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Seminar Paper

Critical Evaluation of Prices in the Information Technology Age: History, Features and Critical Comparison of Cost Based, Market/Value Based, and Willfully/Arbitrary Prices

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Declaration of Authenticity

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- to have individually written, to not have used any other sources or tools than referenced and to not have used any other unauthorized tools for the writing of this seminar paper.
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Abstract

This papers thesis is the critical evaluation of prices in the information technology age. The historical development, features and comparison of cost-based, value-based and arbitrary pricing form the core of this seminar paper. In order to be able to examine the topic in an appropriate and scientific quality, an extensive literature research and evaluation has been carried out. Moreover, the results of important studies, examples from economic practice and theoretical concepts are discussed. The paper begins with a comprehensive historical insight, which introduces important authors and theories of economic and pricing history. This is followed by a detailed look at several theoretical pricing strategies, including cost-based, value-based and arbitrary pricing. Once the necessary background knowledge has been acquired, the topic is critically discussed and interesting insights into the pricing of software and data, as well as personalized and behavioral pricing, are given. The seminar paper ends with a brief outlook on future developments. In terms of content, it is demonstrated that the pricing of goods and services is a complex topic with many different theoretical and practical approaches. The customer is not always the focus of the pricing and even insights from historical thinkers such as Aristotle or Thomas Aquinas are still relevant in the pricing. The analysis and evaluation of data is also playing an increasingly important role in pricing. As examples of this, personalized and behavior-based pricing strategies are presented in the paper. Thus, the reader can expect a comprehensive introduction to the subject of pricing in the information technology age.

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1. Introduction

Since the global breakthrough of the World Wide Web at the end of the 20th century, society and the daily lives of billions of citizens have changed dramatically. Modern information technology and social media make it possible to participate in people's lives across national borders and to keep in contact with friends and relatives all over the world. As soon as it is uploaded to the Internet, information is immediately available worldwide and to an extent that was previously unknown. Until a few decades ago, today's information-oriented world would have been quite hard to imagine.

The business world has also changed drastically. At the beginning of the 2020s, global corporations as well as family owned companies are operating around the world and are faced with a challenging environment with new competitors. The demands of customers with regard to quality, innovation and instant availability are increasing rapidly and corporate strategies have to be adapted to global competition.

One thing, however, has not changed despite this extensive upheaval. One of the most important success factors for companies is still calculating the most accurate and appropriate price for their goods and services. If prices for a product are too high, customers will not buy it and will instead migrate to the competition. Yet, if they are too low, a company will hardly be able to operate profitably and thus hardly remain competitive in the long term.

In this seminar paper, therefore, a critical comparison of prices in the age of information technology is sought. For this purpose, after a comprehensive historical analysis of prices and the development of economic theories, cost-based, value-based and arbitrary pricing is presented in detail. The core of the paper is the subsequent critical evaluation of pricing, in which, in addition to current pricing strategies of software providers, the pricing and importance of data in relation to modern pricing strategies is examined. The seminar paper is concluded with an outlook on future developments.

2. Pricing - A Historical Perspective

Before the various theories on pricing are presented in detail, it is necessary to consider the development of pricing and economic theories over time. Ancient philosophers, scholars of the Middle Ages and savants of classical economic theories provide important insights in their research and considerations that influence modern theories of pricing and are therefore still highly relevant. The following pages serve to provide an overview of important historical developments in prices and the emergence of economic theories.

2.1. Antique - Aristotle and The Roman Economy

Antiquity is considered to be an era of great scientific and philosophical achievements. It is shaped by a multitude of intellectual insights and ideas, some of which are still influencing our modern society in the 21st century. Important political institutions such as democracy and the judiciary, but further astronomical, mathematical and physical observations and theories, sprang from the spirit of this time. In ancient Greece in particular, there were great intellectual thinkers in the form of philosophers such as Plato, Hesiod and Aristotle, whose theories and knowledge are still highly regarded today (Söllner, 2021).

The Greek philosopher Aristotle is considered to be one of the most influential intellectuals of antiquity. In addition to scientific findings on biology, ethics and logic, he is also considered the founder of economic theory. He was the first to succeed in recording economic issues in his works and developing the first economic concepts. These were shaped by value-based and ethical considerations (Söllner, 2021).

His reflections on the nature of value are particularly interesting. Aristotle recognizes that a price in money is a possibility of a measure of the commercial value of a commodity. However, he claims that it does not constitute the nature of exchange value, since it merely indicates the monetary value of a good. To what extent a product is of value to the individual cannot be determined in this way. He also examines whether needs play a role, but ultimately rejects his considerations and does not go into these approaches any further

(Söllner, 2021). However, this value-based approach to pricing can certainly be viewed as revolutionary and forms the basis for further just economic considerations.

Aristotle's findings on market mechanisms and ethical judgments, on the other hand, are rather vague. While barter is recognized as an important institution, the market itself is viewed with suspicion. He postulates that in fair trade, personal sensitivities and the dignity of the individuals involved should also be taken into account. Exchange justice and distributive justice in particular enjoy high priority with Aristotle. Goods should be distributed according to the individual work of citizens, but an adequate supply of everyday goods should always be guaranteed for all citizens. Voluntariness also plays a major role in fairness of exchange. Aristotle advocates private property, but strictly rejects interest with reference to usury (Söllner, 2021). These are the first ideas of just pricing, which Thomas Aquinas later incorporated into his considerations on just prices.

In addition to theoretical considerations of philosophy with regard to economic and fair issues, it is worth taking a look at economic practice in antiquity. The ancient Roman Empire is considered to be a state whose structures and institutions were well advanced. For centuries it was an empire made up of different countries. This also applied to the economic system. Social and economic structures were closely interwoven. Roman traders transported goods between trading centers by sea and faced maritime hazards, principal-agent concerns, and asymmetrical information (Temin, 2012).

Although the Roman Empire had an extensive trade network, a local supply of food and everyday goods still dominated. In general, it can be assumed that Roman agriculture must have been quite efficient in order to be able to supply the urban centers of the empire. Unlike previous and subsequent agricultural societies, the Roman Empire had dozens of large cities, some with more than 100,000 inhabitants. Nevertheless, the capital Rome with over a million citizens is considered the epicenter of the entire empire and the prices for goods and services that prevailed in the capital had an impact on other countries and cities of the Roman Empire (Temin, 2012).

To gain an insight into pricing in the Roman economy, it is worth taking a look at the grain market. In their article 'Money and Prices in the Early Roman Empire', the authors Kessler and Temin offer a particularly interesting insight into the trading and pricing of agricultural goods in ancient Rome. With the help of a regression analysis, they investigate the relationship between local prices and the distance to the capital Rome. For this purpose, the prices of grain from different regions, including Egypt, Palestine, Sicily and Rome, were analyzed and evaluated. The results are surprising. They come to the conclusion that prices and the distance to Rome correlate negatively with one another. So, the further a region is from Rome, the cheaper the prices for grain. Kessler and Temin explain this negative correlation by the fact that Rome was the center of the common wheat market, where supply and demand were highest. The prices in other regions of the empire were based on the Roman price and differed according to the distance to Rome (Kessler and Temin, 2008).

Findings of this kind are only possible through the existence of a uniform monetary system in ancient Rome. It is not known to what extent the exchange rates varied within the Roman provinces and whether Roman coins were available in sufficient quantities in all parts of the empire. Nevertheless, it is the unified monetary system that made the extensive trading system possible and represents one of the greatest achievements of the Roman economy (Kessler and Temin, 2008).

2.2. Pre-classical Times - Scholasticism, Mercantilism and Physiocracy

With the collapse of the Roman Empire, its structures, developed over centuries, and the distinctive economic system disappeared. Long-distance trade and the empire-wide financial system were supplanted by an economic focus on agriculture and trade in smaller local markets. Society was divided into classes and economic activities were mainly characterized by relationships and obligations. The catholic church established itself as a new power of importance, whose influence also had an impact on economic ideas. For centuries, economic theories have been affected by theological doctrines and virtues. The so-called usury doctrine prevailed in Christian Europe, which saw the charging of interest on loans as a sin against welfare, justice and the natural law (Söllner, 2021).

In the Middle Ages, the economy was therefore subject to religious and power-political influences. Yet there were philosophers who wrote important economic theses and scriptures during this time period. The school of Scholasticism followed Aristotle's deliberations as the next significant step in economic doctrine. Thomas Aquinas formulated a particularly remarkable and still highly relevant theory as one of the most important scholars of scholasticism. The "Summa Theologica", which he created between 1265 and 1273, is considered to be his most important work. In this he discusses economic ideas and relationships. The doctrine of the just price forms the core of his considerations. According to him, pricing should be based on the principle of exchange equilibrium. The value of the service provided should therefore correspond to the value paid and both buyers and sellers should benefit equally. Thomas Aquinas adapted Aristotle's virtue of justice to economic issues, thus creating the universal concept of the just price. However, he did not see a direct influence of supply and demand on price formation. Instead, prices should have a stabilizing effect and not endanger existing hierarchies and orders (Dierksmeier and Celano, 2012).

The authors Froot, Kim and Rogoff provide an interesting insight into pricing during the Middle Ages in their paper "The Law of One Price Over 700 Years". In doing so, they examined the price development of various consumer goods such as wheat, butter and oats in England and the Netherlands from the late 13th century to the 20th century. They took the data from two studies by the international commission on price history and evaluated them. This data included records from city markets, educational institutions, hospitals, the military and later also the stock exchange. Price data on imports and exports between the Netherlands and England was also found in the records (Froot et al., 1995). Of course, this data is only a small excerpt, but it still gives a good overview of medieval pricing. Although most of the trade took place at the local and communal level during the Middle Ages, there was still an astonishingly stable price level for consumer goods and foodstuffs, which was primarily shaped by the influence of supply and demand. The authors also demonstrate a strong correlation with the price development of barley, butter and oats, which can also be transferred to other goods (Froot et al., 1995). It is remarkable that the authors succeed in showing how segregated the markets were in the Middle Ages.

The segregation of markets is still a highly relevant topic especially in today's global economic environment.

Scholasticism was followed by mercantilism during the Renaissance. This school of thought dominated economic research from the 15th to the 18th centuries. In contrast to Thomas Aquinus, justice and the equilibrium of exchange were no longer the core of economic theory. The main goal was no longer a fair price but to promote trade and profit maximization. The regulation of prices and the prohibition of interest, which were of great importance in scholasticism, were resolutely rejected. The free market, however, was of no importance to mercantilists. Instead, national welfare should be maximized with tariffs and the promotion of exports. The relationship between the supply and demand of money on interest rates and pricing was also emphasized. Mercantilism had an enormous influence on economic theory in the following centuries and is considered to be the foundation of modern money and currency theories (Söllner, 2021).

The French physiocracy should be mentioned as a special doctrine, which is considered to be the first self-contained economic school. It was founded in 1758, but already lost political relevance in 1776 and connects the human with the natural order. Physiocrats viewed agriculture as the main source of wealth. Commerce and industry, on the other hand, could not increase it. With regard to price setting, farmers should be able to achieve a profitable price and thus also be able to increase supply and demand. The physiocracy formulates a natural price, which is supposed to correspond to the production costs for industrial goods and which is to be fixed by a price premium for agricultural products. In addition, the physiocracy postulates the importance of free trade and unrestricted competition (Söllner, 2021). Some of these approaches were also taken into account in classical economical theories and influenced these significantly.

Even today, some ideas of the Physiocracy, such as a fair price for agricultural produce, are still quite popular.

2.3. Classicism – Adam Smith and David Ricardo

Adam Smith is an influential figure that many people even without in-depth economic knowledge might be familiar with. He is often seen as a kind of founding father of modern economic theory and in fact, his theories and ideas have long been considered pioneering. Still, it should be noted that Smith built his economic insights on the ideas and knowledge of pre-classical economists. Thus, influences of mercantilism and the physiocracy can be seen in his writings (Söllner, 2021).

Smith is considered to be the founder of classical economic theory. As the first economic theorist, he differentiates between natural prices and market prices. He defines the natural price as manufacturing costs with an additional profit mark-up. In addition to adequate wages for labor, costs for capital and land are also taken into account in the manufacturing costs. Smith thus defines a natural price for goods, which from today's perspective is quite similar to a cost-based pricing. The market price differs from this, however, as it can deviate from the natural price due to the influence of supply and demand. Adam Smith argues here that competition ensures stable price levels and differences in market and natural prices are only a snapshot. He therefore assumes the existence of a compensation mechanism which ensures that the market price and the natural price only differ from each other for a short period of time. Adam Smith speaks in this context of the "invisible hand" of the market and derives from its causal relationships and laws of the economy (Kolb, 2017). It is also interesting that he perceives the state's ability to regulate the markets as severely limited. In fact, he sees state intervention in the economy as just and appropriate only when it benefits the lower classes of society and increases the prosperity of the nation (Sen, 2013).

Furthermore, according to Adam Smith, a primary goal of economic activity and social endeavors is economic growth. In fact, growth is also possible in the long term by increasing labor productivity and capital accumulation. The former can be achieved through division of labor, while the latter requires savings in costs and material (Söllner, 2021).

Many of Adam Smith's ideas and approaches are considered revolutionary and his knowledge of economic issues is impressive. It is therefore not surprising that a school of its own was founded to deepen his research. Followers of this teaching, known as the classical school of economics, deepened Smith's knowledge and developed it further.
Of the numerous members of this school, two are introduced in more detail, the French economist Jean-Baptiste Say and David Ricardo (Söllner, 2021).

The former is primarily known for his major work, published in 1803, which today bears the title "Say's Law". In it he postulates complete price flexibility and strictly separates the absolute price level from relative prices. Say assumes an inevitable balance between supply and demand, which means that there can be neither a surplus nor a deification on the part of the buyer. Instead, an automatism would lead to a long-term balance between supply and demand. He is also considered to be one of the first theorists to give the entrepreneur, as an innovator, an important role in economic reality (Söllner, 2021).

As the second important member of this economic school, David Ricardo will now be presented. His work "On the Principles of Political Economy and Taxation", which was first published in 1817, is considered a key work and maxim of the classical school. Like Smith and Say, he argues in a cost- and supply-oriented manner. He differentiates between reducible and non-reducible goods and assigns them different prices. For example, he names works of art like sculptures or paintings as non-reproducible. However, Ricardo argues that almost all goods are reproducible, and he applies natural pricing to these. Production factors such as labor, means of production and interest also have an influence on pricing (Kolb, 2017).

He defines three different scenarios. In the first there is only work as a factor of production. Here the relative prices are directly influenced by the level of labor input. Ricardo argues that here an increase in the wage level would lead to an equivalent increase in prices and that demand has no influence on price formation. In the second scenario, additional means of production are used, but there is neither interest nor different factor input relationships. This means that the production of a chair, for example, always requires the same amount of wood, nails and working time. In this scenario, too, prices are only influenced by the

intensity of the work involved. In the third case, however, Ricardo adds interest, i.e. a monetary component, to the factors of production. As a result, the time of sale also gains influence. If, for example, a chair is sold after a week and another one in a month, the prices have to be set differently. Problems that can arise during production, such as downtime due to missing materials or defective components, are now taken into account and lead to changes in pricing. It must be said, however, that he defined this as a special case which, in his eyes, is negligible in reality (Söllner, 2021).

David Ricardo also provided important considerations in the theory of distribution and growth, as well as in the theory of foreign trade. He was the first economic theorist to work with models, although unlike today, these were not based on mathematical data but on clearly formulated assumptions (Kolb, 2017). Therefore, his economic knowledge can hardly be used nowadays, since it is not based on mathematical certainty but on speculative considerations.

2.4. Pricing in Modern Times – Neoclassicism and Consumption Theory

At the beginning of the 19th century, the ideas of classical economics were slowly being replaced by new approaches and ways of thinking. In economic literature, one often speaks of the neoclassical revolution. Modern economic theory is also shaped by neoclassical ideas. These differ significantly from the classic approaches. The thinkers of classicism, on the one hand, dealt primarily with the conditions and limits of long-term growth of economies and the institutional foundations of economic activity in general and thus adopted a macroeconomic approach. Neoclassicists, on the other hand, consider the microeconomic perspective. Instead of entire economies, the focus here is on the actions of the individual economic subject. Alongside William Stanley Jevons and Léon Walras, the Austrian economist Carl Menger is one of the most important intellectuals in neoclassical economics (Söllner, 2021).

The core of neoclassical economic theory is the consumption theory. This was first presented by Hermann Heinrich Gossen in 1854 and states that the value of a good depends on how its subjective use is perceived. The price for a good corresponds to the so-called marginal utility. The latter decreases with a higher availability of goods, which is

why exclusive goods such as handmade jewelry are expensive, but drinking water, for example, is very cheap (Söllner, 2021).

The following conclusions can be drawn from this theory for pricing. On the one hand, a company's pricing depends on its market power. On the other hand, the customers, i.e. the demand side, also have an influence on the pricing. For example, if a company sells goods at prices that are above the consumers' willingness to pay, they will buy from competitors at lower prices. Many theoretical considerations from consumer theory have been further developed and are still used today. In contrast to Gossen, who postulated a linear utility function and assumed a 'saturation' of consumers, today's consumption theory assumes that consumers have limitless needs (Söllner, 2021).

Nowadays there are a number of different ways to calculate and set prices. Companies can pursue different theoretical approaches. There are price strategies that are calculated on the basis of costs and input, but also prices that are calculated arbitrarily. Moreover, there are approaches that are value based and consider reflections on justice, as postulated by Thomas Aquinas, in the pricing process. Mathematical argumentation naturally serves as the basis for all modern pricing strategies.

Modern pricing therefore also takes place in a microeconomic framework and includes insights from the consumption theory. Of course, companies take into account costs that go into the development, production and sale of a good. But competition, demand and value creation must also be included in the pricing of goods and services if they are to be priced successfully.

3. Pricing Theories and Concepts

In this chapter, which follows the explanation of development and history of prices and economic theories from the antique to modern times, selected pricing strategies are presented in detail. More precisely, these are cost-based, value-based and arbitrary pricing.

Pricing is a key variable that is of elementary importance for the success of a product and the company behind it. In fact, pricing is a strategic decision that companies use to determine what prices they will call for their products and services. There are a multitude of methods and options that companies can fall back on. Basically, there are a few factors that influence the decision on the right pricing strategy. Among other things, these can of course be the targeted target group, or the research and production costs of the product. However, regulatory authorities and local factors can also influence the price decision (Sammut-Bonnici and Channon, 2015).

3.1. Cost-based Pricing

As the first pricing strategy, cost-based pricing is presented in more detail. As one can already deduce from the name, this is an approach in which the costs of a product or service are determined beforehand and serve as the basis for calculating the sales price. Most often, cost-based pricing is used in the form of the cost-plus method. In addition to the variable unit costs, which can be calculated from the required material and working time per unit, this also includes fixed costs, such as rent for production halls or depreciation. A certain percentage is added to the calculated costs per piece, which results in the price for the end customer (Borad, 2020). If, for example, the manufacturer of smartphones offers a model for € 499 and pursues cost-plus pricing, the sales price includes all costs that are generated in production, marketing and sales and a percentage is added to the calculated costs. That part of the price is then the company's profit.

With cost-based pricing, it is important to have a good calculation base and detailed data on all costs that flow into the product or service. The advantages of this strategy include predictability and simplicity. Companies that pursue a cost-based pricing strategy can cover all of their costs and realize a constant profit rate. In addition, no data on demand and competition are taken into account in the price calculation, which means that the amount of market research required is significantly lower than with other price strategies (Carlson, 2021).

However, there are also significant disadvantages to cost-based pricing. Only internal factors such as production costs, wages and sales costs are taken into account when

calculating prices. This data must be available as precisely as possible in order to be able to calculate the prices correctly (Stanisz, 2020). Still, it is often difficult to correctly allocate fixed costs to individual products or services. Here, a company's controlling department has to estimate the right numbers, which can lead to incorrect values if the data is inaccurate. Furthermore, cost of materials or labor can also change and must therefore be adjusted regularly. Moreover, external factors that are outside the sphere of the company are not taken into account at all. For example, the willingness of customers to pay is not considered when setting prices. This can cause serious damage, especially when introducing new products or operating in more dynamic markets with competition (Carlson, 2021).

Consequently, the cost-based approach is solely product-driven. This means that the entire product, including the price setting, is developed solely from the perspective of the company and external influences are completely neglected. Only after a product has been fully developed and priced is the marketing department commissioned to create value for consumers through advertising and staging that reflects the asking price (Nagel et al., 2008).

3.2. Value-based Pricing

Value-based pricing is a strategy that takes customers' willingness to pay into account when calculating prices. External factors such as the market environment and demand are also included. Due to the lack of a precise calculation method, the value-based or market approach is considered to be the most difficult to implement. A price strategy is considered to be value-based if the exact price is set for a service or product that is worth in the eyes of the customer (Stanisz, 2020).

There are a few reasons why this approach is quite complex to implement. Yet it can also map the value of a product or service most precisely. A company must first determine this value in order to then set a reasonable price. In contrast to cost-based pricing, internal factors, such as prices for material and labor, fixed costs, and a profit mark-up that has been calculated in advance are not the only basis for price calculation. Nevertheless, these must of course be taken into account when calculating the value of a product.

A fundamental component of value-based pricing is the creation of value for the customer. Companies have to tailor their products and services to the needs of their customers in order to create value from the perspective of the buyer. It can be quite difficult to determine which properties are seen by consumers as creating value. Often product developers and designers create solutions that they think may be good and innovative. But it is important to be able to convey this value to the customer (Nagel et al., 2008). There are definitely companies that are technologically very advanced and also have the potential to create value for their customers but fail when trying to get their products to customers with adequate and profitable prices.

So, it is necessary to know how to create good value for the target audience of a product. The responsibility for this often lies with the marketing department, which, for example, can decipher the wishes and demands of customers with the help of market research. The determination of values is therefore one of the key elements for a value-based pricing strategy (Nagel et al., 2008).

Understanding values is important, but no guarantee that a product will be successful and that customers will recognize and appreciate the value that they acquire by buying the product. The company must be able to explain the price called and justify the amount to the customer. If the company does not succeed in this, a value-creating product can also fail, regardless of whether it is fairly priced for the customer. It is therefore even more important that the company not only develops reasonable prices but is able justify them to customers. Using the right communication channels also plays a critical role (Nagel et al., 2008). If the manufacturer of a Polaroid camera wants to address young people as a target group, for example, advertising the product via social media such as Instagram or TikTok will be more successful than via a broad-based television advertising campaign.

Furthermore, creating value for the customer is also linked to reducing uncertainties about product properties. This creates advantages for the customer, as he knows the properties and benefits of the product before actually buying it and can thus assess whether the price called is appropriate or arbitrarily set (Liozu et al., 2012).

The value that is assigned to a product is therefore the sum of all the advantages that the buyer receives when purchasing it. Therefore, value is a multidimensional approach that results from a consumer's maximum willingness to pay for a specific product (Liozu et al., 2012). So, if a company wants to implement value-based pricing, it should be aware of all these different factors. After the theoretical background knowledge, an insight should now be given how value-based pricing is used in business practice and where difficulties lie in implementation.

As part of a study, Liozu carried out a survey on value-based pricing, the findings of which are to be reproduced here. In fact, 144 people from various industries, company sizes and positions were interviewed for the survey in order to gain practical experience and perspectives. The highlight of this specific survey is that all participants already had a background in value-based pricing. The results of the study are therefore quite interesting. Only 25% of those surveyed stated that they currently work for a company that primarily pursues a value-based pricing strategy. In contrast, 44% stated that a competitive strategy was being pursued and 31% stated that pricing was based on costs. Even more interesting, however, is that only 39% stated that value-based pricing is a pricing strategy. 22% see it as a methodology. Interestingly, it is precisely the identification of value drivers that has been stated to be particularly difficult. The segmentation of markets and the finding of competitive price levels were also declared to be difficult (Liozu, 2017).

The results of this study show that value-based pricing is also a highly relevant topic in corporate practice. This approach thus gains in importance across sectors, which leads to benefits for customers and providers alike.

3.3. Arbitrage Pricing

Arbitrary pricing differs significantly from the cost- and value-based approach. The arbitrage price theory was developed by the economist Stephen Ross, who presented it in 1976 as an alternative to the previously prevalent capital asset pricing model. The biggest difference to this model is that the arbitrage price theory postulates that markets are not always in equilibrium and perfectly balanced, but that price levels are sometimes too high

or too low.It is indeed a pricing model based on the idea that the return on an asset can be predicted in advance. Linear relationships are postulated between some macroeconomic variables that capture the systematic risk and the expected return on the asset (Hayes, 2020). This relationship can be used to find a price. In the following, the mathematical calculation method and an overview of the relevant variables will be given, as these are of essential importance for a further understanding of this theory.

The simplified formula for the arbitrary price theory model looks like this:

$$E(R)_i = E(R)_z + (E(I) - E(R)_z) \times \beta_n$$

where: $E(R)_I$ =Expected return on the asset
R_z = Risk-free rate of return
β_n = Sensitivity of the asset price to macroeconomic factor *n*
Ei = Risk premium associated with factor *i*

It can be seen from this formula that the expected return on the asset is determined by risk and macroeconomic factors. In this theory, external factors and risks are taken into account. These macroeconomic and financial factors include, for example, risk exposure, exchange rates, retail sales, unexpected inflation, money supply, commodity prices and further the market portfolio of the arbitrageur (Priestley, 1996). The core element of arbitrary pricing is the assumption of imperfect markets. The aim of arbitrageurs is therefore to profit from these fluctuations from the correct market value (Hayes, 2020). The assumptions of this pricing strategy, especially the presence of imperfect markets, can be transferred from the financial markets to other sectors and industries.

In practice, arbitrary pricing often occurs in connection with new and innovative products. Companies specifically exploit the lack of knowledge of consumers in order to achieve the highest possible markup on the price of a good or service. A higher price premium can even lead to customers perceiving the new product as particularly desirable and therefore perceiving the price as fair (Wathieu and Bertini, 2007).

Arbitrary pricing is also made possible by the fact that the intentions and behavior of consumers differ in practice. In contrast to the economic consumption theory as developed

by Gosser, individual economic subjects do not always act completely rationally. It is almost impossible for the average consumer to think carefully about the anticipated benefits of purchasing a good one. Instead, the price shown at the time of purchase is seen as an indication of the value of a product and thus influences the purchase decision of consumers (Wathieu and Bertini, 2007). Therefore, a high price may be associated with a high benefit.

3.4. The Pricing Capability Grid

In addition to these pricing models, the Pricing Capability Grid by Hunterhuber and Liozu (2012) is now presented. This was created with the help of extensive research and shows five different primary pricing zones. These are each dependent on the price strategy pursued and the price realization. In the model, the Y-axis shows the pricing strategies and the X-axis shows the ability of companies to implement them.

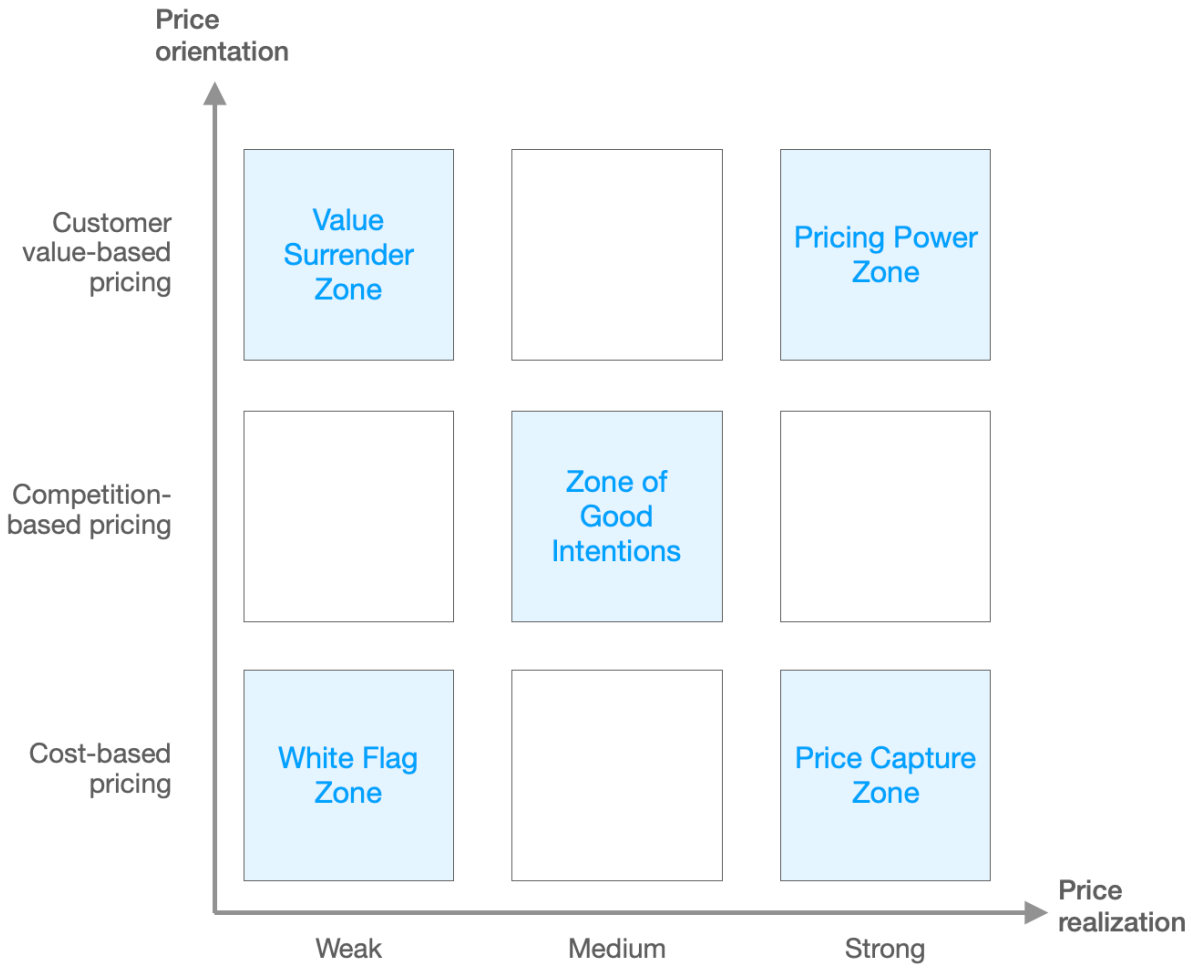

Figure 1: The Pricing Capability Grid, adopted from Hinterhuber and Liozu (2012)

The Pricing Power Zone combines high skills in price orientation with high skills in price realization. It is considered the optimal position. The authors found the use of precise tools to determine the willingness of customers to pay, the use of well-informed sales personnel, and the calculation of price elasticities as characteristics for this. In the Zone of Good Intentions, on the other hand, the pricing strategies and the skills of the sales force are rather average and less sophisticated (Hinterhuber and Liozu, 2012).

The authors identify the white flag zone as the least favored position. Companies whose staff pay little or no attention to pricing fall into this category. Unsurprisingly, cost-based pricing is seen as the least ambitious strategy, as it does not include competition or demand in the pricing process (Hinterhuber and Liozu, 2012).

The results of their research also include the identification of a number of important factors that identify the success of a pricing strategy. In addition to the existence of rules and guidelines and whether these are actually followed, this also includes the existence of previously set target prices. Moreover, the negotiating skills of the sales staff and the self-confidence to walk away from unprofitable deals are also included (Hinterhuber and Liozu, 2012).

4. Critical Comparison of Prices in the Information Technology Age

After the historical and theoretical background and developments in pricing have been discussed in detail, the following section analyzes the extent to which pricing has changed and developed in the age of information technology. In addition to smaller examples from practice, the pricing strategies themselves and the topic of data are also the focus here. Before it is explained in more detail why data play such a large role in current pricing and why it is essential for the implementation of personalized or behavior-based pricing, the pricing strategies of software providers are presented.

4.1. Pricing Strategies of Software Companies

Software is playing an increasingly important role in the corporate context. A promising and still quite new technology in the field of software is cloud computing. With higher

internet bandwidths and new technologies such as 5G, it will be possible in the near future to work and exchange large amounts of data around the globe in real time. In 2018, 49% of all companies in Germany with more than 250 employees were already using paid IT services via Cloud Computing. Of course, there are different types of software and how end users can use them. Within the scope of this work, the focus is on cloud computing, as this technology is becoming more and more relevant in the corporate context and thus has a major influence on the pricing of software providers.

Cloud computing provides computing resources as a service via the Internet. It enables users to process data efficiently, inexpensively and very quickly. A big advantage of clouds is the dynamic scalability, for example through virtualization, and the cost-effective entry for the customer (Weinhardt et al., 2009). Customers do not have to laboriously install software and can access data regardless of their current location. In contrast to the purchase of individual software licenses, which often went hand in hand with the purchase of expensive maintenance contracts, cloud computing providers often provide customers with extensive and individually bookable service offers. These include, for example, infrastructure as a service (IaaS), software as a service (SaaS), security as a service (SECaaS) and many more (Al-Roomi et al., 2013).

The most important providers in the field of cloud computing include companies such as Amazon, Google, IBM and Salesforce. In the operational context, the increased use of cloud computing leads to a reduction in fixed costs and greater flexibility. This also reduces the lock-in effect. This occurs when a lot of money has been invested, for example in a production line or special software, and it is difficult to justify a change or new acquisition (Al-Roomi et al., 2013). This is often the case with ERP systems. ERP is an abbreviation for Enterprise Resource Planning. Such systems offer a wide range of functions and are cost-intensive software programs that are used in many companies for warehouse management, resource planning, personnel management, finance and quality management (Kurbel, 2016).

A price strategy that is still typical for software providers is a one-time payment for unlimited access, so-called licenses. In companies, the number of licenses acquired for

software is usually linked to the number of workstations that use this specific software. So, if a company employs six people in its accounting department and everyone should have access to the accounting program, then six licenses for the program must be acquired. However, this pricing model becomes less important, as it is inflexible, expensive and not user-friendly from the customer's point of view. This strategy is no longer ideal for software providers either. Instead, providers are now focusing on developing adequate pricing models. In fact, software vendors are developing pricing systems that not only maximize their own profits, but at the same time offer their customers the best possible service in a cost-effective manner. In addition, providers use the more flexible options that cloud computing enables them to set prices (Mazrekaj et al., 2016). The following illustration shows which costs have to be taken into account when developing and offering cloud software.

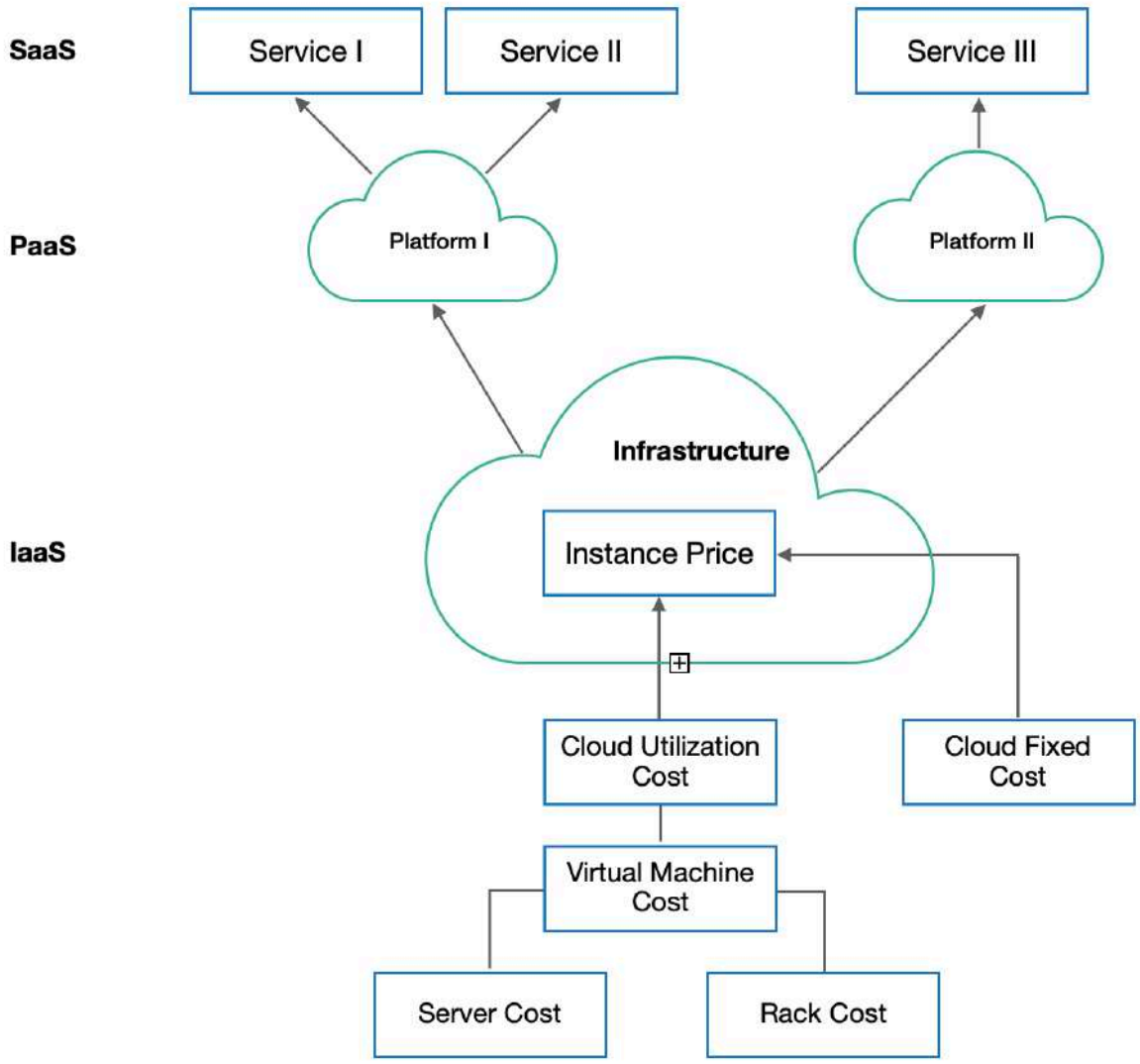

Figure 2: Cloud Computing Cost Accounting Model adapted from Mazrekaj et al. (2016)

The illustration shows that a large part of the costs is not caused by the services offered, but by the underlying infrastructure. Behind every Software as a Service (SaaS) offer there is an extensive network of platforms, servers, computers and network infrastructure that cause running costs. Server costs include, for example, computer costs, i.e. hardware costs, but also maintenance and network costs. The rack costs, on the other hand, include costs for cooling, electricity and facilities (Mazrekaj et al., 2016).

Of course, there are a variety of pricing strategies to pass these costs on to the customer as a provider. There are classic, static models, such as a subscription, which is paid monthly. Examples of this would be Microsoft's office suite and Adobe's Creative Cloud. Here, the user pays a fixed amount every month, regardless of how often the services are used. Amazon is pursuing an alternative pricing approach with its web services. Here, the use of processor power and GB of memory is calculated on an hourly basis. This type of pricing is also known as pay-per-use. Furthermore, there are hybrid price strategies that combine both a subscription and pay-per-use. An example of this would be Google's App Engine, which calls up a monthly fixed price and charges extra costs for each additional GB if the limit is exceeded (Mazrekaj et al., 2016).

The pricing of software, especially offered by cloud, turns out to be quite complex in theory and in practice. In contrast to the production of physical goods, the duplication of software results in significantly lower costs. In the case of internet-based applications, there are of course infrastructure costs for servers, electricity and cooling that increase with the number of users. But the income that can be generated with additional customers clearly exceeds these costs. In contrast to physical goods, there are a wide variety of price strategies that are used by providers. Often, however, these are not value-based, but developed disadvantageously towards the users.

For example, Apple offers a basic package of its iCloud cloud storage service free of charge. However, this only comprises 5 GB and thus the average user is forced to upgrade to a paid subscription. Apple offers 50 GB for € 0.99 per month and 200 GB for € 2.99 per month (Apple Inc., 2021). Music streaming platforms such as Spotify or Soundcloud, on the other hand, offer free variants of their services, which interrupt the user's music enjoyment with

commercial breaks, but offer almost the full range of functions and thus added value for the user (Soundcloud Inc., 2021; Spotify Société Anonyme, 2021).

As with other providers, it is a challenge for software providers to be able to offer good service at reasonable prices. Here, too, the focus should be placed on the perceived value from the customer's point of view, i.e. a strategy of value-based pricing should be selected.

4.2. Pricing Strategies in the Mobile Gaming Industry

A special case, which should definitely be mentioned when it comes to pricing, can be found in the context of the mobile gaming industry. At first glance, this may seem a bit surprising. Yet, most smartphone games are currently based on very sophisticated pricing strategies that would hardly have been feasible just a few years ago.

Mobile gaming is rapidly displacing established forms such as console gaming and is on its way to dominate the digital gaming markets. With the increasing relevance of mobile content, game technologies and business models in the consumer electronics industry are also changing. Furthermore, pricing of digital entertainment has also evolved in the 2010s and interesting pricing strategies can be observed here, especially for mobile games (Civelek et al., 2018). Moreover, global sales in this sector of € 97,104 million are expected in 2021, which is expected to increase to € 142,255 million by 2025. The penetration rate, which in this case indicates the proportion of gamers who use mobile games and the total proportion of gamers in digital games, is expected to be 28.1% by 2025. This is forecast at 23.9% in 2021. Adaptations of the mobile gaming success Pokémon Go, the increasing support of mobile games by Nintendo and mobile versions of popular online games are cited as reasons for this strong growth (Statistisches Bundesamt, 2021).

A category of mobile games that is particularly relevant from a pricing perspective is now presented in more detail. These are so-called free-to-play games that users can download as applications onto their smartphones.

The game Mario Kart Tour, which was developed by Nintendo and is available for Android and iOS, should serve as an example. This is an online racing game that offers weekly

events, online rankings and offers that change every day. In the game itself, the user can then choose from various drivers with whom he would like to contest the races. There are characters for each route that give the player special bonuses and advantages. In order to acquire new characters, real money must be invested in an in-game currency called rubies (Nintendo Co., Ltd., 2021).

The key point of this pricing strategy, however, is that the in-game currency cannot simply be used to purchase the desired driver. Instead, there is a system that is called 'Gacha' in Japanese. At first glance, this can be identified as the purchase of a virtual item. However, this is not a matter of buying a virtual good, but merely acquiring the chance to win a virtual item. These chances vary but are often very low. Therefore, this type of pricing is often compared to gambling (Koeder and Tanaka, 2017). The chances of getting a rare character are usually less than 1% and therefore extraordinarily low. As a result, some players invest hundreds of euros just to get the character they want. In the example of Mario Kart Tour, the prices of the in-game currency range from € 2.29 for 3 rubies to € 74.99 for 135 rubies. In order to be able to roll the dice 10 times for a character, 45 rubies have to be invested, i.e. at least 25 € (Nintendo Co., Ltd., 2021).

If this pricing is compared with the prices for consoles or computer games, which are offered for a one-time fee of a maximum of € 79.99 upon publication, it becomes quite clear how absurdly high the prices for mobile games are. This is interesting insofar as these games can come up with significantly higher audiovisual and narrative qualities, but manufacturers are not yet making use of the financially so successful free-to-play strategy, at least for offline games (Mäyrä and Alha, 2020).

The pricing of free-to-play games is therefore rightly controversial. Many games in this category are developed in such a way that players encounter as many hurdles as possible and are almost forced to invest real money in order to be able to enjoy the game. Deliberate waiting or grinding are popular game mechanics to motivate users to invest additional money (Mäyrä and Alha, 2020).

If the pricing model itself is examined more closely, one finds that this type of pricing can only be identified as deliberately overpriced. The pricing is therefore developed exclusively to maximize profit, while value creation for the customer is completely neglected. Some manufacturers even build deliberate barriers into their games that deliberately reduce the user experience in order to increase profits.

However, this special form of pricing shows once again how highly complex this topic is and how wide-ranging pricing can be found in various branches and industries.

4.3. Importance and Current Development of Pricing

After the detailed analysis of the historical development of price setting, the theoretical explanation of cost-based, value-based and arbitrary price strategies and the critical comparison based on current examples, an overview of the pricing of data and behavior-based price setting should now be given.

At this point it should be mentioned that there are of course various theories and practical approaches to the pricing of public goods such as public transport and infrastructure. The pricing of water and electricity are also highly relevant topics. However, since this would have gone beyond the scope of this seminar paper, no further details on these topics will be given.

4.3.1. Pricing of Data

The current rapid developments and technical achievements mean that pricing is relevant in areas where this would have been inconceivable just a few years ago. Today it is not unusual to work together over long distances in real time, to send large amounts of data globally and to have constant access to important data regardless of location. Important data is not only generated in the private sphere, but also in industry or at the political level. These drastic changes, which especially software companies are currently exposed to, also lead to changes in pricing (Fricker and Maksimov, 2017). It is therefore becoming more and more relevant to deal with the topics of big data and data collection in terms of pricing.

Data is mostly traded via data markets. For this purpose, these are loaded into the retailer's cloud and thus made available for trading. Examples of such data marketplaces would be Microsoft Azure Marketplace, Xignite and Cvedia (Fricker and Maksimov, 2017). There are a few key players in data markets to consider. First there is the market maker. This provides the platform for data trading. He collects the provider's data and then usually keeps part of the price as a commission. The market maker is an independent party that enjoys the trust of buyers and sellers and handles the entire transaction of a purchase and sale. Another actor is of course the owner of the data. This makes his data available for analysis and sales. The last main actor is the buyer. This is a data analyst who wants to analyze and process the acquired data (Li et al., 2017). These actors can be found in most data transactions.

In fact, pricing data is quite difficult. In the following three different papers are presented, in which different aspects of data pricing and interesting theoretical schemes are presented.

As part of a study, Fricker and Maksimov evaluated 15 different papers that deal with the price models of data traders and thus examined which types of pricing are to be found in practice when trading data sets. This shows that the pricing of data is indeed complicated. There are different types of data, such as sensor data, personal data, linguistic data, demographic data, but also data sets such as music or videos that are traded (Fricker and Maksimov, 2017). The biggest challenge for sellers is to price data appropriately. Because for them, pricing is part of the value creation of data. For buyers, however, data that is overpriced becomes unattractive. The authors show how difficult it can be to quantify and price the values of data. The evaluated studies came to different recommendations as to which pricing strategy should be pursued. There were mechanisms that determined optimal prices using algorithms. Others used pricing functions. However, no clear preference can be identified, and the price models presented range from usage-based to volume-based and flat fee prices. The goals set also differed significantly from each other. Some works aimed at maximizing profit, while others also aimed at fairness and wealth maximization (Fricker and Maksimov, 2017). The authors succeed in showing how different

the approaches to pricing data really are, and one can imagine that exciting insights will be gained here in the future.

Another comprehensive and interesting insight into the pricing of data is provided by Li et al. in their paper 'A theory of pricing private data'. The focus here is on private data, which is of value to the owner as well as other institutions and analysts. They take a critical view of the fact that Internet companies such as Facebook or Google seem to make services available to their customers free of charge, but by trading data they are reducing the privacy of their users (Li et al., 2017).

Li et al. developed a framework for pricing that does not allow arbitrary pricing. Since the mathematical formulas and calculations on which this pricing strategy is based are very complex, only the most important findings will be mentioned here. Among other things, the authors refer to the loss of privacy that occurs with every request and every access to data and thus enable fair pricing for all participants when trading private data. By means of micropayments, balanced pricing is made possible, which adequately compensates the data owner for the experienced loss of privacy (Li et al., 2017).

The authors Zhang et al. present yet another concept which, however, includes the actuality, i.e. the freshness of data itself in the data pricing. To do this, they define a new key figure called *age-of-information* (AoI), which indicates how fresh the data is. This key figure is defined as the time that has passed since the arrival of the freshest data packet. Examples of such fresh data would be traffic data, data analysis tools, as examples of fresh data markets, the authors cite real-time cloud computing, financial markets and the Internet of Things (Zhang et al., 2021). This type of data is becoming increasingly relevant and, due to the very complex processing and generation processes, it makes perfect sense to consider the pricing of fresh data separately.

As a result of their research, the authors come to the conclusion that a simple subscription pricing model would be the best option, since time-based or quantity-dependent pricing would be too expensive and therefore not be able to maximize profit (Zhang et al., 2021).

This is interesting insofar as the time component in data is actually a very important factor and one might think that it would play an important role in the pricing of data.

These various theories and concepts for pricing data are of course only a small selection. They make it quite clear which different factors have to be taken into account when determining the price of data. Nevertheless, they also show how difficult it can be to formulate suitable pricing strategies for data that benefit all actors equally.

4.3.2. Personalized and Behavior-based Pricing

In times when data analysis and processing are becoming more and more important in day-to-day business, it is hardly surprising that pricing strategies are also being developed that use data as a basis for price calculation. Two methods of pricing using data are personalized and behavioral pricing. These, too, play an increasingly important role in the information technology age and can be used in corporate context thanks to new technological developments and advances (Li et al., 2021).

As mentioned earlier, user data is valuable information. Now, of course, the question arises whether this personal data can also be used for individual pricing. And indeed, sellers try to use the collection of data to paint the most detailed picture possible of consumers. In addition to the interests and personal demands of the customers, they want to know, above all, how high they are willing to pay for goods in order to be able to optimally price a product or service.

The view of the seller is of course only one of many. In contrast, consumer advocates argue that the collection of personal data should only take place to a limited extent and with a sense of proportion. The topic of privacy in particular continues to enjoy high priority, both in business and in society as well as politics. Important questions about data protection and data collection are still unanswered or are yet to be discussed (Li et al., 2021).

It is therefore not surprising that personalized pricing is generally viewed quite critically. Nevertheless, personalized pricing is already being used in practice. Grocers, airlines and other industries are already trying out personalized pricing strategies. From the seller's

point of view, the advantages are obvious. By precisely predicting the willingness to pay of potential customers, individual offers can be made and, by analyzing customer information and personal data, the appropriate prices from the customer's point of view can be calculated (Elmachtoub et al., 2021). Of course, this kind of price discrimination is not easy to implement. This not only requires extensive market research, but also a large amount of customer data must be collected, stored and analyzed in order to be able to implement any kind of personalized price strategy at all.

Elmachtoub et al. provide important views on personalized pricing in their work 'The Value of Personalized Pricing'. The authors argue that if companies have access to complete customer information, they can pursue an ideal personalized pricing strategy. Since this rarely happens in reality, companies should instead learn to collect customer data in a targeted manner and to evaluate it intelligently (Elmachtoub et al., 2021).

As the results of modeling and calculations, the authors present a framework that does not take the data of individual customers as the basis for personalized pricing but takes into account the characteristics of the underlying market. In particular, they characterized the value of personalized pricing versus booking a single price for all customers. The authors succeed in transforming the previous limits of idealized personalized pricing into more practical limits of the value of function-based pricing compared to individual pricing strategies. This also enables companies that only have limited access to individual customer data to use personalized pricing (Elmachtoub et al., 2021).

Behavioral pricing differs from personalized pricing in a few ways. Here, too, customer data form the basis for calculating prices. However, it is not the individual data from which consumer preferences and willingness to pay are derived. Instead, consumer data is collected using technologies such as internet cookies and automatic data collection devices, thus creating a picture of their purchase history instead of focusing on individual characteristics. Future purchase decisions by customers are then derived and forecast from these past data sets (Li et al., 2021).

The authors Li et al. have developed a model that shows the effect of transparency on behavior-based pricing. To do this, they examine two scenarios. In these, customers once have complete information about whether a company operates behavior-based pricing and once they do not. Although it is a simple and reduced model at first glance, it is mathematically quite complex. Here, too, the results of the study are therefore primarily explained instead of mathematical details.

If the pursuit of such a strategy is advantageous for providers and customers ultimately depends on whether personalized service offers are also available, but also on the availability and pricing of data. Interestingly, the authors come to the conclusion that transparency leads to higher prices and a decrease in social welfare. This is because with transparent pricing, companies do not have to bias prices downwards in order to convince customers. Still, the authors see difficulties in the generation and use of relevant data for pricing, as well as in the willingness of companies to openly inform customers about the data used (Li et al., 2021).

It is indeed difficult, as this type of data collection is highly controversial in both behavioral and personalized pricing. While consumer advocates are calling for the least possible use of personal data, the economy in particular still sees a lot of untapped potential and would like to analyze and evaluate as many data sets as possible.

Whether these price models are value-based or even just, as postulated by Thomas Aquinas, is of course controversial. If personalized price strategies, with almost perfect information on both sides, lead to the fact that the price and value expectations of buyer and seller actually coincide, then this could be answered in the affirmative. However, this often fails due to a lack of will and the ability of businesses to recognize their own advantages when pricing of their goods just.

As long as personalized or behavior-based pricing continues to be developed with the aim of passing on products and services to customers in a profit-maximizing manner, without taking their values into account, these pricing strategies cannot be viewed as value-based.

4.3.3. Outlook on Future Developments

To conclude the critical discussion, a brief outlook should be given as to the extent to which pricing strategies could change in the future.

First, an overview is given of the factors that could influence pricing strategies. These include, for example, geographic factors. Companies price goods for different markets and regions at different rates. Other factors such as customers' willingness to pay and the influence of competition will continue to be relevant in the future. One factor whose influence will increase is the corporate image. Many companies, especially innovators in the field of software, attach great importance to a positive perceived external image (Sammut-Bonnici and Channon, 2015).

For example, the topic of environmental and climate protection is currently highly relevant, and a large number of companies voluntarily undertake to implement ambitious climate and environmental protection measures. For example, Apple published a 105-page 'Environmental Progress Report' in spring 2021, in which information on environmental goals, resource consumption and future corporate strategy are postulated. The main goal of the company is climate neutrality by 2030 (Apple Inc., 2021). The implementation of such an ambitious goal also has an impact on production costs and promotes high research and innovation costs. Of course, the choice of pricing will also depend on the overall corporate strategy in the future. But factors such as the corporate image and political guidelines are increasingly gaining influence and will certainly have an impact on pricing.

Due to the extensive technical advances in recent years, algorithmic pricing is also becoming more and more relevant. This type of pricing is already used, for example, by travel portals and airlines, but also in the retail gasoline market. The ever-increasing amounts of data available and new software and tools for analyzing and evaluating data sets are accelerating this trend. With the help of e-commerce, it is possible for sellers to adjust prices almost constantly and thus to make sellers more competitive. Furthermore, algorithms help companies to price goods and services and therefore save cost for developing a pricing scheme. The use of artificial intelligence, i.e. AI, is also playing an increasingly important role here (Chen et al., 2016).

A well-known example for the use of algorithms in pricing is the Buy Box algorithm from Amazon. If you as a customer would like to purchase a product via the web shop, you complete the purchase by clicking in the buy button. Since many goods that are listed on Amazon are also offered by other retailers and not just by Amazon itself, a special algorithm was developed which determines which supplier's offer is displayed in the Buy Box in addition to Amazon's own price. How this algorithm ranks providers and which factors play a role are of course secret. However, it is assumed that traders themselves develop pricing strategies to be ranked by the Buy Box algorithm higher, thus increasing the chance that the own offers are shown (Chen et al., 2016).

In fact, studies have already shown that the use of algorithms does not make pricing more equitable, but actually increases the price level. Calvano et al. have even come to the conclusion that the systematic implementation and application of artificial intelligence in pricing leads to prices approaching the level of monopolists. This is interesting because in her paper she specifically examined the behavior of price agents who make decisions using reinforced learning algorithms. These act in isolation and independently of other price-setting agents. Through trial and error, they develop and refine these strategies without needing any knowledge of the operating environment (Calvano et al., 2020). Although the findings of this study first have to be evaluated in further studies, they are definitely interesting with regard to current and future developments.

Bundling should also be mentioned as a further pricing principle. In the context of pricing, product bundling means the combination of individual products that are offered at a fixed price in the form of a product combination (Larson, 2014). A simple example are older magazines that are bundled with new publications and thus suggest a good offer and added value to the customer. But software providers such as Microsoft or Adobe also like to use this strategy. In the future, product bundling will probably become even more relevant, because in connection with personalized price strategies and consumer data, individualized offers can be made to individual customers.

As shown in this seminar paper earlier, value-based pricing strategies are also highly relevant today. Many businesses have recognized that value-based pricing benefits not only customers, but also the company itself.

Still, it remains uncertain whether fairer pricing strategies, such as the value-based or just approach, will gain more relevance or if profit-maximizing strategies will continue to dominate in the near future. Indeed, there are companies that price based on customer-perceived value and the number of those has been on the rise for the past couple of years. However, the increasingly complex and extensive methods of pricing created with the help of Big Data and AI may mean that more entrepreneurs will again implement profit-maximizing strategies.

5. Conclusion

In summary, it can be stated that pricing in the age of information technology is a very extensive and complex topic. The prices of products and services are calculated in a variety of ways. However, there are three major strategies with cost-based, value-based and arbitrary pricing that are used by most industries and sectors for pricing goods.

It is indeed interesting to see that modern pricing strategies are also influenced by historical considerations and philosophical insights and that there were theories about values and fair pricing even in ancient times. The Greek philosopher Aristotle in particular provides important impulses with his theories and thoughts. Ancient Rome with its developed and widely ramified trade and economic system also provides interesting economic insights and shows that even in ancient times prices were based on certain factors, such as local conditions and availability. In the Middle Ages it is Thomas Aquinas who created a particularly impressive work with the 'Summa Theologica'. In this, he records considerations about a fair price, an approach that is also used in current value-based pricing methods. Findings from pre-classical schools such as mercantilism and physiocracy also show how relevant economic considerations have been in the course of history.

Findings from pre-classical schools such as mercantilism and physiocracy also show how relevant economic considerations have been in the course of history. Economic growth as the most important goal was postulated for the first time by Adam Smith, who is also considered the founder of modern economic theory. He introduced the concepts of natural and market prices and provided important insights for the further development of price theories. Today's economic concepts and price theories are based primarily on the teachings of neoclassical theories. Particular mention should be made of Gossen's consumption theory, which forms the basis of today's microeconomics.

The in-depth introduction to the theoretical approaches and concepts of cost-based, value-based and arbitrary pricing shows that the price of a good can be calculated in different ways. Even at the beginning of the 2020s, the production and sales costs still form the core of pricing, but the consideration of competition, customers' willingness to pay and value creation are becoming more and more relevant. The concept of the fair price is also moving back into the focus of companies.

As part of the critical evaluation of prices in the information technology age, it is first explained how software companies price their products and services. Reference is made here specifically to cloud computing, which enables software companies to pursue targeted and more individual pricing strategies. This enables target groups to be addressed specifically and priced according to their willingness to pay. The mobile games industry in particular shows how complex and sophisticated pricing strategies can be and that psychological findings can also be incorporated into the pricing.

The core of modern pricing, however, is data. The collection, analysis and evaluation of data sets opens up completely new possibilities for companies to price goods. These include personalized and behavior-based pricing strategies that aim to precisely calculate the future willingness to pay of customers and thus deliver the best possible prices. Data itself is traded on special data markets and priced according to freshness and scope. The value perceived by the consumer is also becoming increasingly relevant, as past behavior can be traced with the help of customer data and future purchase decisions and values perceived can be forecast.

Which pricing strategy is ultimately best suited for a product or service differs from case to case. Depending on the industry, product category and target clientele, different pricing methods can be advantageous. However, even in the age of information technology, companies should note that a value-based approach, in which the value perceived by customers forms the core of the pricing, is almost never wrong.

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