts behind VBS and can fulfill the requirements for implementation. It offers evidence of significant understanding of customer`s business model by demonstrating the impacts that the usage of product would bring. With it, the M&S departments of medical device suppliers are able to develop sales arguments based on concrete financial effects expressed in monetary terms. Theoretical research on this topic also served as a collection of recommendations on how a value case can be performed. It was concluded that it has to be relevant to customer`s specific situation while focusing on the main economic changes that will come as a result of the solution`s implementation. Ideally the customer`s perspective should be significantly involved and it should contribute to his overall awareness of the product and potential complications that it can prevent.

The final goal of the thesis was to develop a value case on an example product provided by B. Braun and to examine how these results could be integrated into sales tools (goals E and F). To generate results, TCO method was used as the main method for calculating added-value of the B. Braun`s product. After the product profile was developed product`s unique features were identified and connected to differentiating benefits. These benefits were then used to steer the calculations into showing potential differences in TCO values for B. Braun`s offer and the reference offer. Three hypothesis were set in this part to serve as basis to form conclusions on the results. It was confirmed that clinical and operational benefits of B. Braun`s product lead to cost savings in hospital daily operations (H1). To understand how the product affects hospital`s daily operations, clinical evidence research and internal handling tests had to be performed. This tasks showed on an example how knowledge of customer`s processes assists sales argumentation and how important it is to practice VBS. Next, the calculations managed to successfully present how B. Braun`s product leads to lower TCO value (H2). This goes in line with the concept of product`s added-value discussed in the theoretical part. In this example, product`s value was shown through cost reductions. Finally, the TCO analysis results were used to form a value case which successfully indicated that B. Braun`s product offers a business potential for the customer (H3). The argument for business potential can be now used by the sales representative because the value case managed to present financial benefits that far outweigh the initial higher price of B. Braun`s product. All three hypothesis were confirmed and resulted in a positive result from the perspective of B. Braun.

However, some limitations had to be emphasized regarding the practical part and general implementation of value case into VBS sales tools. As some medical areas and procedures have more clinical research, the first potential limitation is the absence of clinical evidence in certain products. This can be avoided by ordering research from clinical and academic institutions, but to do that some financial resources will have to be allocated for this purpose. Another limitation connected to this topic is the potential for wrong estimations if sufficient clinical evidence was not found. Next, the handling time measurements for the example of this thesis were performed following the official standards for nursing practice. It could happen that in reality the actual handling times would be different based on nurse's experience and accuracy in following guidelines. The last limitation concerns the final usage of value case as a section in the sales tool. As the value case tries to precisely imitate the hospital`s specific situation and offers customizable variables, there is potential that these variables would be set inaccurately by the customer. Overall, all of these limitations could lead to inaccurate results. However, the literature suggested that the main goal of the calculations is not to be completely precise, but to offer a base for raising customer`s awareness about the offered product`s benefits.

To conclude, VBS has evolved as a new M&S approach that shifts the conversation away from products and prices to business impacts on the customer`s business model. Its implementation can assist companies like B. Braun in overcoming challenges and difficulties and capturing opportunities on the current medical device market. But to implement it, a significant amount of effort has to be made. VBS demands different and greater competences of M&S departments, which now have to focus not only on how the products benefit their organizational goals, but also how they can benefit the ones from the customer.

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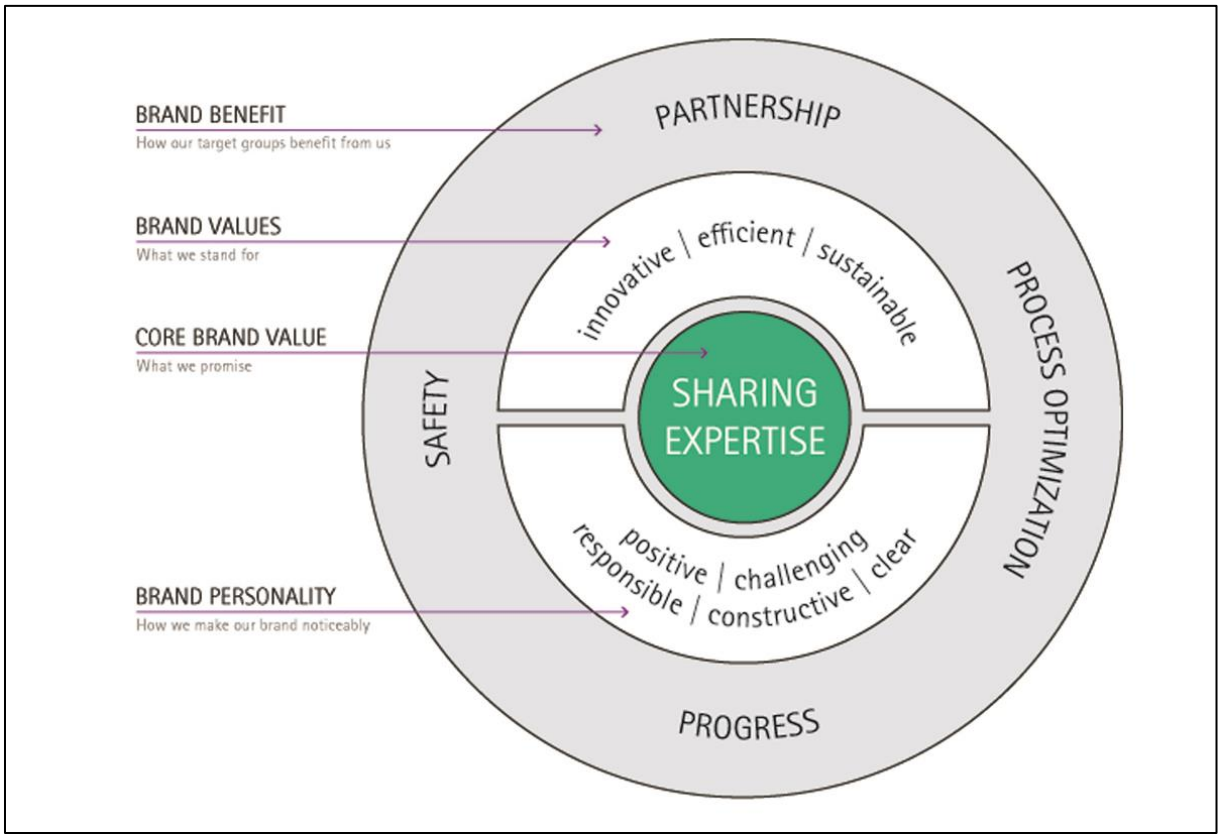
List of abbreviations

BBMAG	B. Braun Melsungen AG
GMS	Global Marketing and Sales
GPO	Group Purchasing Organization
EUR	Euro
EU28	28 Members of the European Union
USA	United States of America
SME	Small or Medium Enterprise
SG&A	Selling, General and Administrative Expenses
NICE	National Institute for Health and Clinical Excellence
NHS	National Health Service
HCO	Healthcare Organization
HCP	Healthcare Provider
HCW	Healthcare Worker
BDP	Buying-Decision Process
CPO	Chief Procurement Officer
COO	Chief Operational Officer
VBP	Value-based Procurement
VBS	Value-based Selling
MEAT	Most Economically Advantageous Tender
HR	Human Resources
M&S	Marketing and Sales
R&D	Research and Development
STP	Segmentation, Targeting and Positioning
B2B	Business to Business
3WSC	Three-way Stopcock
CRM	Customer Relationship Management
VEL	Value Equivalence Line
USP	Unique Selling Proposition
TCO	Total Cost of Ownership
LLC	Life-cycle Costing
HAC	Hospital-acquired Complication
ALOS	Average Length of Stay
ROI	Return on Investment
NFC	Needle-free Connector
AE	Adverse Event
ASP	Average Selling Price
ESC	Environmental Stress Cracking
CLABSI	Central line associated bloodstream infections
CDC	Center for disease control and prevention
ADE	Adverse Drug Event

Appendix

Appendix 1: B. Braun brand positioning detailed



Appendix 2: Global Marketing Plan – IV Administration Sets (competitor analysis section)

B BRAUN
SHARING EXPERTISE

Hospital Care
Global Marketing Plan

Author: Ngoc Doan Lisa Tran
Date: 31.01.2015

The competitive landscape of competitors on the IV sets market is diverse, with a mix of international as well as local companies. A general trend in the competitive landscape is the increasing number of fusions and mergers and acquisitions undertaken by large corporations in order to close gaps in their current product portfolio, such as the acquisition of Carefusion by BD.
However, a general weakness for the competitors on the market is that a clear marketing strategy similar to the B.Braun Safe infusion therapy campaign is missing. In addition, the B.Braun scientific study published by University Aachen about DEHT having no adverse effect even with high concentrations in IV infusions is a competitive advantage as no other competitor has a similar study for their plasticizers. In the following, an overview over the strengths and weaknesses of the main international competitors is given:

Competitor	Strengths	Weaknesses
BD	▪ Fusion with Carefusion/ Sendal, making BD a global provider of a large portfolio in IV therapy ▪ Well-received brand image with long history and expertise ▪ Leads the business with needlefree devices (joint venture on interlink with Baxter) ▪ Aggressive pricing activities ▪ Broad product portfolio incl. sets with automatic venting ▪ Cooperation with low-cost Korean manufacturer	▪ IV sets no focus products ▪ Lower quality ▪ Aggressive pricing activities ▪ No own production facility
CareFusion (former Cardinal Health)	▪ Strong portfolio with needle-free valves ▪ DEHP-free products in the portfolio ▪ Cooperation with Chinese manufacturer ensures cost advantages ▪ Broad assortment ▪ Set portfolio dedicated to matching pumps ▪ Product design with acceptable quality ▪ Access to low-cost segment through acquisition of Sendal	▪ Customer awareness more focused on infusion pumps ▪ No real R&D activities by Carefusion; components often purchased from external sources at higher costs ▪ Sets too complex for automatic assembly; expensive hand-made production
SENDAL UK	▪ Intrafix SafeSet imitation by Sendal offered in DE, F, UK, ES, FI, and PT. **Tenders won in FI and F in 2014** (despite minor reliability compared to the original SafeSet) ▪ Production site in Spain subsidized by government ▪ Aggressive pricing policy wherever possible	▪ Small family owned company operating only with medical products. Issues with financial resources to support further and quick growth. ▪ No brand awareness in key markets outside Spain, Portugal, France, UK up to now ▪ Aggressive pricing activities
	▪ Specialized in giving sets and accessories ▪ Production site in Portugal: expected cost advantages ▪ Superior spike properties (low insertion force) ▪ PrimeStop without extra costs ▪ SpinLock connector without extra costs ▪ Roller clamp w. good performance reg. set-	▪ Small family owned company w/o clear focus on medical business ▪ Restricted marketing opportunities due to small assortment of product lines: no comprehensive IV system offering ▪ Only local distribution in selected markets, no global relevance ▪ Roller clamp: high forces for flow rate

Appendix 3: Global Marketing Plan – IV Administration Sets (market trends section)

3.3 Market trends

Markets continue to be strongly influenced by country-specific market environments, especially financing of the health care system, price regulation/ reimbursement systems, regulatory requirements, and user habits. The general trends on the IV sets market can be classified into three categories:

Increasing product requirements	Changing customer behavior	Changing market environment
• needle-free devices, e.g. needle-free injection sites already attached to the line such as integrated valves and stopcocks • PVC-free, DEHP-free, and latex-free material • Bisphenol A-free material • no adsorption of drugs • spinlock connector as basic requirement • sterilization: different standards across the countries (e.g. China: demand for EO-free products; Europe: license for gamma sterilization facilities increasingly harder to obtain) • UV protection for light-sensitive medications • extension of usage time, e.g. up to 7 days according to CDC guidelines • spikeless connection to container • environmental friendly material • ready-to-use sets • universal non-dedicated pump compatibility • more and more complex configurations, particularly special configurations for local markets, e.g. China and Australia • special sets for oncological and antibiotic applications (closed system = safe connection, reduced risk of contamination) • Smart IV technology (e.g. with peristaltic pumps – patent held by Carefusion)	• increasing safety awareness about the risks surrounding infusion therapy (advanced care), e.g. protection against contamination, air embolism, etc. • purchasing through tenders/ GPOs with a strong focus on prices • evidence-based decision making: e.g. laboratory tests, clinical studies, and value cases requested as basis for decisions • need for process-oriented value selling • system providers: purchasing large portfolios from selected suppliers • lower influence of users on buying decisions • limited access of manufacturing companies to users for promotional purposes, only to the purchasing department of hospitals	• decreasing budgets in the healthcare system, leading to higher price pressure in the market • increasing competition, further adding to the price pressure • higher local regulatory requirements, e.g. need for clinical studies in China for new registrations • local reimbursement policies (e.g. reimbursement only for special IV sets in China) • protectionism: local manufacturing sites or joint ventures with local companies needed in order to gain access into the local market (e.g. Russia, China)

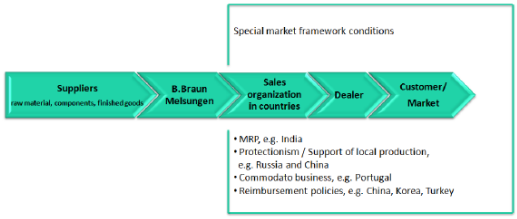
To address these market trends, B.Braun is actively registering patents or acquiring them. Within the project Next Generation IV Sets, the registration of patents are being evaluated in the following areas:

- Drip Chamber
- Assembly
- Fluid Filter

- Flow Control
- Packaging
- Automatic flushing after delivery of each medication
- Zero residual volume stopcock
- Inhouse valves

4. Value chain analysis

Following the market analysis, it is important for B.Braun to consider the whole value chain. There are different value chain structures existing. For this value chain analysis, the following value chain has been defined. It includes the supplier, B.Braun as a company, the sales organizations in the different countries, and dealers as well as the market.
Globally, there are special market framework conditions in the value chain that have an influence on the operations and actions of B.Braun. Some examples are shown in the graph. More details on the market barriers are listed in the appendix. These barriers need to be considered in all marketing activities.



5. Customer analysis

5.1 Areas of use and user groups

IV administration sets are used for

- Fluid volume maintenance and replacement
- Infusion of total parenteral nutrition
- Infusion of antibiotics with bottles and bags
- Delivery of chemotherapeutic agents
- Blood replacement therapy
- Injection of medications

IV administration sets are giving sets by gravity and compatible pumps which can be used in hospital. Thus, these sets are intended to be used by

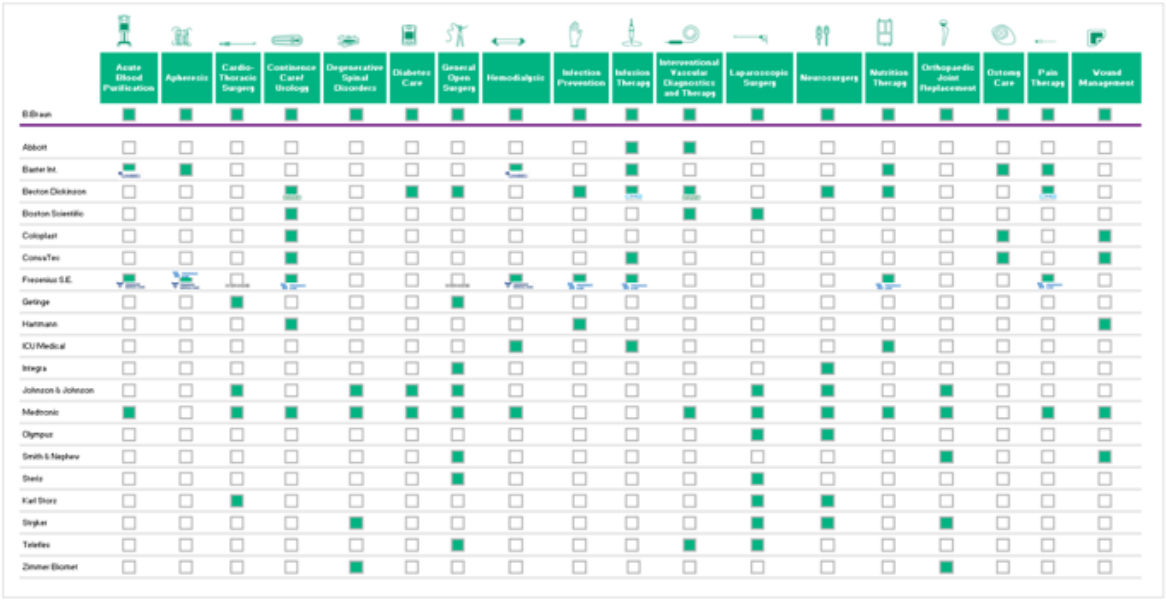
- trained healthcare professionals
- pharmacists
- licensed and/or certified physicians
- healthcare practitioners

Appendix 4: Market intelligence (BKC Intranet)

B BRAUN SHARING EXPERTISE HOME TOOLS & SERVICES LOCATIONS DIVISIONS CENTRAL SERVICES B. BRAUN GROUP

Therapeutic areas

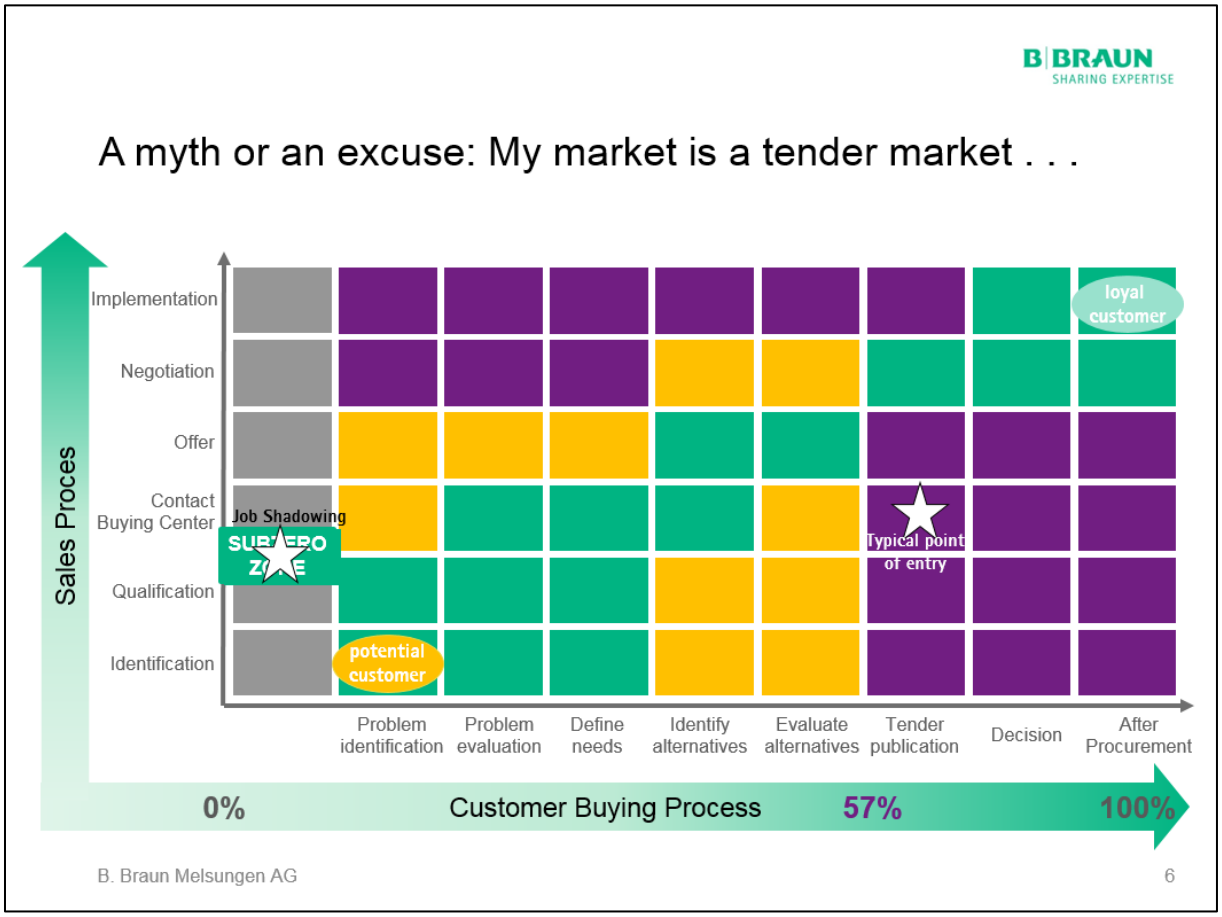
The matrix gives you an overview which competitor is relevant in which therapeutic area (open the short profile by clicking on the company name within the matrix).



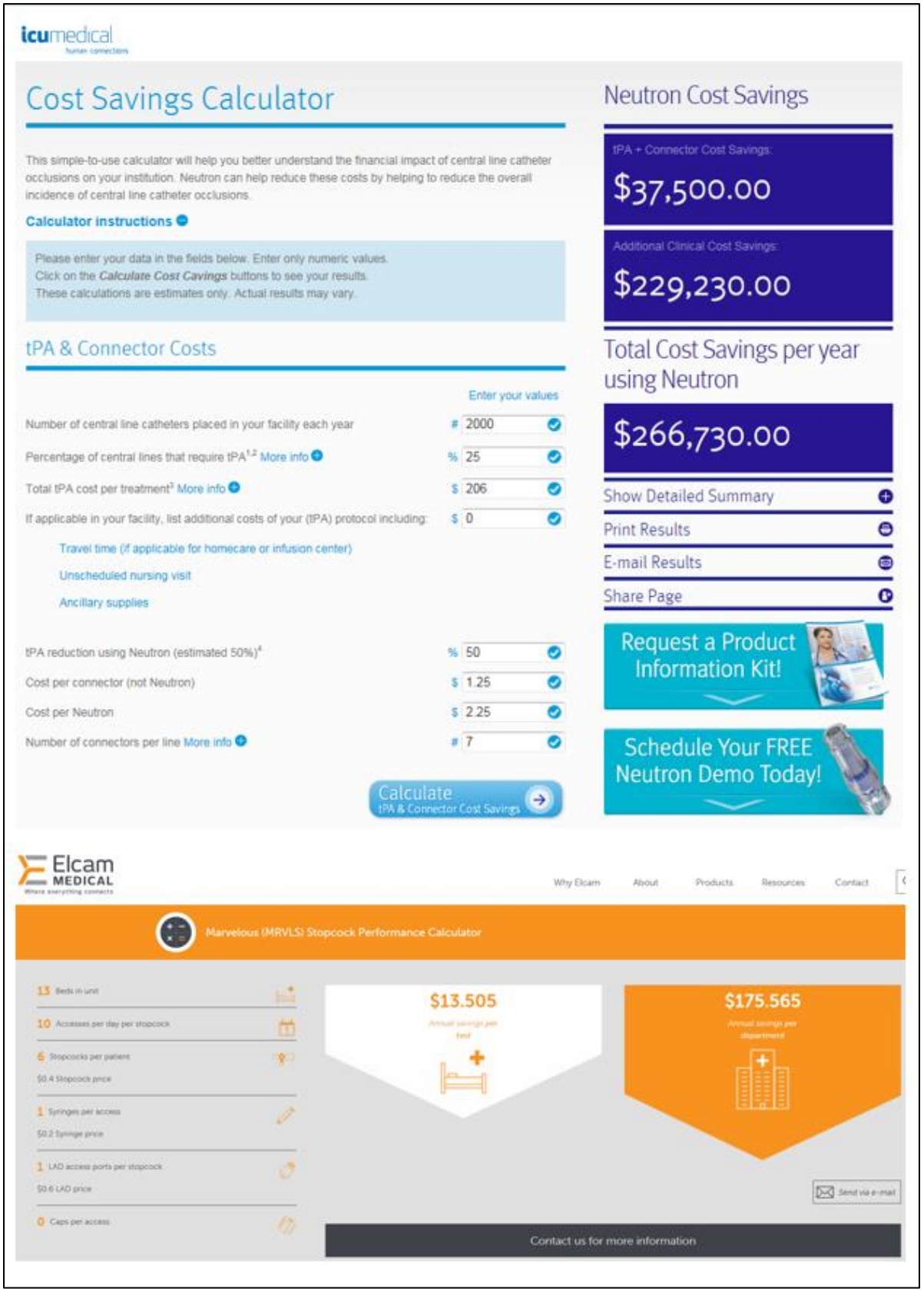
Overview on most important KPIs per competitor

	Annual Revenue in m€	Gross Profit in m€	Gross Profit in %	SG&A in m€	Share of SG&A based on annual revenue	Rev./Employee in t€	Number of Employees
B.Braun	6.789	2.955	44	2.051	30%	110	61.583
Baxter	9.352	3.961	42	2.291	24%	199	47.000
BD	10.709	5.262	49	2.904	27%	255	41.933
Fresenius Kabi	6.358	-	-	-	-	175	36.380
Fresenius Medical Care	17.784	6.004	34	3.578	20%	156	114.000
Fresenius S.E.	33.886	10.476	31	5.539	16%	124	273.249
ICU Medical	1.144	377	33	269	24%	168	6.802
Johnson & Johnson	67.744	45.292	67	18.968	28%	506	134.000
Medtronic	26.309	18.082	69	8.228	31%	256	102.688
Stryker	11.020	7.238	66	4.031	37%	334	33.000

Appendix 5: Point of entry in customer BDP



Appendix 6: Results of value calculations of two value calculator examples



Appendix 7: Extract from Infusion and Transfusion Accessories Brochure

User benefits of Discofix® C

- Allows convenient access for injections and aspirations by rotating adapter
- Lets you feel the proper setting by tactile response at every 45° turn
- Resists the hazardous effects of pharmaceuticals
- Maintains a leakproof connection even during long-term application
- Prevents leakage, contamination and air embolism

Detailed information for healthcare professionals
Risk Prevention in Infusion Therapy can be found in the folders "Chemical Contamination" and "Air Embolism".

Stopcocks Lipid Resistant	Colour	Swivel lock	Extension (cm)	Sales unit/Pcs.	Code No. (REF)
Discofix® 3-way stopcocks 	■	■		200	4095111
	■	■		200	4095120
	■	■		200	4095138
	□	■		200	4095146
	■		10	100	4098102
	□		10	100	4098250
	■		25	100	4098218
	■		50	100	4098501
	■		75	100	4098234
	■		100	100	4098080

Manifolds Lipid Resistant	Colour	Swivel lock	Proximal Stopcock	Extension (cm)	Sales unit/Pcs.	Code No. (REF)
Discofix® 3-gang manifolds 	■ ■ ■	■			50	4085434
	■ ■ ■	■			50	4083032
	■ ■ ■			150	50	4083660
	■ ■ ■		■	150	50	4083415
Discofix® 5-gang manifolds 	■ ■ □ ■ ■	■			50	4085450
	■ ■ ■ ■ ■	■			50	4083059
	■ ■ ■ ■ ■				50	4083377
	■ ■ ■ ■ ■		■		50	4083407

Discofix® Combi-Holder	Product description	Sales unit/Pcs.	Code No. (REF)
	Combi-holder, suitable for stopcock manifolds and Medifix® manometer Scale	1	4086007

Needle-free access

Appendix 8: Extract from Becton Dickinson MaxPlus™ Clear clinical information brochure

The results are clear case histories – the bottom line

In a 350-bed acute adult care facility

The hospital was already implementing Institute for Healthcare Improvement (IHI) best practice interventions and using chlorhexidine impregnated disks before the introduction of MaxPlus™ Clear in January 2007[1]

CRBSI redundant rate (per 1000 central line days)[1]

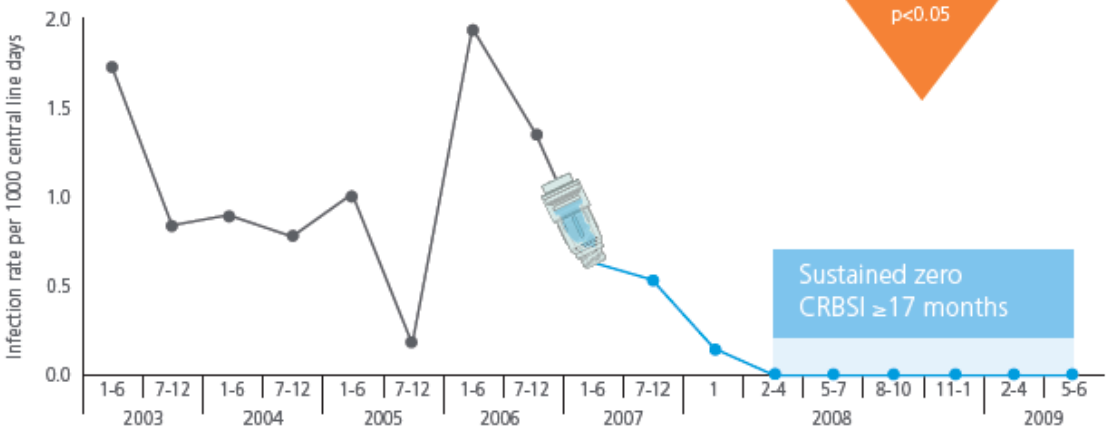
Prior to the introduction of MaxPlus™ Clear

0.63

After the introduction of MaxPlus™ Clear

0.00

100% reduction p<0.05



"Cost savings were calculated for the 6-month period of January 2007 through June 2007 to be $241,000 for the ICUs alone[1]"

Getting to zero

References: 1. Royer T. J Infus Nurs 2010; 33: 398-406. 2. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2010.