Chapter 6
Marketing Concepts and Instruments in Supply Chain Management

Thomas Neukirchen, Oliver Gansser and Matthias Klumpp

Abstract Logistics and Supply Chain Management as a subfield of management science have their roots in the production and distribution of goods. In this chapter the basic objectives, principles and links about marketing and their relationship to logistics and supply chain management are outlined. The first—*basic*—part addresses the definition, logistics interaction, basic concepts, and a case study regarding marketing as a management philosophy and principle for corporate leadership. Here, "distribution channels" and "time to market" are two marketing topics particularly relevant to logistics. The *advanced* part of the chapter outlines detailed instruments for marketing strategies and market research. The final *state of the art* part of this chapter describes modern forecasting methods as well as innovation fields, including a further case study regarding future trends.

6.1 Definitions, Objectives and Logistics Interfaces (Basic)

Modern marketing management is widely seen as a leading value driver for businesses around the world. Logistics and supply chain functions are important enablers of the value that consumers experience. Most product markets changed after the Second World War from a seller's market to a buyer's market as more and more suppliers offered an ever-larger volume and variety of products. In such situations, sales and earnings were not a given once a product has been manufactured. Saturation was

T. Neukirchen (✉) · O. Gansser
FOM University of Applied Sciences, Essen,
Nordrhein-Westfalen, Germany
e-mail: thomas.neukirchen@fom.de

O. Gansser
e-mail: oliver.gansser@fom.de

M. Klumpp
FOM University of Applied Sciences and University of Duisburg-Essen, Essen,
Nordrhein-Westfalen, Germany
e-mail: matthias.klumpp@fom.de

H. Zijm et al. (eds.), *Operations, Logistics and Supply Chain Management*,
Lecture Notes in Logistics, https://doi.org/10.1007/978-3-319-92447-2_6

characteristic for the market the companies had to face in these times. Competition among producing companies rose and customers could decide between variations of each product. Divided markets and smaller market shares for each product meant that it was more likely than ever for companies not to reach viable, that is, sufficiently high, sales volumes. Therefore, focus shifted towards the act of selling itself, the qualities of markets became the subject of professional inquiry. The professional management science discipline of marketing management came into being by providing elaborated methods and instruments for securing product sales. Obviously, the main concern of such strategies and activities are the characteristics, and (more or less stable or malleable) preferences of customers as in standard free markets they decide about such product sales (outside exceptional situations such as monopolies or government regulated markets).

Modern marketing management has been defined as follows (e.g. Kotler and Keller 2015):

> *Marketing management has the **objective** to professionally use company resources to increase the customer base, improve customer opinions of company products and/or services, and therefore enlarge the present and future earning potential. This includes the planning, implementation as well as tracking and review of all corporate marketing resources and activities. Furthermore, it aims at embedding the customer- and market-led management and decision philosophy strongly within all corporate processes and personnel on all hierarchy and decision levels.*

In order to outline this marketing management perspective as the fundamental corporate orientation towards the customer and the *market* (including competitive forces such as technology, competitors, alliances, regulation and cross-market developments), we may look at the example of two companies and their market track record. In Table 6.1 we compare Amazon and Nokia regarding their strategic market orientation. Technology was used as primary enabler for both companies and they were able to provide customers with unique products or services of high value. Therefore they were global leaders in their domain. The difference is … Amazon still is an industry leader whereas Nokia is not.

At one point in time, Nokia was not able to react adequately to the market needs at a strategic level, especially as smartphone applications began to dictate how mobile phones were used. This led a loss of one third of the global market share for Nokia between 2008 and 2011. On the other hand, Amazon is still able to maintain its leadership position in the online retail business, even entering new areas, e.g., grocery business. There may be changes ahead in technology, regional importance (Asia), political or other developments that may prohibit a successful company like Amazon to stay at the top of its game. Thus, companies need to understand changing customer demands and preferences and be able to meet their needs on a continuous basis. This is the final quest and challenge for marketing management: to secure future earnings potentials by scouting, analyzing, understanding and implementing the requirements of customers and markets, now and in the future.

A good introductory example for the strategic nature of marketing is the ***PESTLE*** analysis explained next. Such an analysis with six dimensions is used for analyzing

Table 6.1 Comparison of marketing success amazon and nokia

	Amazon	Nokia
Market	Retail	Telecommunications
Founding date	1994	1967 (roots from 1865 in pulp and rubber production)
Location	Seattle, USA	Espoo, Finland
Development milestones	1995, first online book sale 1998, internationalization, e.g. Germany, Spain 2007, start of Amazon Prime	1987, first mobile phone 1998–2011, global market leader mobile phones 2014, mobile phone division sold to Microsoft
Employees • 2017 • 2007 • 1997	• 306,800 • 17,000 • –150	• 105,000 • 112,260 • 36,647
Turnover • 2017/2016 • 2007 • 1997	• 113,420 mil. US-$ • 14,840 mil. US-$ • 147.8 mil. US-$	• 23,600 mil. € • 51,060 mil. € • 9,700 mil. €
Profit • 2017/2016 • 2007 • 1997	• 2,371 mil. US-$ • 476 mil. US-$ • −22.6 mil. US-$ (loss)	• −766 mil. € (loss) • 7,200 mil. € • 1.4 mil. €

Sources Internet sources (wikipedia, statista, wikinvest, nokia, amazon—January 2017)

potential market segments (in a qualitative way) before further scrutinizing and defining marketing strategies. This can be applied to business units or complete markets, e.g., when entering a new country for selling corporate products or services. Within the analysis, the abbreviation letters stand for: *P* for Political, *E* for Economic, *S* for Social, *T* for Technological, *L* for Legal and *E* for Environmental. Hence, an overall perspective of a market or segment environment from different angles is necessary to develop a sound marketing strategy. Several lead questions for implementing the analysis are suggested, for example:

- What is the *political* situation and how can it affect the industry and sales?
- What are important *economic* factors?
- How much importance does *culture* have in the market and what are its determinants?
- What *technological* innovations are likely to pop up and affect the market structure?
- Are there any current *legislations* that regulate the industry or can there be any change in the legislations for the industry?
- What are the *environmental* concerns for the industry?

To understand the market, this framework represents one of the basic parts of strategic management that not only defines what a company should do, but also influences an organization's goals and strategies. Obviously, the importance of each

factor may vary from market to market and country to country. It is similar to a SWOT (Strengths, Opportunities, Weaknesses, and Threats) analysis but in some dimensions more detailed.

- **Political**: These factors determine the extent to which a government may influence the economy or a certain industry, e.g., by imposing a new tax or duty due to which entire revenue generating structures of organizations might change. Political factors include tax and fiscal policies, trade tariffs, and other factors that may affect the business environment (economic environment) significantly.
- **Economic**: These factors are determinants of an economy's performance that directly impact a company and have long term effects, e.g., a rise in inflation rate of an economy would affect the way companies' price their products and services. Adding to that, it would affect the purchasing power of a consumer and change demand/supply models for that economy. Economic factors include inflation rate, interest rates, foreign exchange rates, economic growth patterns and others. It also accounts for the foreign direct investment (FDI) depending on specific industries as well as qualification and employment structures and qualities.
- **Social**: These factors describe the social environment of the market, e.g., determinants such as cultural trends, demographics, and population trends. An example for this can be seasonal buying trends where there is high or low demand during holiday seasons.
- **Technological**: Such factors relate to innovations in technology that affect operations of the industry and the market. This adheres to automation, research, and development and the level of technological awareness and advancement that a market possesses.
- **Legal**: These factors have both external and internal aspects. Specific laws may affect the business environment in a certain country while there are certain policies that companies maintain for themselves. Legal analysis also takes into consideration both angles and then identifies the strategies in light of these legislations, e.g., consumer laws, safety standards, labor laws.
- **Environmental**: Factors include those that influence or are determined by the surrounding environment. Factors of a business environmental analysis include but are not limited to climate, weather, geographical location, global changes in climate, and environmental offsets.

The case study discussed in Sect. 6.2 shows how intertwined marketing management and logistics as well as supply chain management functions are. Like other complementary products and items such as bread and butter or cars and tires, marketing management and logistics management need each other and rely on each other for a successful joint market posture. There are many intertwined topics and processes between marketing management and additional corporate as well as supply chain functions. This section sketches the interesting segment of interactions from marketing management with logistics and operations processes, mainly in purchasing and manufacturing.[1]

[1] See also the previous Chaps. 4 and 5.

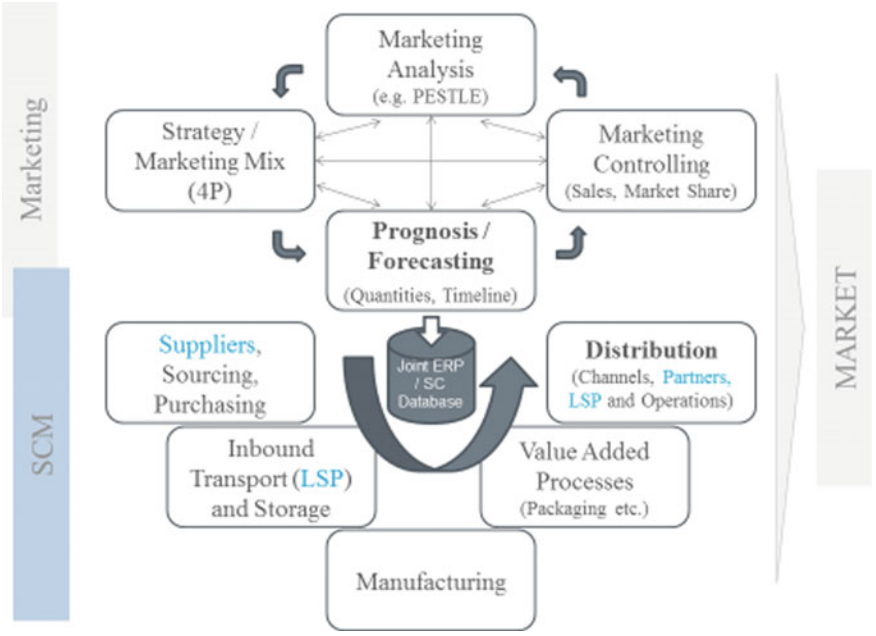

Fig. 6.1 Marketing and supply chain interaction

Obviously, especially forecasting methods and their results directly impact the planning and decisions in purchasing and manufacturing: quantitative prognosis results for sales numbers and volumes as well as direct customer orders will directly translate into item purchasing volumes a company needs from suppliers as input to manufacturing processes. Also timing (which customer and market requires which product in what numbers at what specific time) is an essential input for purchasing, transportation and manufacturing planning, therefore not only sheer volume quantities are expected as results from the marketing management and forecasting methods.

Figure 6.1 outlines this interaction, depicting the inherent marketing management circle in the upper part (analysis, strategy, forecasting, implementation, control). Subsequently, the forecasting function is a crucial impact for a multitude of supply chain, logistics and operations management processes: from purchasing (supplier selection, contracting and ordering) over inbound transport, manufacturing and added services (packaging and others) to distribution processes. Note that light/blue indicated functions are often performed by corporate partners in the supply chain such as logistics service providers (LSP).

Modern supply chain and information system architectures are providing this core interaction with joint ERP and supply chain information systems, often implemented in internet- and cloud-based services and platforms. The detailed connection with the operational level in distribution is also outlined further in Chap. 14.

6.2 Case Study: Customer Orientation Repair Shops

Background
"Following a policy reform in the European Union, independent motor traders and service groups were granted better and fairer access to technical information, training, repair shop equipment, and original spare parts. Consequently, as market competition increased, the aftermarket operations of automotive manufacturers faced increasing pressure. To overcome new market threats, one of the world's most successful manufacturers of premium passenger cars transformed their aftermarket logistics platform to improve service, enhance retention, and increase part sales.

Customer Challenge
With a distribution model configured around a single warehouse, the automotive manufacturer's service centers received only one parts delivery each working day. Automotive parts were held in a centrally located warehouse where orders were taken until 18:00 each day for them to be delivered to service centers by 8:00 the following day. Because of this, whenever an additional problem was diagnosed in the service center, the end-customer had to make a return visit or the service center would hold the vehicle for an additional day for the required parts to arrive. Both scenarios, however, did not fulfill the levels of satisfaction demanded by its end-customers. In a bid to resolve this, the manufacturer redesigned its after-market logistics operations, developing a network of strategic local distribution centers that provided same-day parts deliveries.

Supply Chain Solution
Working in partnership with the manufacturer, DHL Supply Chain drew up a sustainable logistics solution that enabled 18 service centers across Scotland and Northern England to receive three additional part deliveries each day. Due to the widespread geographical coverage of service centers across the region, location was of primary importance. DHL Supply Chain had an established warehouse operation in central Scotland which was ideally positioned and had available storage capacity to accommodate the strategic stock-holding requirements. The warehouse was re-configured and 16,500 sq ft allocated to store the automotive parts. An optimized solution was also devised for receipt, storage, pick, and dispatch. With the warehouse operation responsible for fulfilling three daily order runs each day, three short peaks of activity occurred that aligned to the cut-off times for dealer dispatches. Activity spikes of this kind meant a dedicated team of full-time employees would not provide a cost-effective solution due to the periods of downtime between the highs of activity. A decision to create a multi-skilled workforce was made, enabling the automotive operation to draw on labor support from the existing operation whenever it was required. Selected employees underwent training and learned about the manufacturer's

processes and procedures for safely and accurately picking orders and preparing for distribution. The outbound transport element into the dealerships was awarded to a different third party logistics provider following a competitive tender.

Customer Benefits
The three-year implementation and contract phase went live in September 2010 and, after the first month of operations, performance indicators demonstrated the success of the start-up. The operation handled 2,035 inbound lines and made 530 dispatches to dealers, which translated into a 100% service level. Since establishing the local distribution, there has not only been a decrease in the number of return visits end-customers require but also in the amount of inventory held at service centers. In addition, **overall parts sales has increased**. After 18 months, the manufacturer recognized the outstanding achievements and awarded the contract "gold" status for service performance and greatly exceeding the inventory accuracy targets set. DHL is currently working with the premium car manufacturer to roll out and replicate the innovative aftermarket logistics model in key geographies around the globe. Underpinned by a culture of continuous improvement, SCM and logistics aims to drive efficiency improvements by sharing successful ideas across all operations—a testament to how its size and scale can be leveraged to deliver excellence worldwide." (*Source*: www.dhl.com/content/dam/downloads/g0/logistics/case_stuies/dhl_auto_same_day_parts_deliveries_case_study.pdf).

Lessons Learned
This case shows the inherent connection and collaboration of marketing and logistics efforts in order to increase customer service and satisfaction and finally realizing competitive advantage and earnings potential. The customer shall ideally be the major objective and driver of strategy and process changes within all corporate activities from purchasing to production, distribution and sales.

6.3 Basic Functions and Interactions: Markets, Distribution Channels and Partners, Time-to-Market (Basic)

6.3.1 Development of Marketing Concepts: The 4P Example

Originally published by McCarthy, the 4P-framework for marketing decisions can be seen as synonymous to the *marketing mix*, which is one of the three best-known strategy-models (the other two being the 3C's model and the Ansoff Matrix) and as

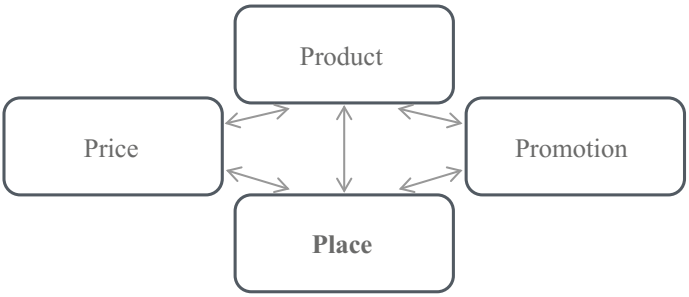

Fig. 6.2 4P model: marketing mix

such can be embedded into the numerous existing approaches to marketing strategy (others focusing on the relative timing of market entrance and entrant roles, diversification and integration, for instance). In the classic formulation, 4P represents the words product, price, promotion, and place. Each P is further defined and related to strategic decisions and actions. We give a short overview of the classic 4P and one variation with the Modern Marketing Management 4P as presented by Kotler and Keller (2015), depicted in Fig. 6.2.

The classic 4P refers to "Product, Price, Place, Promotion". Here, *Product* incorporates the variables product variety, quality, design, features, brand name, packaging, sizes, services, warranties, returns (Source: Kotler and Keller 2015). *Price* represents the list price, further: discounts, allowances, payment period, and credit terms. *Promotion* refers to sales promotion and sales force, advertising, public relations (PR), direct marketing. Under *Place* the classic model subsumes channels, coverage, assortments, locations, inventory, and transport. Kotler and Keller (2015) have offered a replacement model categorizing the marketing mix-components into "People, Processes, Programs, Performance". Variations, up to 8 Ps and more, include partial to complete overlaps of these two.

The broad scope and complexity of modern marketing and its treatments in applied and scholarly literature suggest a long tradition of marketing, approached systemically. While marketing practice has been around for ages, its theoretical counterpart however is fairly new and their interaction has undergone a number of paradigm shifts, or changes in focus. Table 6.2 presents a timeline of marketing thought.

6.3.2 Distribution Channels

Two general marketing topics are of particular interest for logistics and supply chain management: "distribution channels" and "time to market". Logistics has been described as standing at the intersection of purchasing and marketing, as is suggested with the place-category in the various multiple-P-frameworks. Making products available to customers in a way that is most efficient thus constitutes the main

Table 6.2 Timeframe of marketing thought

Paradigm: focus on …	Description
Production	Advent of mass-production Machine-made products are substituting manufactured goods (with manufactured in its literal meaning as 'hand-made'). Focus on price, standardization in favor of customization: demand overhang
Product	Rising disposable household income and increasing market size. Attempts to raise output quantities while adding features: product complexity rises, as do prices
Sales	Supply overhang due to enlarged capacities. Supplier-centered approach on advertising and short term-oriented personal selling. Persuasion efforts to compensate for product shortcomings
Consumer	Aim: make products, thus organizations should fit customers' needs/demands. The customer-centered approach entails the entire modern marketing concept as, for instance, structured with the 4P-model and its negotiation both with the outside environment and within the organization

goal of distribution. Distribution contributes to the product attributes, most simply by trade-offs such as speed versus upfront costs and waste. Generally, distribution and transport means have to be chosen according to end user needs and preferences. Distribution channels can therefore include long chains of intermediate actors whose roles in fact consist in cost reduction and increasing efficiency.

Distribution takes on a very broad scope in a logistics context. Strategic matters occur all along the supply chain, starting at pre-production with procuring and transporting raw materials. All steps and movements related to intermediate products up to the completed product and its delivery may be included, whether it be on a business-to-business-level (B2B) or on a business-to-customer-level (B2C). This encompasses all related (strategic) decisions (e.g., store location, stock levels, and information systems). With a view to modes of transport and their selection, we encounter a problem based on several factors. Some factors are strategic, for instance, the choice of own transport method versus that of a competitors, product attributes, method choice made by competitors, costs associated with respective channel, reliability, time, security, traceability, and customer service level required (Coyle et al. 1988). As Fig. 6.3 shows, these categories translate into many quality determinants, which, in customer-centered marketing, amount to choice criteria.

Of course, selection of transport modes is directly related to the choice of the distribution channel, which is the succession of intermediary agents a product passes, starting at the producing entity and ending at the consumer. Examples for intermediaries are wholesalers and retailers. Given the structure of the intermediaries and their interactions, we can further differentiate between conventional marketing channels, vertical marketing systems (VMS, i.e. corporate, administered, contractual VMS), horizontal marketing systems and multichannel marketing.

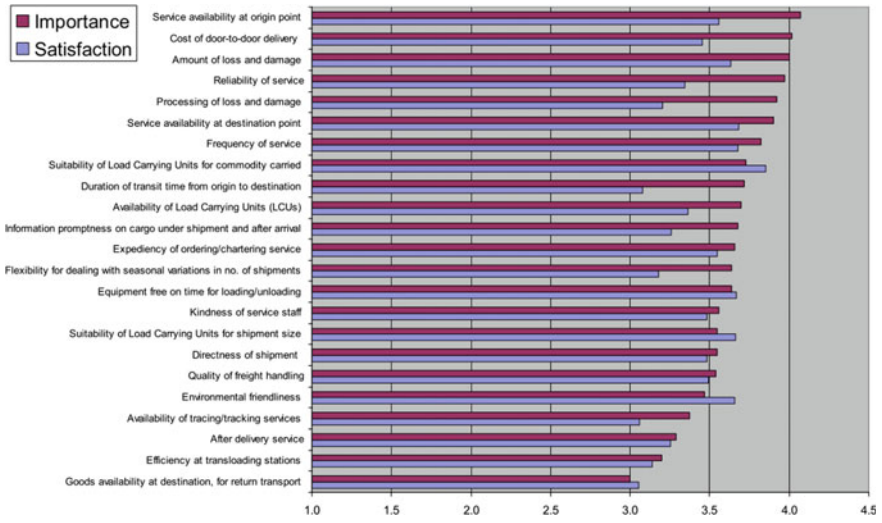

Fig. 6.3 Scores of importance and satisfaction assigned by shippers to twenty-three quality dimensions of rail shipments (Grue and Ludvigsen 2006)

6.3.3 Time to Market

Time to market (TTM) describes two things: the time span from product conception to availability for sale (both requiring some specific definition), and the strategy that aims at optimizing this period. It is of special interest with respect to markets with high innovation frequency. Though suggestive in terms of measurability, practical definitions of both the starting and end point of this time span vary greatly depending on the type of industry, organization or the profession considered. Possible starting points are (for example): product idea, concept or draft approval, approval of financing/budget, actual placement of staff. Similarly, various definitions of the end include shipment or sales start date, a predefined sales figure or a well-defined transaction within the producing organization. Generally, these definitions are industry-specific. With respect to strategic considerations, mostly TTM-values achieved by companies from the same industry are relevant. Figure 6.4 depicts the cost implications of deviating from an ideal TTM.

Given the product development process is sufficiently structured, no phase or step within the product development process can be skipped or moved to advantageous effect. Within a framework such as six sigma, time-saving-measures (in the short term) that override the given succession of procedures may cause a company to incur both higher costs and lower quality. In general, important variables shaping a TTM improvement efforts are innovation frequency of the industry, predictability of product release schedules, resource input goals and conditions (e.g., labor input/cost versus speed), adaptability, flexibility and desired responsiveness to mid-project requirement changes.

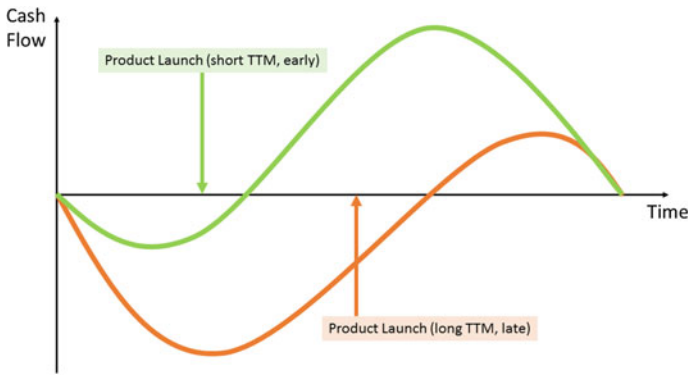

Fig. 6.4 TTM-effects on cash flow (green-early to market, orange-late to market)

One instance from the area of software development shows how the introduction of agile methods has drastically reduced TTM. Because software products pervade the world's functionality, placing focus on achieving higher quality can be leveraged with respect to many applications. Indirectly, TTM-reducing measures represent competitive challenges and opportunities in virtually all industries. Continuing performance management beginning with the initial project draft and accompanying all succeeding stages improves TTM as well as other critical aspects (e.g., defect avoidance or identification, customer service and acceptance rates, stability). Further, this illustrates the difficulties for clear definitions of the concept itself, because rapid prototyping, for instance, aims at delivering principally finished products or elements (Fig. 6.5).

While waterfall methods make planning phases more stringent and apparently easier, numerous shortcomings, virtually with respect to all other areas, render them outdated in the presence of agile methods. Most important shortcomings are the separation of business and development in early phases, high knowledge requirements on the side of users (which is rarely given) and, in line with this, potential for extensive rework—all of this increasing TTM. With agile methods, flexibility, cost and risk reductions, short release circles (typically 2–4 weeks) greatly offset the more intense management required—*and* decisively reduce TTM.

6.3.4 Cows, Dogs, and Stars?

Perhaps the most famous brand marketing tool has been known since the 1970s as the Product Portfolio Matrix, Boston Box, BCG-Matrix, or growth-share-matrix, as it basically plots business units or products to be analyzed along the dimensions (relative) market share and growth rate. The quadrants of the diagram (see Fig. 6.6) are dubbed cash cows, dogs, question marks, and stars:

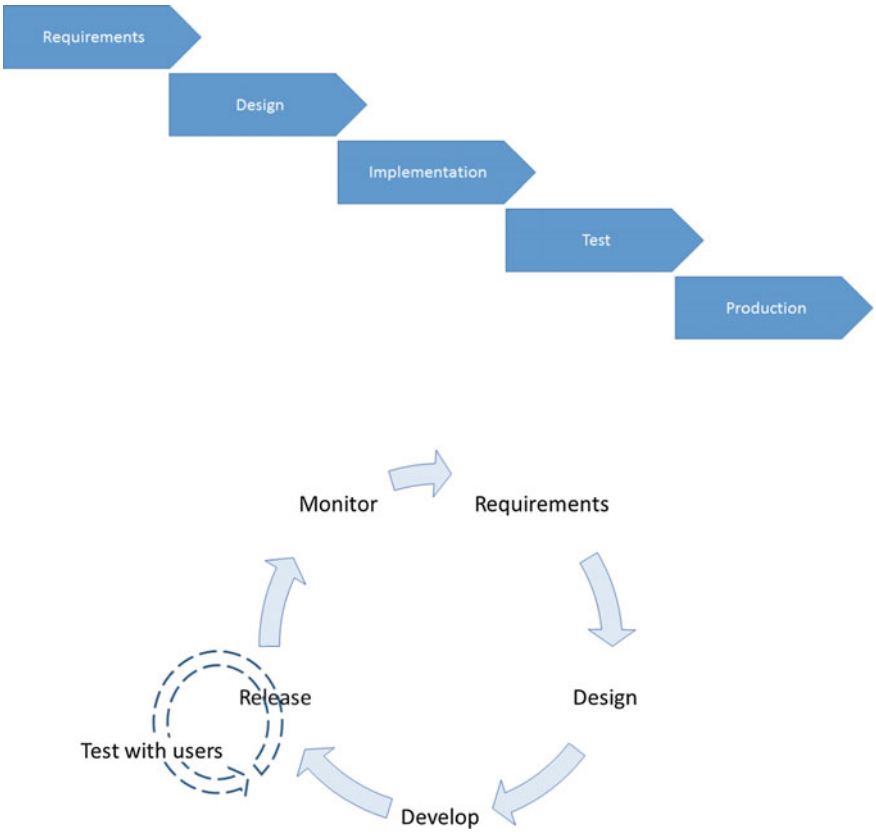

Fig. 6.5 Waterfall versus agile software development

- Cash Cows: Located at the intersection of high market share and low growth, generate cash for the company's operations.
- Dogs: Units remaining at break even. Depending on perspective, these are valued more or less enthusiastically. If one views long term-oriented goals such as job and human capital preservation as part of a company's tasks, these units are sustainable. If one views generating cash as the main objective, these units may be seen as indifferent.
- Question Marks: Companies with a high market share and high growth potential either turn into dogs or stars, depending on performance.
- Stars: These are startups which have succeeded to the forefront of a fast-growing market or—niche (compare Farris et al. 2010).

The driving principle behind this is cash flow-management and the notion that cash would be generated proportionally to a product's market share, while its usage is positively correlated to market growth rate.

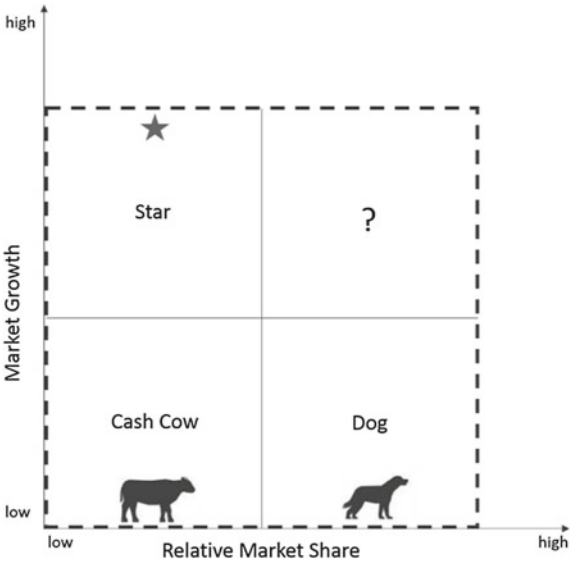

Fig. 6.6 BCG matrix

The Market Share is defined by Farris et al. (2010) as the ratio of a market accounted for by a specific ('well-defined') entity.

$$unit\ market\ share_i = \frac{unit\ sales_i}{total\ market\ unit\ sales} \in [0, 1]$$

Multiplying this dimensionless value by 100 yields the percentage market share for the units sold by a company i. Adjustment for prices yields revenue market share:

$$revenue\ market\ share_i = \frac{sales\ revenue_i}{total\ market\ sales\ revenue}$$

Variations of these measures can be used, for instance, to express relative market share of brands against some competitor's market share (Farris et al. 2010). The discrete growth rate g of a time-dependent value M (for example, market share) between two points in time, t and t_0 is defined as

$$g = \frac{M(t) - M(t_0)}{M(t_0)}$$

and the continuous rate is given as

$$w = \frac{1}{M(t_0)} * \frac{dM}{dt}(t_0)$$

and the general discrete growth rate regarding a number of points in time as

$$growth\,rate\,(t_0, t) = \left(\frac{M(t)}{M(t_0)}\right)^{1/n} - 1, with\, n = t - t_0.$$

A number of related concentration measures are used, with different definitions accounting for dispersion among firms' shares. For reference, we list the Rosenbluth, comprehensive concentration, Linda, and U-indices as well as the Pareto slope (Curry and George 1983). A measure widely used in economic analysis and policy consulting is the Herfindahl index:

$$H = \sum_{i=1}^{N} s_i^2$$

Here, s_i is the market share of firm i in the market considered.

6.4 Quantitative Methods (Advanced)

As the plethora of marketing models already suggest, the field of marketing has long eluded the access of quantitative methods and still does so in many respects. This is due to numerous reasons on all levels and with respect to many interactions: complexity and nonlinearities. For example, the delayed, unsystematic or interrelated responses to marketing efforts, cannot be quantified satisfactorily. Measurements as well as modelling efforts suffer from the ineffectiveness of available research methods (for instance, questionnaires), interdependencies and rapid changes of variables. Notwithstanding these overall limitations, a respectable variety of methods exists. Each is applicable to some areas and questions in marketing. Still, use and fit of a method for a given question has to be assessed carefully. To relate the methods shown in this section to Logistics and SCM, one may think of how these affect decisions in purchasing and manufacturing. For example, sales volume forecasts for a manufacturing company translate into item purchasing volumes on the level of its immediate suppliers. This pattern may replicate multiple times all along the supply chain, downward to 2nd, 3rd, …, nth-tier suppliers. Also timing is critical for purchasing, transportation and planning. Thus, marketing management and forecasts are expected to yield sufficiently precise estimates with respect to volume and time. Below we replicate the taxonomy of the main quantitative methods in marketing by Moutinho and Meidan (2003). The fields sub-methods of which will be explained in more detail in the subsequent sections are indicated in Fig. 6.7.

The characteristic feature of permanent reinvention may suggest itself to game-theoretic treatments, because this has a decisively strategic component. Considering game theory as a toolbox for modelling and predictive efforts concerning all sorts of competitive behavior renders it relevant to at least a few areas in marketing. In retail, for instance, market conditions are to be reasonably close to theoretical assumptions such as interactivity, complete and perfect information, dynamics and interdepen-

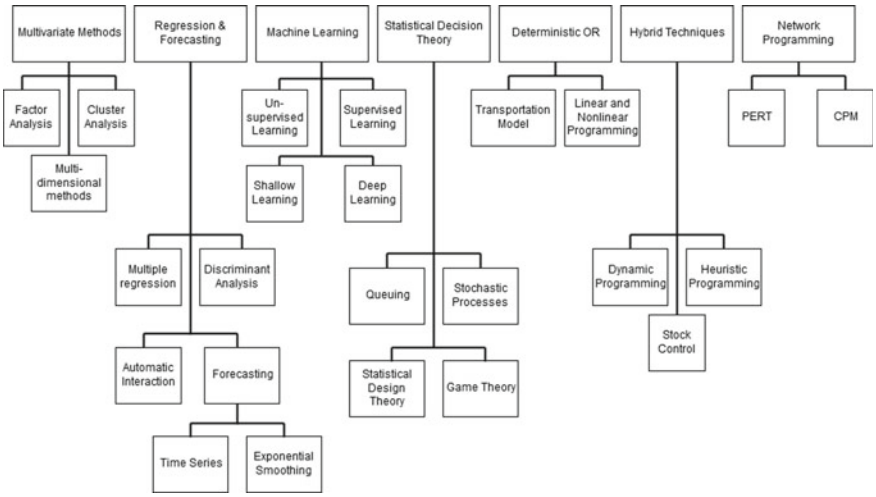

Fig. 6.7 Marketing methods

dence, at least among the dimensions of pricing, stock determination, negotiations in general and advertising budget allocation. Because game theory begins with an axiomatic approach, thus restrictively defining properties of an agent, it contradicts the empirical approach marketing and market research take, as the following informal outline makes clear. The (classic) mathematical description of a game includes a finite set of players.

Further, the following is assumed: each player has finitely many feasible choice options. These are called strategies and contain an exhaustive plan of action: Here, exhaustive means, 'for any choice situation that is laid out in the game, no matter if it actually occurs. Players are assumed to have complete, ordered preferences over possible outcomes (often represented as von Neumann-Morgenstern utility functions). These assign real-valued utilities to each outcome of the game.

Thus, its use is confined to decision-making vis-à-vis very well-defined problems. One could model a 'supermarket game' using a normal form setup (Jones 2003). In the example shown in Fig. 6.8 two supermarket chains may pick from three strategies (aggressive, moderate, passive). These strategies are aggregates of much more detailed choices each chain can make for promotions, price reductions, in store-advertising, and advertising in different types of media, for instance. Many more simplifying assumptions hold: the game can be seen as Chain I against all contenders in its market, represented as one Chain J. Each player knows about the strategies available to each other player. In Jones (2003) the example was used to illustrate an equilibrium point for the game. Each chain repeatedly engages in this competition, for instance on a weekly basis. In Fig. 6.8, the overall payoffs for mutual choice of passive strategies (20, 20) are highest, thus arguably being an incentive for collusion. However, this is not a stable situation, and thus no solution in terms of game theory. Here, one would argue that an equilibrium is reached once each player

		Chain J		
		aggressive	moderate	passive
Chain I	aggressive	13,13	16,12	**30**,8
	moderate	12,16	14,14	**25**,12
	passive	8,**30**	12,**25**	**20,20**

Fig. 6.8 Retailing competition as a normal form game (Jones 2003, 58). Supermarket Chains I and J compete, whereas J can be seen as representing many individual competitors of I. Available strategies are aggregated as aggressive, moderate, passive. In each field, the first number represents payoff for Chain I, the second payoff for Chain J

has chosen a strategy and no player can benefit by changing strategies while the other players keep theirs unchanged (Nash 1950). As is indicated by the numbers in bold print in Fig. 6.8, unilaterally deviating from a passive or moderate strategy looks beneficial. With the assumed symmetry of information and each player doing the same, the game would reach stability only of both players act aggressively. Here, both (or all) chains are comparably worse off. Still, there is no incentive to individually change to another strategy. Formally, this follows from the assumptions. A real world-explanation is that promotions are manufacturer-driven thus as much harming profits of retailers as they are inevitable (Jone 2003). The scope of game theory in marketing research is thus quite limited. However, its principles can prove useful in the analysis of market entry and competitive/cooperative strategy (entry barriers and likely contenders in a prospective market, network effects, allocation of manufacturing tasks, information distribution to market, information acquisition behavior of customers, bargaining in general).

Arriving at a crisp, purely quantitative formulation of objectives and measures seems rewarding. Many decisions related to marketing are too complex to be captured in an arrangement of a few elegant formulae. Other instances of purely quantitative attempts at incorporating the topic of marketing as a whole are physics-inspired, for instance (e.g. mimicking percolation to model adoption and spread of innovation). Thus, with the obvious need of addressing the complexity of marketing strategies, methods for market research purposes as well as for deriving sufficiently precise forecasts are explained in Sects. 6.5 and 6.6, respectively.

6.5 Market Research Methods

Because organizations must make informed decisions, marketing managers must find out what they need to know to develop marketing objectives, select a target market, position (or reposition) their product, and develop product, price, promotion, and place strategies. Therefore, they need information. To make good decisions, marketing managers must have information that is accurate, up-to-date, and relevant.

To understand these needs, they first need to conduct marketing research to identify them. Typically, marketing research is an ongoing process, a series of steps marketing managers take repeatedly to learn about the market. A company can carry out the research itself or commission another company to achieve the goal. Management must be informed to make decisions. A research process usually has seven phases (Solomon et al. 2017):

6.5.1 Steps in a Market Research Process

a. ***Definition of the research problem.*** There are three questions to answer.

- *What is the research objective and what questions should the research answer?* The strategic triangle can be used to analyze the situation if the problem is not directly apparent from the company. For example, it could be clear that the company's revenues are declining. The analysis of the strengths and weaknesses and the coverage contribution analysis show, for example, that the sales program of the company is obsolete. This phase usually ends with the need for further information (through market research) to create a new concept with the content objectives, strategies and measures. The link between the strategic triangle (Fig. 6.9) and the concept pyramid consists of information on the three corner points of the strategic triangle and the analysis and forwarding of the relevant information for the creation of a new company concept (Gansser 2014a).
- *What is the total population of interest and what is the nature of this population?* In the case of inadequate definition of population totals, systematically distorted selection of information subjects, or sloppy realization of the selection criteria, the results of the investigation may deviate significantly from the circumstances in the population of interest. This is to be avoided.
- *Which internal and external factors influence the current situation?* The analysis of exogenous influences leads to an analysis of the environment, i.e., the chances and risks arising from the general environment (analysis of the general environment), the relevant markets, the sales markets, the procurement markets, the capital market and the labor market (market analysis), and the relevant economic branch as a whole. Internal factors as the cause of a crisis are generally limited to the way a company's strategic business unit is viewed. In doing so, the performance-creating area is also affected by the area of corporate management (Gansser 2014a).

b. ***Definition of research design***. The research design concretizes what information marketers collect and what kind of study they perform. Research designs fall into categories of *secondary research* and *primary research*. Not all research problems need the same research techniques, and marketers solve many problems most effectively with a combination of different techniques. In a first step, market researchers always must ask whether the information they need to decide is

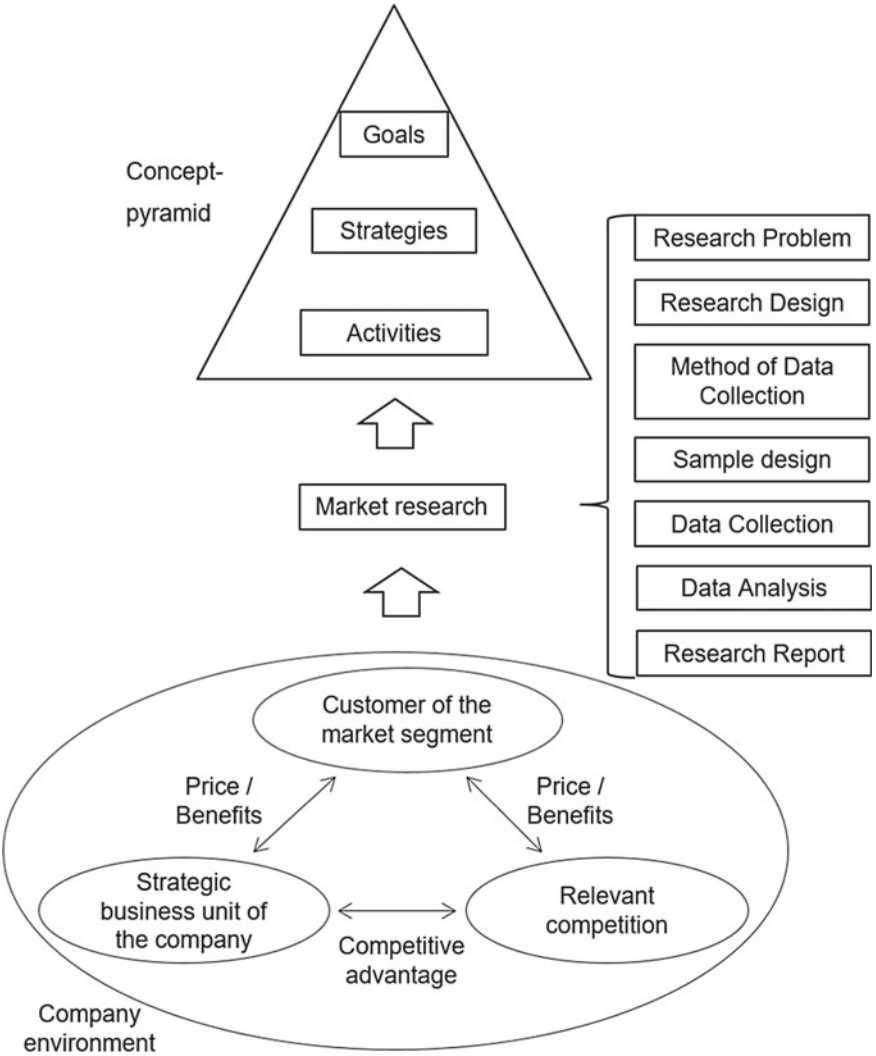

Fig. 6.9 Role of market research, company concept and situation analysis

already there. Data that are intended for a different purpose than the specific one, are called *secondary data*. Information that is sourced for specific problems is called *primary data*. Primary data includes demographic and psychological information about customers and prospects, customer attitudes, and opinions about products and competing products, as well as their awareness or knowledge of a product and their beliefs about the people using these products.

c. ***Method for data collection of primary data***. Primary data collection methods are described as either *survey* or *observation*. The degree of structuring is very high

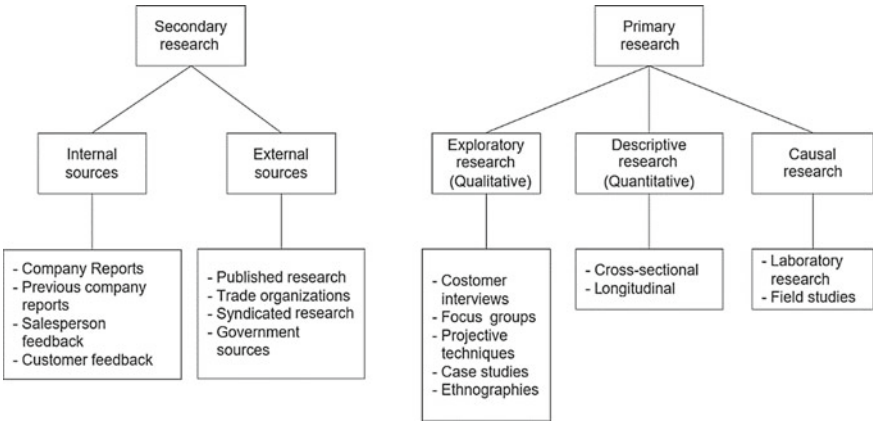

Fig. 6.10 Research designs (based on Solomon et al. 2017)

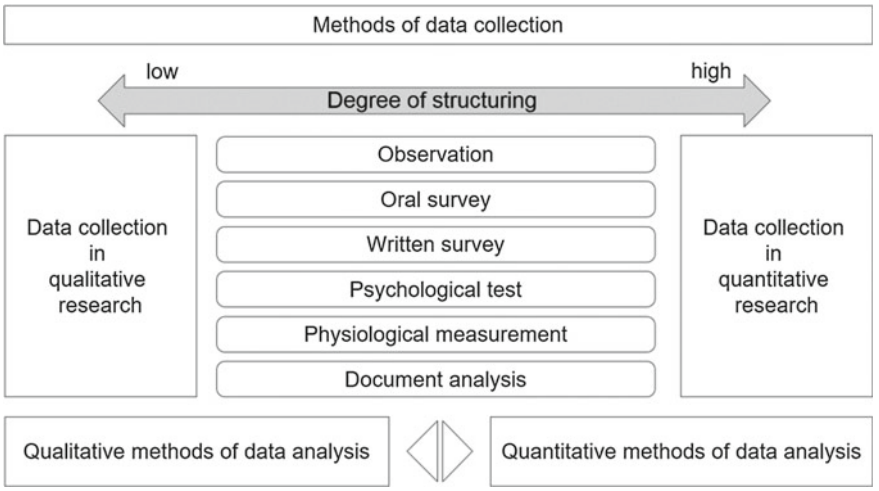

Fig. 6.11 Qualitative versus quantitative research

for quantitative data collection methods. Qualitative data collection techniques are not or only partly structured. It should be emphasized that the data collection tools are the same for both qualitative and quantitative research. Figure 6.10 illustrates this. Characteristically, three factors influence the quality of research results: validity, reliability, and representativeness. *Validity* is the extent to which research measures what it was intended to measure. *Reliability* is the extent to which research measurement techniques are free of errors. *Representativeness* is the extent to which consumers in a study are like a larger group in which the organization has an interest. It is about the predictability of the opportunity for all elements of the population to fall into the sample (Fig. 6.11).

d. ***Design of the Sample***. Market researchers usually collect most of their data from a sample of the population of interest. Based on the answers from this sample, they infer these results on the population. Whether such conclusions are true or inaccurate depends on the nature and quality of the sample. There are two main types of samples: Probability and Non-Probability samples. A *probability sample* is a sample in which each member of the population has a known chance of being included. A *nonprobability sample* is a sample in which personal judgment is used to select respondents and a *convenience sample* is a nonprobability sample composed of individuals who just happen to be available when and where the data are being collected.

e. ***Data collection***. Primary data can be collected in many ways. Surveys, physical measurements and observation are three of the possibilities. The quality of our inference is only as good as the data are. The same logic applies to the people who collect the data: the quality of the research results is only as good as the worst interviewer in the study. Therefore, interviewers must be trained and cared for.

f. ***Data analysis and data interpretation***. The basic prerequisite for data analysis is the determination of the *measuring level* of the available data. As a rule, the application of particularly powerful methods of statistics is only permitted if certain measurement levels are available. *Measurement* is the assignment of numbers or other symbols to characteristics of objects according to certain prespecified rules. *Scaling* is the generation of a continuum upon which measured objects are located. There are four primary scales of measurement: nominal, ordinal, interval and ratio. A *nominal scale* is a scale where numbers serve only as labels or tags for identifying and classifying objects with a strict one-to-one correspondence between the numbers and the objects. O*rdinal scale* is a ranking scale in which numbers are assigned to objects to indicate the relative extent to which some characteristic is possessed. Thus, it is possible to determine whether an object has more or less of a characteristic than some other object. *Interval scale* is a scale in which the numbers are used to rank objects such that numerically equal distances on the scale represent equal distances in the characteristic being measured. *Ratio scale* is the highest scale. This scale allows the researcher to identify or classify objects, rank order the objects, and compare intervals or differences. It is also meaningful to compute ratios of scale values (Malhotra 2009).

   Quality of the data: This refers to how normal the data is distributed. The first techniques discussed are sensitive to the linearity, normality and the same variability assumptions of the data. Studies of distribution, skewness and curiosity are helpful in the examination of the distribution. It is also important to understand the size of the missing values in observations and to determine whether to ignore them or to refer values to the missing observations. Another data quality measure is outliers, and it is important to determine whether the outliers are to be shifted again. When held, they can cause a distortion of the data; when they are eliminated, they can help with the assumptions of normality. The key is to try to understand what the outliers represent (Diez et al. 2014).

Statistical methods can be classified as follows:

- *Descriptive data analysis*: One of the tasks of statistical methods is to summarize data on many individual cases (for example: consumers, companies). Statistical metrics and representations are used in the form of tables and graphs.
- *Multivariate analytical methods*: In market research marketers must deal with complex relationships between numerous variables. For instance, aspects of consumer behavior (e.g. brand selection, type of needs) can hardly be explained by one variable, and the success or failure of a product never depends on one factor (e.g. advertising budget or price). For marketers, therefore, multivariate analytical methods, which are suitable for the simultaneous analysis of many variables at the same time, play an important role (Malhotra 2009).
  a. *Dependency analyses*: There are procedures which are designed to explain a *dependent* variable by a certain number of *independent* variables, for example the market share of a product by advertising budgets, price, purchasing power of the target group, relative product quality, etc. Common methods are analysis of variance, regression and conjoint measurement.
  b. *Interdependency analyses*: In other multivariate procedures, connections between a larger number of variables are the focus. The variables are not classified as dependent or independent; rather, the whole set of interdependent relationships is examined. Common methods are principal component analysis, exploratory factor analysis and cluster analysis.

g. ***Report the Research Results***. The last step in market research is to report on the research results and to document the results. In general, a research report must be clear and concise. The readers—top management, clients, creative departments and many others—must be able to easily understand the results of the research.

6.5.2 Multivariate Analysis Methods in Market Research

The purpose of this chapter is to provide a comprehensive understanding of common multivariate analytical methods in market research, leading to an understanding of the corresponding use of each of the techniques. We do not discuss the underlying statistics of each method. Rather, it is a field leader to understand the types of research questions that can be formulated, and the skills and limitations of any technique in answering these questions. In this section, the essential application of the method of market research like regression analysis, logistic regression analysis, factor analysis, structure equilibrium models, conjoint analysis and cluster analysis are described.

6.5.2.1 Analysis of Variances

The analysis of variance (ANOVA) can be used to check whether there is a significant difference between two or more mean values. The variance analysis is particularly

suitable for comparison between groups, which in turn explains their application for the evaluation of *experiments*, where comparisons between measured values from experimental and control groups must be made. The number of groups (independent variable) determines whether it is a one-factor analysis (one group) or a multi-factorial analysis (several groups). In variance analysis, a distinction is made between the explained and unexplained variance of the dependent (metric) variables. The influence of the independent variables (group membership) is assessed based on the relation between explained variance and unexplained variance. One of the central ideas of the variance analysis is to compare variances of the dependent variables within the groups with variances between the groups (deviations of the group mean values from the total mean value). If the variance between the groups is large compared to the variance within the groups, then this indicates a clear influence of the independent variables, which determines the group membership.

Assumptions of the variance analysis (Diez et al. 2014):

- The error term must be normally distributed, which at the same time is a normal distribution of the measured values in the population.
- The error term must be the same or homogeneous between the groups.
- The measured values must be independent of each other.

6.5.2.2 Regression

The central idea of this method is that the different values of a dependent variable (target variable) are to be fed back to another (independent) variable (influencing variable). In this sense, the dependent variable is explained by the independent or explanatory variables. The regression analysis method for analyzing associative relationships between a metric-dependent variable (target variable) and one or more independent variables (influencing variable) can be used in the following ways:

- To determine whether the independent variables explain a significant variation in the dependent variable: *whether a relationship exists*.
- To determine how much of the variation in the dependent variable can be explained by the independent variables: *strength of the relationship*.
- To determine the structure or form of the relationship: *the mathematical equation relating the independent and dependent variables*.
- To predict the values of the dependent variable.
- To control for other independent variables when evaluating the contributions of a specific variable or set of variables.

Steps of Regression Analysis (Diez et al 2014; Chapman and Feit 2015; Malhotra 2009):

1. Formulation of the regression model: Based on theoretical and empirical findings as well as previous experience, it is necessary to determine which independent variables could explain the variable of interest (dependent).

2. Estimation of the parameters of the regression model: For the estimation of the regression model, some assumptions are necessary, which can be inferred from the relevant literature.

   A regression model in the bivariate case looks like

$$\hat{Y} = b_0 + b_1 * X$$

and in the multiple (multivariate) case

$$\hat{Y} = b_0 + b_1 * X_1 + b_2 * X_2 + b_n * X_n$$

where $\hat{Y}$ is the dependent variable, $X_1, \ldots, X_n$ are independent variable, b_0 is the intercept and $b_1, \ldots, b_n$ are the slopes of the corresponding variables.

The most commonly used technique for fitting a function is a minimum square estimate (least squares procedure). This technique determines the best-fitting by minimizing the sum of the squared vertical distances of all the observations. The determined parameters (regression coefficients) determine the relationship between the independent and the dependent variables for the examined data record. By using these parameters and the respective variable values of the independent variables, the value of the dependent variables can be estimated for each case.

3. Checking model fit: An important measure for the assessment of a regression model is the proportion of the variance explained by the model divided by the total variance. The strength of association is measured by the square of the multiple correlation coefficient R^2, which is also called the coefficient of determination. R^2 is between 0 and 1. The extreme values 0 and 1 mean that a model does not explain any variance or the dependent variable is completely explained.

6.5.2.3 Logistic Regression

With logistic regression, the influences on a dependent nominal scaled variable can be examined. It is assumed that the dependent variable is dichotomous, that means, it can take only two values (0 and 1). With the help of several independent variables, the probabilities for the values of the dependent variable (an "event") are estimated. In a multinomial logistic regression, categorical dependent variables with more than two expressions can also be analyzed. Because no linear relationship is tested, the Regression coefficients are not interpreted exactly as in linear regressions. Only the direction of the influence can be interpreted.

6.5.2.4 Dimension Reduction with PCA and EFA

Data often have many variables—or dimensions—and it is beneficial to reduce them to a smaller number of variables (or dimensions). Contexts between constructs can be

identified more clearly. There are two common methods to reduce the complexity of multivariate metric data by reducing the number of dimensions in the data (Chapmann and Feit 2014):

- The *principal component analysis* (PCA) attempts to find uncorrelated linear combinations that capture the maximum variance in the data. The direction of view is from the data to the components.
- The *exploratory factor analysis* (EFA) attempts to model the variance based on a small number of dimensions, while at the same time trying to make the dimensions of the original variables interpretable. It is assumed that the data correspond to a factor model. The direction of the view is from the factors to the data.

Reasons for the need for data reduction:

- In the technical sense of dimensional reduction, we can use the factor/component values instead of variable sets (e.g. for mean value comparisons, regression analysis and cluster analysis).
- We can reduce uncertainty. If we believe that a construct is not clearly measurable, the uncertainty can be reduced with a variable set.
- We can simplify the data acquisition effort by focusing on variables that are known to make a significant contribution to the factor/component of interest. If we find that some variables are not important for a factor, we can eliminate them from the record.

6.5.2.5 Multidimensional Scaling (MDS)

MDS is a method that can also be used to find low-dimensional representations of data. Instead of extracting components or latent factors, as with the PCA or EFA, the MDS instead works with distances (or similarities). The MDS tries to find a low-dimensional map that best preserves all observed similarities between objects. Information provided by MDS has been used for a variety of marketing applications (Malhotra 2009): image measurement, market segmentation, new product development, assessment of advertising effectiveness, pricing analysis, channel decisions and attitude scale construction. In a study to explore behavioral types by the FOM in 2016, 22.131 people were asked on a scale from 1 to 7 about their values and their purchasing behavior. With PCA thirteen principal components were formed (five dimensions of human values and eight dimensions of consumer behavior):

- Human values are: *Enjoyment, Appreciation, Conformism, Security and Consciousness.*
- Consumer behavior are: *Perfectionism, Brand Consciousness, Novelty Fashion, Stress, Price, Impulsion, Confusion and Habit.*

To represent these thirteen dimensions in a two-dimensional space, a metric MDS is calculated. To calculate the MDS, the individual Dimensions are correlated with each other (product-moment correlation). With this approach, the dimensions are

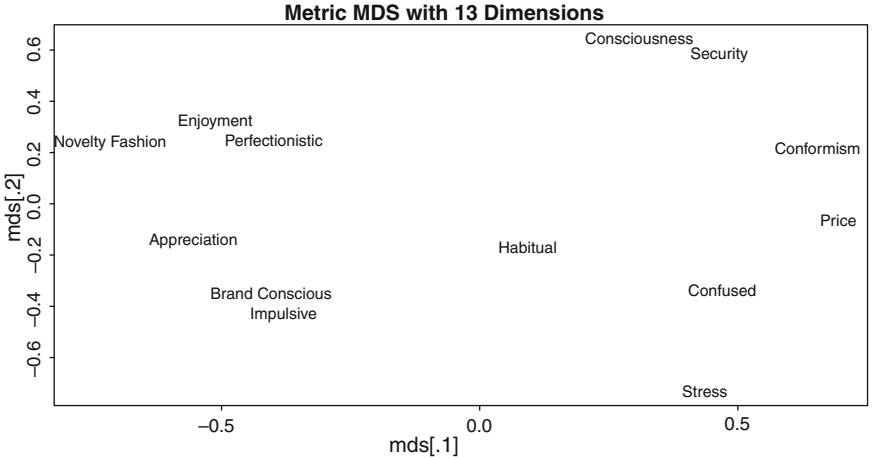

Fig. 6.12 Perception space; 13 dimensions, human values and consumer behavior

represented as points in the multidimensional space so that the distances between the points represent the correlations of the dimensions (Fig. 6.12).

For non-metric data such as rankings or categorical variables, an MDS algorithm is used which does not take any metric distances (Chapman and Feit 2014). For practical application, it is important to get a plausible interpretation of the perception space created by the MDS. In this context, the additional integration of independent assessment dimensions into the perception space with the aid of the vector model can represent a valuable interpretation aid. In a pre-study of the behavioral types in 2014 (n = 15.563), 40 values were calculated by MDS in a perception space. For interpretation, feature vectors in the form of the dimensions of the purchasing behavior are now included in the configuration of the MDS analysis (Fig. 6.13).

The method implementation process can be described in short as follows:

- First, the six dimensions of purchasing behavior were correlated with the individual items of the value orientations.
- Subsequently, a linear regression analysis was carried out for each of the dimensions of the purchasing behavior.
- The two coordinates of the values in the MDS are the independent variables which are used to explain the variance of the purchasing behavior (here the correlation with the values).
- For the vector model, the beta coefficients of the two dimensions are of interest. These are used as coordinates for the vector to be drawn.
- The vector runs in the diagram as a straight line through the origin and the point defined by these two coordinates, namely as an arrow in the direction of the point.

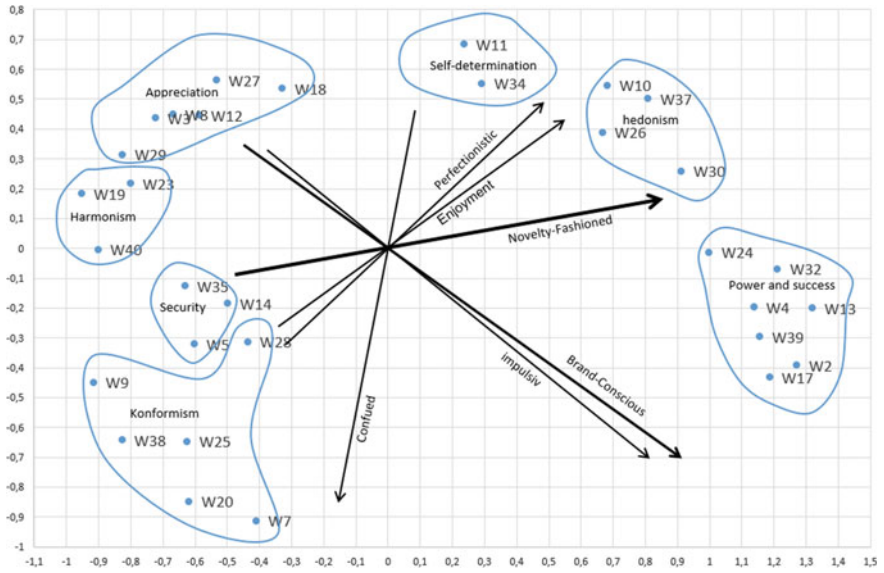

Fig. 6.13 Perception space with an integrated vector model (Gansser 2014b)

6.5.2.6 Cluster Analysis

Cluster analysis is used to find homogeneous groups (usually observations) within the data which are as heterogeneous as possible between the groups. Market segmentation is a typical application of cluster analysis. To determine the similarity of observations, different distance measures can be used. For metric features, for example, the Euclidean metric is often used, that is, similarity and distance are determined based on the Euclidean distance. Other measures like the Manhattan or the Gower distance are also possible. These have the advantage that they can be used not only for metric data but also for mixed variable types.

Typical steps of cluster analysis (Chapmann and Feit 2014):

- Selection of the variables to be used for group formation (e.g., sociodemographic features, setting variables, lifestyle characteristics).
- Quantification of similarities or dissimilarities of objects based on a so-called proximity measure and determination of a distance or similarity matrix.
- Summary of the objects into homogeneous groups based on the values of the degree of proximity using the application of a fusion algorithm (Fig. 6.14).

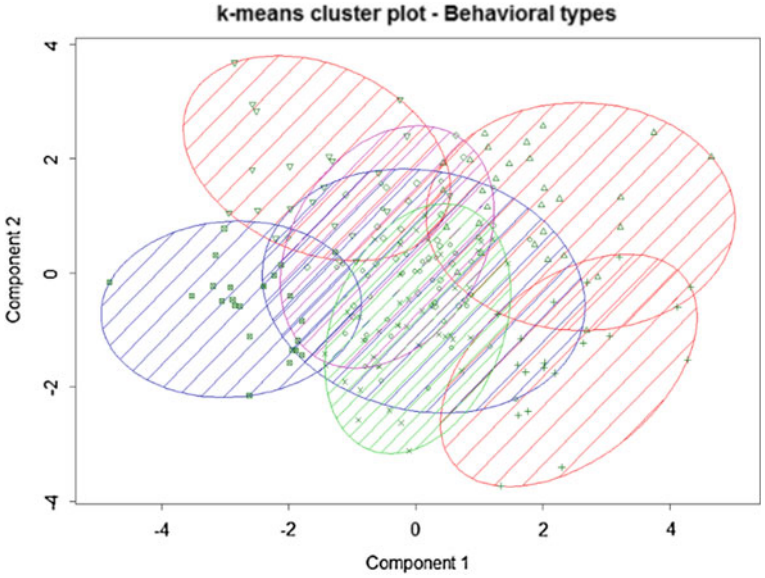

Fig. 6.14 Cluster plot for the seven behavioral types

6.6 Forecasting Methods (State of the Art)

Among the large number of forecasting instruments in financial management and controlling, only the three most important methods for predicting the behavior of market participants are presented—Conjoint analysis, marketing intelligence and Monte-Carlo simulation.

6.6.1 Conjoint Analysis

Conjoint analysis is a widely used and established method for measuring preferences. In practice, they are mainly used for price estimation, new product planning, and for customer segmentation. In comparison with other methods, conjoint measurements are a more realistic form of preference measurement with a higher validity. Depending on the procedure, one or several product concepts are submitted for assessment. The products are defined by features that have a certain set of characteristics. Thus, the subject identifies shared values for each characteristic of a feature. Based on the measured preferences, a prognosis can be generated, which product is preferred and likely to be bought in the future. Conjoint analysis has been used in marketing for a variety of purposes, including the following (Malhotra 2009):

- Determining the relative importance of attributes in the consumer choice process.
- Estimating the market share of brands that differ in attribute levels.
- Determining the composition of the most preferred brand.
- Segmenting the market based on similarity of preferences for attribute levels.

To calculate these predictions, purchase decision models are applied. For various hypothetical product alternatives, total utility values are estimated, which are subsequently transformed into selection probabilities. For all models, the choice is based on the principles of utility maximization, so that alternatives with higher benefits are preferred to alternatives with lower benefits. The use of such decision-making models for forecasting purposes is problematic if there is no information on the real purchasing decision processes and therefore the market researcher must make an individual selection of the decision models. This disadvantage exists in the group of *traditional conjoint analysis* methods, in which the assessed alternatives are placed in a preference ranking of the information subjects or are evaluated by means of rating scales.

This disadvantage is eliminated in the *choice-based conjoint analysis*, in which the persons select the most attractive alternative from different *choice sets*. A *choice set* consists of two hypothetical alternatives and the possibility of non-selection. Thus, it can be assumed that the natural buying behavior of the person is analyzed. The choice-based conjoint analysis is a probabilistic method for the preference structure measurement. The partial utilities of the individual characteristics are estimated from the total benefit. The assessment objects are constructed based on experimental designs.

Procedure for conjoint analysis (Gansser and Füller 2015)

- Selection of the characteristic expressions
- Definition of experimental design
- Creation of orthogonally fractionated choice sets
- Presentation of the stimuli from the survey participants
- Estimation of the utility function.

The result of the conjoint analysis is the calculation of odds ratios. In the case of nominal characteristics, the odds ratio (exp(coef)) of a variable indicates the chances of the odds of a characteristic of a feature compared to the basic category, i.e., the ratio of a chance. It is then possible to interpret the feature expression with the highest chance ratio as an example for each characteristic compared to its basic category.

Finally, the conjoint analysis can be used to answer which offer persons prefer and are likely to buy in the future. In addition to the chances of a feature compared to a basic form, this method also allows the relevance and therefore the importance of different characteristics to be measured.

6.6.2 Marketing Intelligence

A marketing intelligence system includes a set of procedures to maintain everyday information about developments in the marketing environment. The purpose of the information collection is the accurate and confident decision-making in determining the marketing concept (goals, strategies and activities). Once the data are collected (manually or automatically), the analysis is usually carried out using software-based systems. The intelligence approach is that the sources of information are of a different nature and are placed in a single environment after being captured. The goal is the integrated information collection and visualization of internal and external data sources. This enables current key performance indicators (KPI's) to be viewed in real-time, or as fast as the data can be captured, and to analyze trends. The term "business intelligence" (BI) has become established as a concept for all methods for analyzing business performance. In this way, the company has different areas of the intelligence approach, which are aimed at analyzing and optimizing the partial performance. In addition to marketing intelligence, the sales intelligence division has also become established. In both methods, the requirement for the integrated efficiency measurement across the departments consists. The trend is that classic controlling tasks are transferred from the central control department to the operating divisions. Business Intelligence (BI), as a closed system, includes all the analysis and optimization capabilities that can be used to capture, analyze, and improve business information.

Analyses in the context of intelligence approaches should meet the following requirements:

- Evaluations must be possible in real time.
- They should be accessible inside and outside the company with web applications (also mobile).
- The data are available in standardized and consolidated form. They do not have to be collected, consolidated and evaluated by the user.
- Users can customize the analyses and reports to their individual requirements.
- For the analyses, menus are available for clear and meaningful charts.
- Multi-dimensional analyses (OLAP) and data integration from all business areas allow to generate new findings.

To efficiently capture data from the environment and the strategic triangle, some specific data sources are being developed that are particularly suitable for marketing intelligence. These data can usually be collected by the company itself. In the case of less sensitive data, there is also the possibility of commissioning external agencies:

- *The sales assistant as a free market researcher*: Field service persons are generally closest to the customer. They can observe the way customers use the products most easily and without complex market research. Ideas for new products can be generated in this way. In addition, information about competitors and retailers can be recorded.

- *Mystery Shopping in the retail store*: Using camouflaged employees and their observations, the quality of consulting and competence of the salesmen should be determined. This is not undisputed and should be provided with an extended focus also on the quality of the facilities. Companies can also assess the quality of customer experience with the use of Mystery Shoppers.
- *Competition analysis*: This can be done by purchasing the competitor's products, reviewing the advertising campaigns, press reporting, reading their published reports, and so on. Competitive intelligence must be legal and ethical.
- *Customer community*: Customers (size, demand, representativeness) that are to be identified can provide valuable information on the product, product use and sales channels as participants in a community (online or offline) or a panel. This enables them to be actively involved in the company's improvement processes. Online platforms such as chatrooms, blogs, discussion forums, customer review boards can be used to generate customer feedback. This allows the company to understand customer experiences and impressions.
- *Official data*: Governments from almost all countries publish reports on population development, demographic characteristics, agricultural production and other data. These country-specific basic data can be helpful when planning business concepts.

6.6.3 Risk Analysis with Monte-Carlo Simulation

Marketing planning attempts to capture the future market share. Based on assumptions, future values are determined and target values are calculated. For the calculation of the target variable, a model is formulated with cause-effect relationships. Because the target variables are indeterminate, various risk scenarios are identified in a risk analysis by means of a Monte Carlo simulation. By means of Monte Carlo simulation, realizations of each influencing variable are generated according to a presumed probability distribution, from which values of the target variable are calculated, Based upon a large number of simulations, we hence obtain estimations of the probability distribution or at least mean, variance and confidence intervals.

6.7 Case Study: Telecommunication Customer Segmentation Using Machine Learning

Background
With rising consumption of data-intensive mobile content, a number of challenges for telecom providers arises: a search for better rates, signup benefits or discounts, wireless local number portability and business models relying on separation of mobile tariff and handset, increase of the number of customers willing to churn more frequently, etc.

Customer Challenge
The Irish company iD Mobile Ireland approaches these market characteristics by separating mobile tariff and handset, thus allowing customers to buy a new handset every three months given their current has been paid for, and further enabling customers to adjust the limits for calls and data services in their contracts on a monthly basis. The company has devised this business model on the basis of customer data and is relying on generating even more useful customer data just by the use of this flexible business model, which has potential to yield more accurate data on customers' preferences than 'rigid' tariffs do. Holding on to customers is the challenge, and being able to predict churning based on machine learning algorithms an effective answer to it.

Solution Approach
For a detailed introduction into machine learning, the reader is referred to (Hastie et al. 2009). Machine learning, in principle, refers to the study and construction of algorithms able to learn from and make predictions on data, thus being beyond static program instructions and rather leading to data-driven predictions or decisions, based on a model built from sample inputs. No matter what procedure or application, the common element is always a decision rule that leads to separation of data into subgroups, possibly repeated hierarchically. For instance, in the iD Mobile Ireland case, data on call record information (duration, start time, number of users involved, and call type) was used to draw conclusions regarding behavioral patterns. One issue here was to decide if payment delays of some users were due to fraudulent behavior or unsuspicious reasons. A machine learning algorithm would be trained on a sufficiently large subset of the data to 'learn' how to separate 'good' from 'bad' customers, entirely data-driven. Another directly marketing-oriented application has been customer segmentation into a number (which number exactly is determined data-driven) of classes defined by willingness to pay—not binary, as in the fraud-issue, but into several classes in order to indicate spending habits and status and likeliness of willingness to spend more—one application of which is individually targeted marketing.
(*Source* Dullaghan and Rozaki 2017)

6.8 Further Reading

For further insights into the marketing section there are some starting leads to report:

Jobber and Ellis-Chadwick (2012) are providing a general textbook on recent issues in the field and extending standard questions.

An application-oriented introduction to Monte-Carlos simulation is e.g. Robert and Casella (2009).
Insights into the state of the art world of structural equation modelling are provided by Hair et al. (2016).
A future-oriented perspective on marketing in times of social media is provided by Tuten and Solomon (2017).
An interesting—historical and autobiographical—read on the subject is also Kotler (2017).

References

Chapman C, Feit EMD (2014) R for marketing research and analytics. Springer, London
Chapman C, Feit EMD (2015) R for marketing research and analytics. Springer, London
Coyle JJ, Bardi EJ, Langley CJ (1988) The management of business logistics. St. Paul, South-Western
Curry B, George KD (1983) Industrial concentration: a survey. J Indust Econom 31(3):203–255
Diez DM, Barr CD, Çetinkaya-Rundel M (2014) Introductory statistics with randomization and simulation. https://www.openintro.org/stat/textbook.php?stat_book=isrs
Dullaghan C, Rozaki E (2017) Integration of machine learning techniques to evaluate dynamic customer segmentation analysis for mobile customers. Int J Data Min Knowled Manag Process 7(1):13–24
Farris PW, Bendle NT, Pfeifer PE, Reibstein DJ (2010) Marketing metrics: the definitive guide to measuring marketing performance. Pearson, New Jersey
Gansser O (2014a) Marketingplanung als Instrument zur Krisenbewältigung. In: Krol B (Hrsg.) ifes Schriftenreihe, Band 9, Essen 2014
Gansser O (2014b) Wie Werte unsere Käufe beeinflussen. http://www.fom.de/forschung/institute/institut_fuer_empirie_und_statistik.html#!tab=publikationen-2
Gansser O, Füller SR (2015) Präferenzprognosen mittels Conjoint—Analyse—eine Fallstudie mit Choice-Based-Design. In: Gansser AO, Krol B (eds) Markt- und Absatzprognosen. Springer, Wiesbaden
Grue B, Ludvigsen J (2006) Decision factors underlying transport mode choice in European freight transport. In: Proceedings of the European transport conference ETC
Hair JF, Hult GTM, Ringle Christian CM, Sarstedt M, Thiele KO (2016) Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. J Acad Mark Sci 2017:1–17. https://doi.org/10.1007/s11747-017-0517-x
Hastie T, Tibshirani R, Friedman J (2009) The elements of statistical learning, 2nd edn. Springer, New York
Jobber D, Ellis-Chadwick F (2012) Principles and practice of marketing. McGraw-Hill Higher Education, London
Jones E (2003) An application of game theory to supermarket pricing. J Food Distrib Res Food Distrib Res Soc 34(01):56–62
Kotler P (2017) Philip Kotler: some of my adventures in marketing. J Historic Res Market 9(2):203–208. https://doi.org/10.1108/JHRM-11-2016-0027
Kotler PT, Keller KL (2015) Marketing management, 15th edn. London, Pearson
Malhotra NK (2009) Marketing research: an applied orientation, 6th edn. Prentice Hall, London
Moutinho L, Meidan A (2003) Quantitative methods in marketing. In: Baker MJ (ed) The marketing book. Heinemann/Chartered Institute of Marketing, London
Nash JF (1950) The bargaining problem. Econometrica 18(2):155–162
Robert CP, Casella G (2009) Introducing 'Monte carlo simulation with R. Springer, London

Solomon MR, Marshall GW, Stuart EW (2017) Marketing: real people, real choices, 9th edn. Prentice Hall, New Jersey
Tuten TL, Solomon MR (2017) Social media marketing. Sage, London