Chapter 4
The Business Model Concept as a Unit of Analysis for Management Science

The last chapter demonstrated that corporate sustainability can indeed facilitate economic success in many ways. However, the link between the two is complex, and there is a risk that companies will engage in many disconnected environmental initiatives that fail to tap the full economic potential which environmental sustainability offers. At the same time, companies may find it difficult to translate abstract environmental strategies into viable business concepts. I propose to use the business model concept to overcome these problems. In order to use the concept as intended with the management framework of chapter 9, it is necessary to clarify the relationship between business models and strategy, and to define and explain the generic elements of business models and how they interact. Ways to identify and deal with systemic patterns and growth dynamics complete the theoretical foundation that is needed to design successful green business models.

4.1 Strategy and its Relation to Business Models

Business has often been compared to warfare. Some ancient books on war like Sun Tzu's "The Art of War" (Sun Tzu 1963) or Carl von Clausewitz' "Vom Kriege" (von Clausewitz 1832) have become highly appreciated works for many business strategists. War and business are fundamentally different in their motivation and outcome (von Oetinger et al. 2003, 5f.). However, they have many conceptual commonalities, and warfare can therefore be used as an allegory to illustrate the relationship between strategy, business models, and the operational layer as it is understood in this work.

If one compared a modern cooperation to a 14th century army, one may consider the army's artillery to be one of its strategic business units. Following this example, the *business model* would correspond to a blueprint that comprises the logic of how the artillery is supposed to contribute to the success of the army. This blueprint would be based on the artillery's armament – medieval catapults in this case – and depict the catapults' capabilities (e.g., impact, firing range, speed), principal means of use (e.g., combat procedures), the required resources (e.g. operating personnel, type of ammunition), and all other relevant information that describes the concept behind the artillery's function.

A. Sommer: Managing Green Business Model Transformations, SPLCEM, pp. 49–91.
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However, the business model needs to be distinguished from *strategy* (Magretta 2002). The term *strategy* derives from Greek *strategos*, an elected general in ancient Athens and refers to the "coordinated application of all the forces […] to achieve a goal. […] strategy's components include a long-range view, the preparation of resources, and planning for the use of those resources before, during, and after an action" (Britannica Online Encyclopædia 2009).

Therefore, *business strategy* plans for the future success of a business in a dynamic, competitive environment (Porter 2008b). In contrast, the *business model* can be viewed as its translation into a logical framework for economic value creation (Osterwalder 2004). Hence, *business strategy* and *business model* are interlinked (Zott & Amit 2006). If it becomes evident that the business model will no longer support the strategy effectively in the foreseeable future, companies should either adapt their business model or revisit their strategy (or both). None of the two principally precedes the other, just like one leg needs to follow the other when walking (Umbeck 2009, 55; based on Mintzberg et al. 2009, 37, who originally referred to strategy and structure). There is a risk, however, that an established company instead "loses connection" to its strategy in order to retain the business model that has worked well in the past and been optimised considerably over time. Or, managers neglect strategy – in a continuous effort to mimic successful competitors – and blindly chase every new hyped technology, much afraid of missing the next revolution (Porter 1996, 75ff.). To phrase it in the context of the artillery example: Even the army with the best developed catapults needs to realise at some point that gunpowder and cannons make catapults obsolete. The trick is to recognise when that point will be reached – because early, immature versions of cannons were still inferior and ineffective compared to catapults. In fact, catapults and cannons co-existed for a quite some time until the catapult concept was finally abandoned (Wikipedia 2009a).

One piece that determines the competitiveness of a firm, however, is still missing: the operational layer. In order to execute the business model efficiently, business organisation and related business processes need to be aligned. While the *architecture* of key processes that directly relate to the core logic of value creation belongs to the business model layer, the actual implementation of business processes does not (Osterwalder 2004, 14). Tools like benchmarking and best practice sharing often address primarily the operational layer (Porter 1996). On a similar note, Casadesus-Masanell & Ricart (2010) further distinguish *tactics* from strategy and business models. Strategy would then correspond to higher order choices including the selection and design of business models and strategic contingencies. Tactics therefore map to the operational layer and include the remaining choices given the employed business model of the firm. However, because the term tactics implies conscious decisions, the operational layer is more comprehensive as it also includes historic characteristics, or ones that emerge in a seemingly random fashion (but may eventually still be relevant for the success of the firm). Translated to the military example, strategy would include the selection of the artillery as a branch of service and its role within the campaign, the business model represents

the blueprint and area of application of the artillery, and tactics would include choices made by soldiers on the battlefield.

The relationship between the business strategy, business model and the operational layer as it is understood in this work is summarised in figure 4.1:

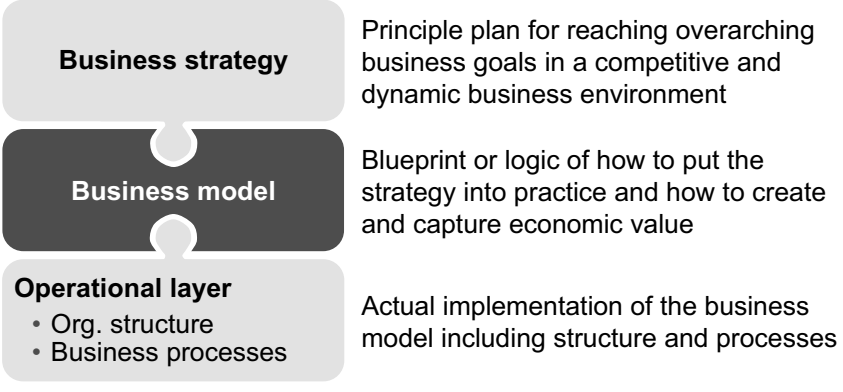

Fig. 4.1 Relationship between business strategy, business model, and the operational layer

A sound strategy that is poorly executed cannot create value. Conversely, operational efficiency without a distinct strategy will not deliver sustained success either – even if some individual elements of the business model are improved substantially. As Porter points out, operational effectiveness is necessary but not sufficient since "[competitive advantage] grows out of the *entire system* of activities" (Porter 1996, 73). With the business environment becoming more and more dynamic, competitive, and afflicted with uncertainty in many ways, the gap between these two layers has become wider than it used to be, and more difficult to bridge (Al-Debei et al. 2008). Al-Debei et al. (2008) argue that the digital revolution has not only produced a more challenging business environment, it has also essentially created the need for the business model concept to translate business strategy into business processes. It could be added that other (to a certain degree related) phenomena like globalisation or the sustainability movement have further contributed to that need. Therefore, the business model concept can be viewed as a mediator between business strategy and the operational layer of a company. Consequently, some business model researchers consider the business model concept to be a further development of the strategy concept (Umbeck 2009, 50). A good fit is not only critical between the business model and the strategy layer. Business models must also take into consideration corporate realities of the operational layer. Among other things, it is this hard-to-achieve fit which secures competitive advantage for successful companies.

So far, the terms *strategy* and *business model* have been introduced in a rather general, intuitive way. This, of course, neglects the many detailed elements of the latter,

and maybe even more so the complex nature of the former – given that a whole academic field has been created around it: the field of strategic management.

Mintzberg et al. (2009, 9ff.) propose to use no less than five complementary definitions to capture the term strategy with all its different facets: Strategies can take the form of *plans* for future direction, or *patterns* that reflect the realised course of action that a company took. Strategies can also take the form of *positions* within the competitive environment. For other scholars and practitioners strategy reveals itself as a *perspective* that represents the distinctive way things are done at a given company. Finally, a strategy can be a *ploy*, a manoeuvre to outwit competitors.

Moreover, the authors suggest in their review of the field of strategic management that ten different academic schools can be distinguished. It exceeds the scope of this work to discuss them all. However, one school in particular has to be mentioned as it bears the closest resemblance to the business model concept used in this work: the so-called *configuration school* (e.g., Miller 1986; 1996). The configuration school supports the notion that elements of a business can be combined to reinforce success within the competitive environment. Also, occasional transformations – or re-configurations – are necessary to sustain that success. Like the business model concept, the configuration school integrates elements from various other schools of strategic management: analytical, prescriptive management versus organisational learning; cultural aspects versus power and politics; the resource-based versus the market-based view of the firm (Mintzberg et al. 2009, 317ff.). Although the different strategic management schools are not discussed in detail, various useful ideas from these schools will thus be introduced as appropriate in later chapters.

Like the concept of strategy, the business model concept has historically not been free of ambiguity and alternative interpretations. Michael Porter even stated that "the business model approach to management becomes an invitation for faulty thinking and self delusion." (Porter 2008a, 117). I argue that exactly the opposite is the case – if (and only if) business models are clearly defined and are not seen in isolation from strategy. A detailed definition and explanation of the business model concept is presented next.

4.2 Definitions and Elements of Business Models

One of the few authors who delivered comprehensive works on business models is Osterwalder (Osterwalder 2004; Osterwalder et al. 2005; Osterwalder & Pigneur 2010). Repeating the (ongoing) discussions around the different uses of the term *business models* in literature would be of little use here; for reviews of the matter compare for example Lambert (2003; 2006), Osterwalder (2004), Osterwalder et al. (2005), and Baden-Fuller & Morgan (2010). Instead, the following definition proposed by Osterwalder (2004, 15) which is based on a synthesis of existing literature on (e-)business models is used:

"A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams."

Furthermore, Osterwalder (2004) derived nine business model *building blocks*, or business model elements, grouped into four *pillars* (see table 4.1):

Table 4.1 Business model pillars and building blocks according to Osterwalder (Osterwalder 2004, 43)

Pillar	Building block of business model	Description
Product	Value Proposition	A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer.
Customer Interface	Target Customer	The Target Customer is a segment of customers a company wants to offer value to.
	Distribution Channel	A Distribution Channel is a means of getting in touch with the customer.
	Relationship	The Relationship describes the kind of link a company establishes between itself and the customer.
Infrastructure Management	Value Configuration	The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer.
	Capability	A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.
	Partner Network	A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer.
Financial Aspects	Cost Structure	The Cost Structure is the representation in money of all the means employed in the business model.
	Revenue Model	The Revenue Model describes the way a company makes money through a variety of revenue flows.

The *Product* pillar relates to what is offered to the customer. The *Customer Interface* pillar describes the customer and how the offering is delivered. *Infrastructure Management* deals with value creation aspects of the business models. The last pillar, *Financial Aspects*, summarises how the company plans to make money with its business model.

Osterwalder's classification has been created against the background of e-business. Nonetheless, it is a useful starting point for analysing green business models (or any other). Other authors have provided alternative (and sometimes conflicting) definitions, elements and classifications, many of which Osterwalder considered and synthesised for his own classification (for an overview see Osterwalder 2004, 24).

Another main source are the recent works on business models by Johnson et al. (2008) and Johnson (2010), particularly due to the perspectives on how established companies can transform their business models. The identified business model components are similar to those of Osterwalder, but grouped and accentuated differently (see figure 4.2).

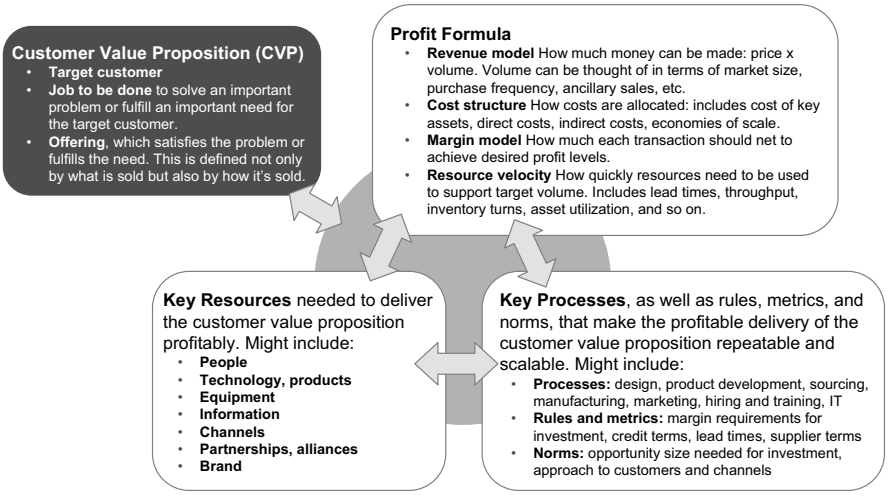

Fig. 4.2 The elements of Johnson et al's business model concept (adapted from Johnson et al. 2008, 54)

Johnson et al. (2008) identify the *Customer Value Proposition (CVP)* as by far the most important part. In contrast to Osterwalder's *Value Proposition* building block, the *CVP* also contains the target customer and its needs, which Osterwalder assigns to the separate *Customer Interface* pillar. Johnson et al. do not use an equivalent to the *Customer Interface* pillar and instead distribute the respective components on different dimensions including *Key resources (Channels)*. Together with the closely related *Key Resources*, Johnson et al. view *Key Processes* as the means to describe how the value is created and delivered to the customer and the firm as defined by the *CVP* and the *Profit Formula*, respectively. With regard to the delivery dimension, the authors seem to follow an understanding of business models that is somewhat overlapping with the operational layer as defined in chapter 4.1. However, they explicitly consider only *key* resources and processes to be part of the business model which in turn is consistent with the view advanced in this work that not the actual implementation, but only the systemically relevant

aspects of a business should be considered. This means, for example, that a specific process that influences the overall logic of the business model is considered on a conceptual level, in contrast to generic processes that (most) businesses employ in a similar fashion.

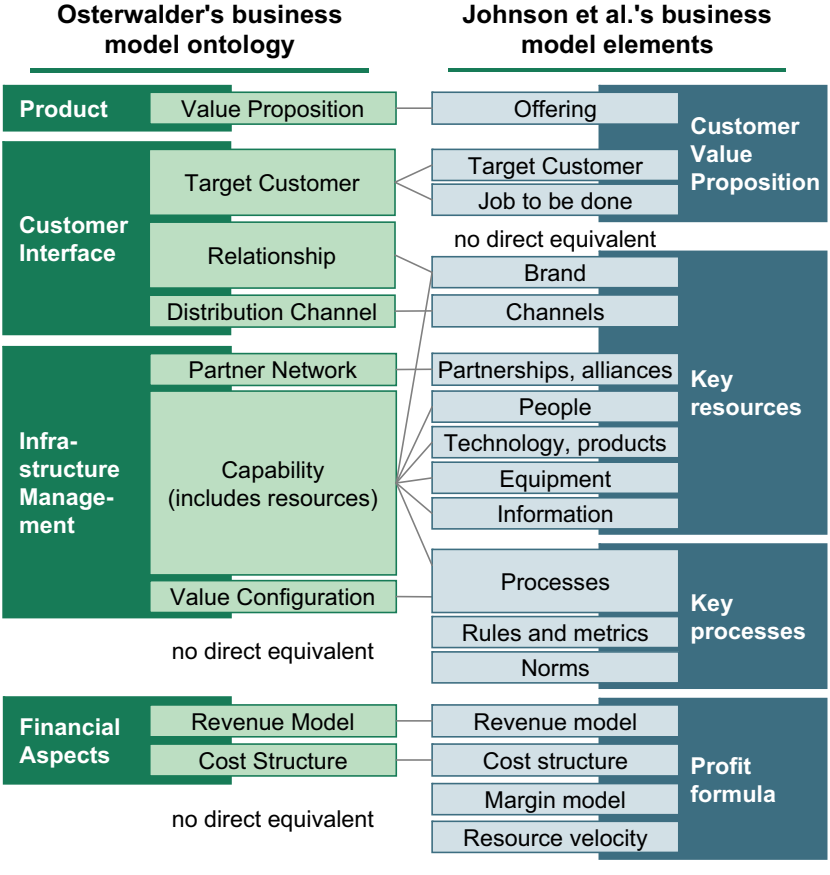

Fig. 4.3 Matching of business model elements of Osterwalder (2004) and Johnson et al. (2008)

Figure 4.3 presents an attempt to visualise a matching of the business model elements of Osterwalder (2004) and Johnson et al. (2008). Although figure 4.3 suggests that most elements used by the two authors are equivalent, it has to be noted that while element *categories* which Osterwalder and Johnson et al. use are largely the same, on a detailed level there are some important differences. The differences in the conceptions of business models can be explained with the different background and purpose of their works. Osterwalder heavily draws on e-business model literature and aims to develop an ontology – a "rigorous conceptual model

of business models" (Osterwalder 2004, 2) – that can be used as a basis to develop (software-based) management tools. Osterwalder also points out that the four pillars are in line with the four perspectives of the well-established *Balanced Scorecard* management tool by Kaplan & Norton (2000). However, in the practice-oriented book "Business Model Generation" (Osterwalder & Pigneur 2010), the authors rely on the nine building blocks only, presumably because the four-pillar model has turned out to be too generic to be of practical use.

In contrast to Osterwalder's original work, Johnson et al. detach themselves from the e-business notion and intend to explain if and how incumbent companies should change their existing business models. Therefore, the approach of Johnson et al. provides a good fit with the research in this work. Tobias Umbeck, who also synthesised and extended previous business model conceptualisations with their practical use for established companies in mind, proposes to consider an additional dimension, that contains competitive elements (competitive barriers, inimitability, uniqueness) (Umbeck 2009, 60ff.). Although these characteristics are important and receive due attention in the management framework of chapter 9, they are considered strategic outcomes (of combinations) of business model elements, and not elements themselves. Furthermore, due to the centrality of the human factor for the success of almost any business model, Umbeck places employees, corporate culture, and organisation at the centre of business model elements. While the motivation is comprehensible, this again mixes different levels of consideration. For instance, corporate culture influences many business model elements, but as a phenomenon goes beyond a single business model design.

In conclusion, the combined works of Osterwalder and Johnson provide a well-suited basis to conceptualise business models as a unit for analysis for management science. While Johnson et al. cover a slightly larger scope, Osterwalder discusses each of the business model elements including their characteristics and interrelationships in greater depth. Consequently, Osterwalder's dissertation will serve as the theoretical starting point and be used to structure the detailed discussion of business model elements in the following.

4.3 Recapitulation of the Business Model Ontology by Osterwalder

The nine business model building blocks presented in table 4.1 represent the core of Osterwalder's business model ontology[7]. However, in some cases, these elements are decomposed even further into sub-elements. Osterwalder describes each of these components in a highly structured (technical) manner, including its definition, type of element, attributes and relationships to other elements. The chosen level of detail of the following recapitulation is necessary to develop a

[7] For clarification purposes, Osterwalder's pillars, building blocks, (sub-)elements and attribute categories will always be written capitalised and italic in the following; attribute *values* will be written in normal font with parenthesis if necessary for differentiation.

substantiated understanding of business model elements for the purpose of this work. It will also be helpful for practitioners who intend to design business models themselves. However, readers who are only interested in gaining an overview of the resulting composition of business models as used in this book may wish to jump directly to chapter 4.4.

4.3.1 The Product Pillar

The *Product* pillar (Osterwalder 2004, 48ff.) contains the *Value Proposition* element which consists of one or more *Offerings* (see figure 4.4). These provide value to the *Target Customer(s)* and are based on the *Capability(ies)* elements (that belong to the *Customer Interface* and *Infrastructure Management* pillars, respectively). Attributes of an *Offering* include *Reasoning*, *Value Level*, *Price Level* and *Life Cycle* (sometimes also referred to as *Value Life Cycle*).

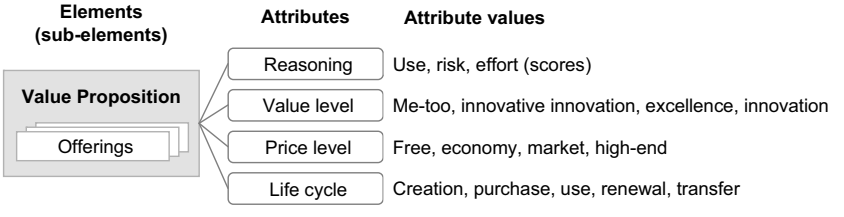

Fig. 4.4 Osterwalder's Product pillar (based on Osterwalder 2004, 48ff.)

Reasoning is the essence of why the *Offering* is expected to be useful to the customer. It consists of several aspects:

- Use: The core of the value; degree of utility depends on the match with the customer's needs.
- Risk: Reducing risks can offer additional value to the customer, including financial risk (e.g., loss of value of owned goods), or risks of poor performance (e.g., compatibility of software, product complexity). For example, a company can offer some sort of insurance and guarantees or provide complementary risk mitigation services.
- Effort: The convenience (or hassle) which the customer experiences in conjunction with the offering. This includes effort and cost along the whole product life cycle.

The second attribute, *Value Level*, refers to a relative, qualitative value scale including the level "me-too" (no differentiation through product features, but potentially offering aggressive prices), "innovative imitation" (selected innovative elements added to a standard *Value Proposition* or *Offering*), "excellence" (perfected value), and "innovation" (entirely new product / service or novel combination of the same; advantage may only be short-lived). The *Value Level* has to be considered in conjunction with the *Price Level* attribute, which is defined with the levels "free", "economy" (lower price than most competitors), "market" (close to average), "high-end" (e.g., luxury segment

or innovations). In the case of "free" offerings like Google searches, other revenue streams are exploited instead (e.g., advertisement). Based on Kambil et al. (1996), Osterwalder presents the concept of the *value frontier*, i.e., the currently feasible combinations of value and price (that can be offered given the corresponding cost). Business model transformations can either move a company along the value frontier, or, in the case of a true innovation, shift it further towards the lower right (see figure 4.5):

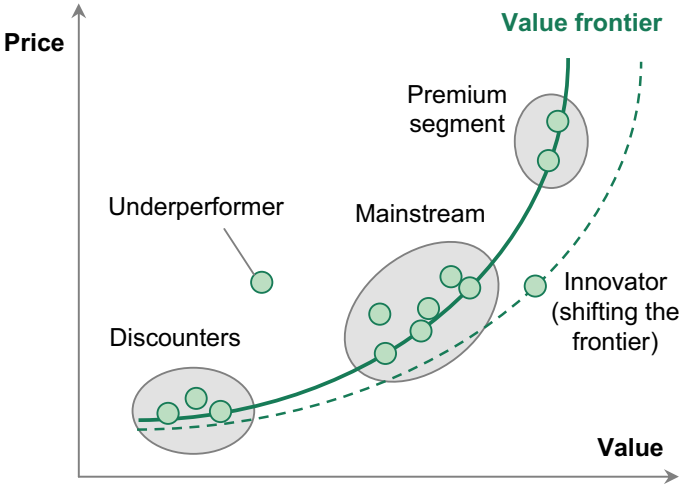

Fig. 4.5 Illustrative example of companies' positioning on the value-price-matrix (adapted from Kambil et al. 1996, 8)

The last attribute of *Offering* that Osterwalder suggests is *Life Cycle*. He distinguishes the value generated at creation, purchase, use, renewal (e.g., product update) and transfer (e.g., re-selling or disposal) of the *Offering*. Although Osterwalder presents the *Life Cycle* attribute to be separate, it could be considered an alternative view to the *Reasoning* attribute: For example, a sophisticated purchasing method reduces effort, an innovative transfer concept can reduce risk (of ownership), and the "use" aspect of *Reasoning* directly corresponds to the use phase.

When comparing all *Value Proposition* attributes to those of competitors, the relative attractiveness should become apparent. However, some factors that Osterwalder does not consider explicitly to be part of a *Value Proposition* can become decisive for the buying decision and customer satisfaction. For instance, the power of brands plays a crucial role for consumer goods. Brand, considered a resource by Johnson et al. and part of the *Customer Interface* pillar by Osterwalder, can influence the value proposition in various ways: For example, brand can lower the perceived risk of product failure with respect to the *Reasoning* attribute. It can also influence the value generated during the purchasing process through reduced product search and evaluation costs, or deliver higher utility during the

use phase through prestige. This demonstrates how difficult it is to provide a comprehensive evaluation of the value proposition as the customer would experience it (beyond formal product criteria). However, the lens of the business model concept at least forces analysts to consider different elements of value creation, delivery and capture separately *and* as a whole, thereby reducing the risk of self-serving biases and sugar-coating of its attractiveness.

4.3.2 The Customer Interface Pillar

Customer Interface (Osterwalder 2004, 58ff.) comprises all customer-related aspects including the elements *Target Customer*, *Customer Relationship*, and *Channel* (see figure 4.6). The latter two form a bridge between the *Target Customer* and the *Value Proposition*.

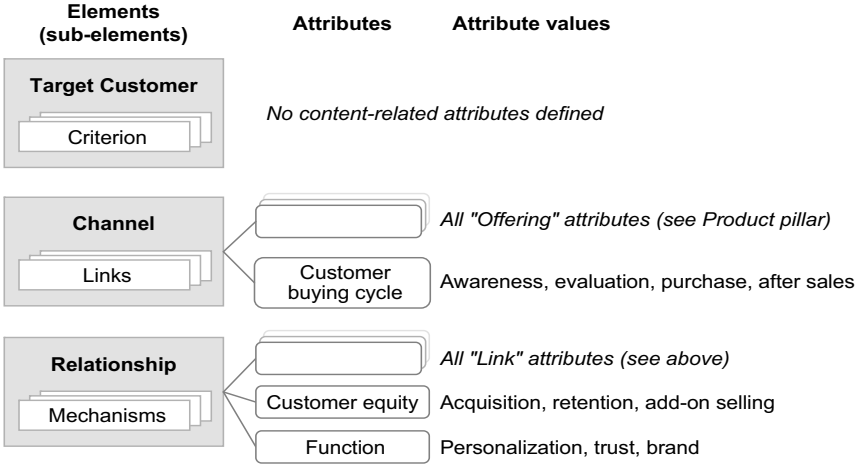

Fig. 4.6 Osterwalder's Customer Interface pillar (based on Osterwalder 2004, 58ff.)

A sound segmentation of customers is critical because it ensures that the *Value Proposition* precisely addresses the customers' needs. To define the *Target Customer*, Osterwalder introduces the *Criterion* element, but gives little advice how to apply it. He simply states that they "could be of geographical or socio-demographic nature" (Osterwalder 2004, 61). Osterwalder & Pigneur (2010, 20) later proposed to segment customers based on different needs, channels, types of relationships, levels of profitability or their willingness to pay for certain aspects.

The notion of customers as the only target group is too narrow for some business models. Particularly for green or social business models, the value proposition often needs to appeal to other groups as well if they have essential influence on their success. For example, regulators can make green business models viable through subsidies or taxes on less clean alternatives.

Through the *Channel* element, the *Value Proposition* is delivered to the *Target Customer*. A firm can use several *Channels* to make contact with the customer. They can be direct or indirect, physical or virtual. Each *Channel* consists of a number of *Link* elements that represent individual marketing tasks. The high granularity of marketing tasks is necessary to understand and avoid channel conflicts due to overlapping activities that can confuse or even disgruntle customers (Moriarty & Moran 1990). Osterwalder (2004, 68f.) proposes to use the *Hybrid Grid* tool presented by Moriarty & Moran (1990) to map channels and marketing tasks to remedy multi-channel challenges. Using Osterwalder's terms, it consists of a matrix with the *Channels* on the vertical axis, the phases of the *Customer Buying Cycle* ("awareness", "evaluation", "purchase", and "after sales") on the horizontal axis and the *Links* as cells of the matrix.

Osterwalder acknowledges that channel *Links* can contribute to a *Value Proposition*. Consequently, the *Link* element can positively influence "use" (e.g., through online help pages), "risk" (e.g., confidence through in-store buying advice), or "effort" (e.g., convenient internet sales) of an *Offering*. Moreover, the value contribution of a *Link* can also be assessed based on the *Life Cycle* attribute introduced in the previous section.

The last building block of the *Customer Interface* is the *Relationship* element. It describes the relationship between the company and its customer segments. Osterwalder distinguishes between acquisition, retention and add-on selling to specify the *Customer Equity* attribute of a *Relationship*. Osterwalder (2004, 72f.) highlights the various trade-offs that companies face in this respect: Customer acquisition tends to be much more expensive than retaining existing customers. However, not all customers are equally profitable for the company, which suggests pursuing a differentiated retention approach. Blattberg et al. (2001, 71ff.), who provided the classification of *Customer Equity* that Osterwalder follows, argue that companies should not take a too narrow view and consider customer satisfaction only. In fact, retention is already influenced during the acquisition phase when customer expectations are created that may or may not be met later on (an argument against too aggressive customer acquisition through discounts, etc.). Most of the other mentioned retention factors are already covered within the *Value Proposition* building block: ease of purchase, value relative to price, product uniqueness and suitability, and customer service. Additional factors include loyalty mechanisms (like airline frequent flyer programmes) and lock-out provisions that increase switching cost (e.g., some products can require re-learning how to use the product when switching).

A further way to increase the profitability is add-on selling as it tends to be much more profitable than selling to new customers. Add-on selling is not limited to selling related products (which is then called cross-selling), but can also use the existing customer relationship to sell completely unrelated products (Blattberg et al. 2001, 95ff.).

Osterwalder introduces the *Mechanism* element to decompose the *Relationship* building block. A Mechanism can also be a *Link* and contribute to the *Value Proposition*. It can have the following *Functions*: "personalization", "trust", and "brand".

Personalisation can be realised in a traditional, "human" way like the in the old corner shop. Alternatively, information technology can economically realise a similar level of personalisation. Possibilities include one-to-one marketing, recommending systems (for personalised product recommendations), or the more product-related mass customisation. Mass customisation means that customers customise products (e.g. through a product configuration website) which are then produced in an automated way (see Da Silveira et al. 2001; Zipkin 2001).

A minimum level of trust is a prerequisite for any business transaction. Trust traditionally depends on "identity, assumed quality or the perception of risk and it deepens over the time of a relationship" (Osterwalder 2004, 75). The e-business age originated new trust mechanisms like community-based ratings and online reputations systems. Third party certification, verification and labelling services have gained importance, for example to generate trust in online payment services. In addition to the application that Osterwalder mentions, these trust mechanisms also play an important role in the sustainability domain. There are myriads of green labels of all kinds, and consumers around the world usually assume that a product is green if it carries a green label. At the same time, however, only few understand the exact meaning of different labels and – especially in Europe – many labels are considered to be misleading (Manget et al. 2009, 18f.).

Osterwalder considers the third *Function*, brand, to be of great importance for the competitiveness of firms. Well-defined brands also help to ensure alignment between business model design and communication to the customer. Osterwalder remarks that every interaction with customers or the environment affects the brand of a company and defines brand mechanisms as "actions that are devoted to identity and brand building" (Osterwalder 2004, 76). However, his understanding of branding may be too narrow and ignore its reciprocal nature: Recent research observed a new form of branding called *user generated branding*. It describes the phenomenon that individuals can publish brand-related content at great reach and speed through the internet – beyond the control corporate brand management. Progressive companies now try to exploit this circumstance by consciously fostering such activities to build trust and a positive brand, for example through corporate blogs (Burmann & Arnhold 2008). This phenomenon is also highly relevant in the sustainability domain, where green reputation often plays a pivotal role for success. Therefore, brand is first and foremost a key resource for many companies, a view that is also advanced by Johnson et al (2008). More generally, companies can maintain purely transactional relationships with their customers, or, at the other end of the spectrum, even encourage them to actively participate in value creation activities.

In line with the argument brought forward with respect to target groups, *Relationships* may also need to be understood more broadly in the context of certain business models. A "target group equity" may, for example, include government aid from supportive regulators, or the idealistic help of NGOs that promote the business model without any formal agreement. The difference to the partnership element, however, is blurry in such cases – as it is the case when customers participate in building a brand or designing a product.

4.3.3 The Infrastructure Management Pillar

So far, the described building blocks cover the value that is offered to the customer and how it is delivered. The third pillar, *Infrastructure Management* (Osterwalder 2004, 79ff.), deals with how the economic value is actually created by the firm and its business partners. Although not very visible to the outside, this part of the business model is maybe the most complex and difficult to get right. Therefore, it is not surprising that *Infrastructure Management* is the most comprehensive of Osterwalder's four pillars (see figure 4.7).

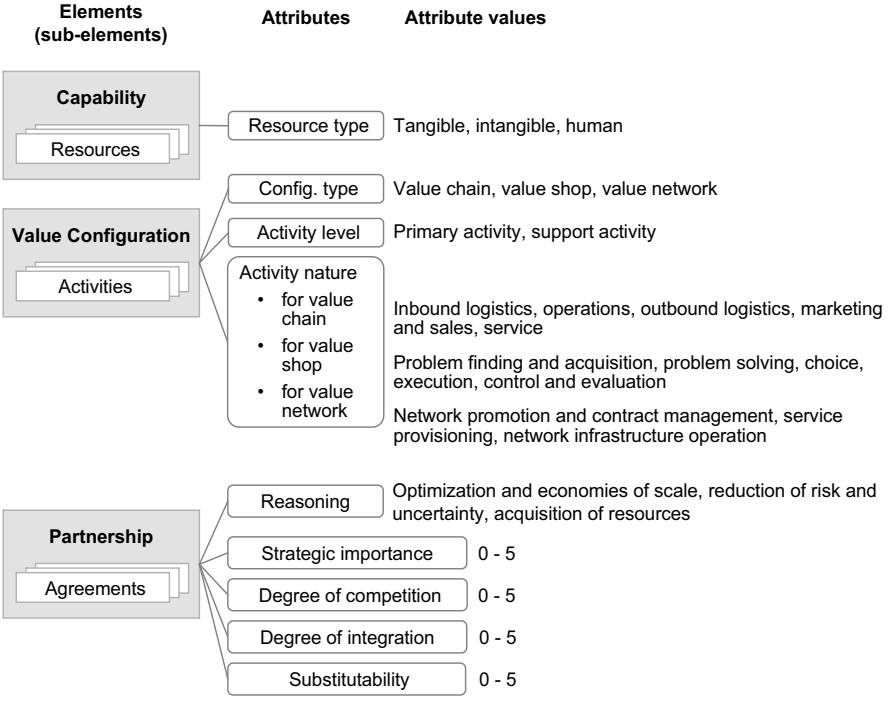

Fig. 4.7 Osterwalder's Infrastructure Management pillar (based on Osterwalder 2004, 79ff.)

Infrastructure Management comprises three building blocks: The first is *Capability* that represents the ability to use resources necessary to create value. The second building block, *Value Configuration* describes the way the company arranges its activities to support or perform the creation of value. The last building block, *Partnership*, covers the agreements which the company has with external parties to create value. As Osterwalder points out, the partner dimension has gained special importance in recent years due to simplified cooperation through electronic means. This fact gains further importance in the context of sustainability which covers very diverse knowledge domains and in many instances requires very specific capabilities that few companies can or want to build internally (Senge et al. 2008).

Capabilities are understood as "repeatable patterns of action in the use of assets to create, produce, and/or offer products and services to the market" (Osterwalder 2004, 79; based on Wallin 2000). Osterwalder (2004, 81) presents Wallin's business capabilities framework that distinguishes two dimensions: internal vs. external and resources vs. customer focused capabilities. The resulting four capability types are (1) *resource-integration* capabilities to deploy firm-addressable resources (external, resource-related), (2) *generative* capabilities like execution and innovation (internal, resource-related), (3) *customer-interaction* capabilities (external, customer-related), and (4) *transformative* capabilities to create offerings that provide sufficiently high value at low enough cost (internal, customer-related).

Capabilities rely on *Resources* that can be divided into tangible, intangible, and human. Johnson (2010, 40) offers a more concrete categorisation into *people, technology and products, equipment, information, channels, partnerships and alliances, funding,* and *brand*. For the business model, only key resources are of interest. The relative importance of each type of *Resource* depends on the industry and company (Osterwalder 2004, 82); for example, consultancies are extremely dependent on their human resources while a commodities producer mostly relies on tangible assets that can be found on balance sheets. Intangible resources are not fully reflected on balance sheets but have seen increasing importance in recent years: According to Brand Finance, a brand valuation consultancy, intangible assets now comprise about two thirds of the global enterprise value (Brand Finance 2007). This also has implications for Green Business Model Transformations. Björn Stigson, President of the World Business Council for Sustainable Development (WBCSD), remarks that "at a normal global company, the majority of the assets underpinning market capital are intangibles. That is a different story than in the past. The business case for sustainability is now increasingly connected to brand and reputation." (Economist Intelligence Unit 2008b, 33)

The second building block of this pillar is *Value Configuration* consists of a set of *Activities* and is divided into three *Configuration Types*: The classic value chain, as defined by Porter (1985), and two extensions by Stabell & Fjeldstad (1998). The value chain consists of *primary activities* that create and deliver value to the customer, namely *inbound logistics*, *operations*, *outbound logistics*, *marketing and sales,* and *service*. In addition, *supporting activities* are necessary that allow the *primary activities* to take place. They are: *procurement*, *technology development*, *human resource management*, and *firm infrastructure* (Porter 1985). Stabell & Fjeldstad (1998) extended Porter's mainly sequential value chain framework with two alternatives: *value shop* and *value network*.

Value shops are supposed to better represent service provider business models (e.g. consultancies and venture capitalists) that create value by solving unique problems for customers. Value networks correspond to intermediary business models (e.g., stock exchanges and telecom operators) that "sell mediation between customers or places" (Fjeldstad & Haanœs 2001, 5).

Osterwalder's distinction into *Capabilities* and *Value Configuration* building blocks is largely equivalent to that used by Johnson et al. (2008) into *key resources* and *key processes*. Both authors emphasise the strong link between the two: processes use or share one or more resources and hence are only useful in

combination. The ability to create or adapt such combinations (e.g., responding to changing market conditions) is referred to as *dynamic capabilities* (Teece et al. 1997).

The third building block, *Partnership*, consists of a set of *Agreements*. These *Agreements* have the purpose to allow having *Capabilities*, *Resources* and *Activities* of external partners at the firm's disposal. Consequently, partnerships enable companies to tap into many additional ways of value creation (Doz & Hamel 1998; Gulati et al. 2000). Partnerships can hence create social capital, and represent a valuable resource in itself.

The topic has been discussed in management literature under many different terms including *strategic networks*, *b-webs*, *value networks*, *alliances*, and so on. Osterwalder (2004, 90f.) elaborates on four theoretical perspectives that can inform thinking about partnering:

1. *Transaction cost economics* (TCE) (see Coase 1937; Williamson 1981) suggests comparing whole transactions performed internally versus through the market, and thereby considering production *and* transaction costs.
2. The already mentioned *resource-based view* (RBV) of the firm emphasises how firms can acquire and use external resources (e.g., customer data, brand names, patents or technologies) to gain competitive advantage.
3. *Organisational learning* (see Argyris & Schön 1978; Senge 1990; Nonaka & Takeuchi 1995) implies that, by working together, companies can exchange knowledge (e.g., production methods, market expertise) to their mutual advantage.
4. *Co-opetition* (see Brandenburger & Nalebuff 1996) asserts the possibility that cooperation between competitors can create win-win situations, e.g. by working together to grow or capture a new market.

All perspectives are useful when analysing new green business model designs, as the case examples in chapter 7 will demonstrate. These perspectives should be viewed as complementary. Because they emphasise different aspects of value creation (e.g., cost versus capabilities), the answers to questions like which value chain activities to perform internally, or what kind of relationships to enter with external organisations, may not always imply the same courses of action (Eisenhardt & Schoonhoven 1996, 137).

As mentioned earlier, partnerships play a pivotal role for the success of many sustainability initiatives. Particularly greening supply chains has become a key priority (and challenge) for many companies. For instance, retailers – above all Wal-Mart – have already created significant value this way (Makower 2009, 138ff.).

Partnerships are characterised by the *Agreement* element which is encompasses five attributes: *Reasoning*, *Strategic Importance*, *Degree of Competition*, *Degree of Integration* and *Substitutability*. Osterwalder (2004, 93) distinguishes between three broad kinds of *Reasoning*: "optimization and economies of scale" (e.g., through outsourcing or shared infrastructure), "reduction of risk and uncertainty" (e.g., by using external market expertise or co-opetition), and "acquisition of resources" (to

externally leverage the business model). The remaining attributes are supposed to be operationalised with an ordinal scale (0 to 5), but – with the exception of *Degree of Integration* – Osterwalder offers no advice on how to set the score.

4.3.4 The Financial Aspects Pillar

The fourth and final pillar, *Financial Aspects* (Osterwalder 2004, 95ff.), is about the economics of the business model. It contains the *Revenue Model* and *Cost Structure*, which together determine the profitability of the business model as a whole (see figure 4.8).

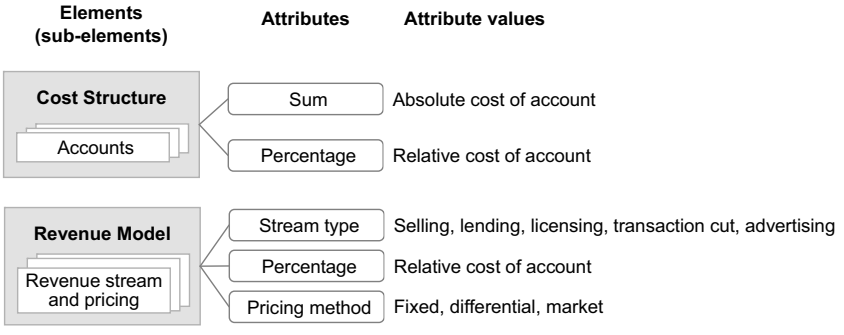

Fig. 4.8 Osterwalder's Financial Aspects pillar (based on Osterwalder 2004, 95ff.)

The *Revenue Model* consists of one or more *Revenue Stream and Pricing* elements. Osterwalder (2004, 97f.) defines five different *Stream Types*:

- Selling: Involves a partial or complete transfer of ownership (e.g., a physical CD is sold, but not the property rights for the music).
- Lending: The use of goods that are made available to the customer on a temporary basis (e.g., money lending or car rental). Osterwalder & Pigneur (2010, 31) additionally distinguish two more related revenue streams: usage fees (e.g., hotel stays) and subscription fees (e.g., gym memberships)
- Licensing: The permission to use intangible property; in contrast to lending, parallel licensing of the same intangible is possible. Licensing enables a business to generate revenue without direct involvement in production or commercialisation activities (e.g., through patents, copyrights, franchising)
- Transaction cut: Enabling or performing a transaction (e.g. investment banking deals, e-business platforms)
- Advertising: Allowing the placement of commercial messages on owned media (e.g., TV or newspaper ads)

One important revenue stream-related concept in the sustainability context that Osterwalder does not mention is *servicising*. The concept aims to substitute selling physical products and material use with the provision of services instead. Not only

does it help the environment by facilitating a more efficient use of resources, it has also the potential to increase revenue and profits (Rothenberg 2007).

Business models often involve a mix of several types of revenue streams. Information technology has facilitated to diversify revenue streams and advance underlying *Pricing Methods*. Furthermore, greater transparency of prices through the internet has increased the customer's power as a price maker, which in turn induces some companies to move away from simple towards more complex (and harder to compare) pricing mechanisms. Osterwalder (2004, 98ff.) distinguishes three generic methods and 12 mechanisms for pricing: (1) fixed pricing (pay-per use, subscription, list price/menu price); (2) differential pricing (product feature dependent, customer characteristic dependent, volume dependent, and value-based); and (3) market pricing (bargaining, yield management, auction, reverse auction, and dynamic market).

It is important to realise that pricing can have a direct impact on the environmental sustainability of a business model. For instance, subscriptions encourage consumption while pay-per-use pricing incentivises customers to use as little product – and therefore resources – as possible.

The last building block, *Cost Structure*, consists of a set of *Accounts*, each of which represents a specific type of expenditure. Osterwalder simply defines *Sum* and *Percentage* of the total *Cost Structure* as its attributes. He remarks that *Accounts* can be defined very detailed or as aggregates of expenditures. As an example, he mentions cost of goods sold and operating expenses that could be split further into R&D, marketing and sales, and general and administrative expenses. It is surprising that Osterwalder leaves the discussion of the greatly important cost element at this rather shallow level. After all, one of the important problems that many (large) companies face is not aggregated cost and revenues considered in isolation, but that they do not know which part (e.g., product lines, customer segments) of their business make money and how much. However, declining profitability of certain business segments can remain undetected given satisfactory overall profitability. Not only can this become a problem in the long run if the segment gains in relative importance. But it is also critical to have this kind of information when a business model is supposed to be transformed, as this usually leads to shifts in the revenue, cost, and customer structure.

Johnson et al. (2008) suggest the introduction of a *margin model* in addition to cost and revenue models. This way, choices to accept losses in some parts of the business in favour of long-term success or the overall logic of the business model can be made more explicit, e.g., supported by sophisticated sensitivity analyses. Another element that Johnson et al. (2008) propose regarding the money-earning logic of a business is *resource velocity*. This encompasses "how fast we need to turn over inventory, fixed assets, and other assets – and, overall, how well we need to utilize resources – to support our expected volume and achieve our anticipated profits" (Johnson et al. 2008, 53). This item may have certain relevance for some business models, but is not considered central and thus not incorporated explicitly in the following.

4.4 The Business Model Composition Applied in this Work

As outlined above, Osterwalder's business model ontology provides a suitable starting point as a unit of analysis for management science. However, two main factors limit its applicability in the context of this work: Firstly, the ontology has been created with a strong e-business focus, thereby neglecting some aspects important for this work that thus had to be supplemented. Secondly, definitions and arrangement of business model elements are done in a way that is appropriate for the translation into a formal modelling language (in this case the eXtensible Markup Language XML). However, some business practitioners that Osterwalder interviewed raised concerns about its complexity. One CEO of an industrial company suggested to adapt the complexity to "specific managerial levels of decision making" (Osterwalder 2004, 135). In the practitioner-oriented book "Business Model Generation" (Osterwalder & Pigneur 2010), labelling of elements has therefore been made more intuitive.

The final conceptualisation of the business model as a unit of analysis is thus principally a blend of the works of Osterwalder (2004) and Osterwalder & Pigneur (2010), Johnson et al. (2008) and Johnson (2010), and own considerations (based on interviews and multiple iterations in the development of the management framework in chapter 9).

Despite the focus on green business models, the resulting business model conceptualisation is applicable to green and non-green business models alike. No specific elements representing sustainability aspects have been added. The business model concept can be used to analyse and manage the business logic of a firm, as well as – a main function in this publication – for the exploration of future opportunities (Osterwalder 2004, 19ff.). There is no reason why these uses should focus only on financial and operational viability, and not also include environmental performance. Sustainability originates from the very same elements as growth or profitability. If a quantified analysis is desired, the cost and revenue models could be extended by environmental cost (impact) and benefit calculations (see Schaltegger et al. 2006 for a detailed discussion). Because this practice is optional, and not obligatory to successfully manage Green Business Model Transformations, I refrain from incorporating this aspect explicitly.

Figure 4.9 (see below) provides an overview of the business model composition that forms the basis of all references to the business model concept in the remainder of this book.

At the heart of the understanding of business models is the division into two value perspectives: ***capturing*** and ***creating value***. Each perspective comprises two components. ***Value propositions*** and ***target groups*** constitute the value capture perspective, ***key resources*** and ***key processes*** the value creation perspective. The fifth component, ***financial logic***, integrates the two. It is critical to understand that all components are interconnected, as indicated by the puzzle shapes of the two value perspectives in figure 4.9. Each component is further divided into several business model elements that are briefly outlined in the following sections. Depending on the requirements, analyses can thus be conducted on the level of the

two value perspectives, the five business model components, or a greater number of business model elements.

In addition, a business model is embedded in the ***external business environment*** that influences – and is influenced by – the business model. In addition to competition, this includes general economic, political and societal factors as well as activities by stakeholders of the firm that are not directly participating in creating and capturing value for the firm (for a broad discussion of the nonmarket environment, see Baron 2009). This dimension must not be ignored when analysing or designing new business models. An unfavourable external business environment can spoil an otherwise sound business model, e.g. due to defensive moves from competitors, or political opposition (also see Osterwalder & Pigneur 2010, 200ff.).

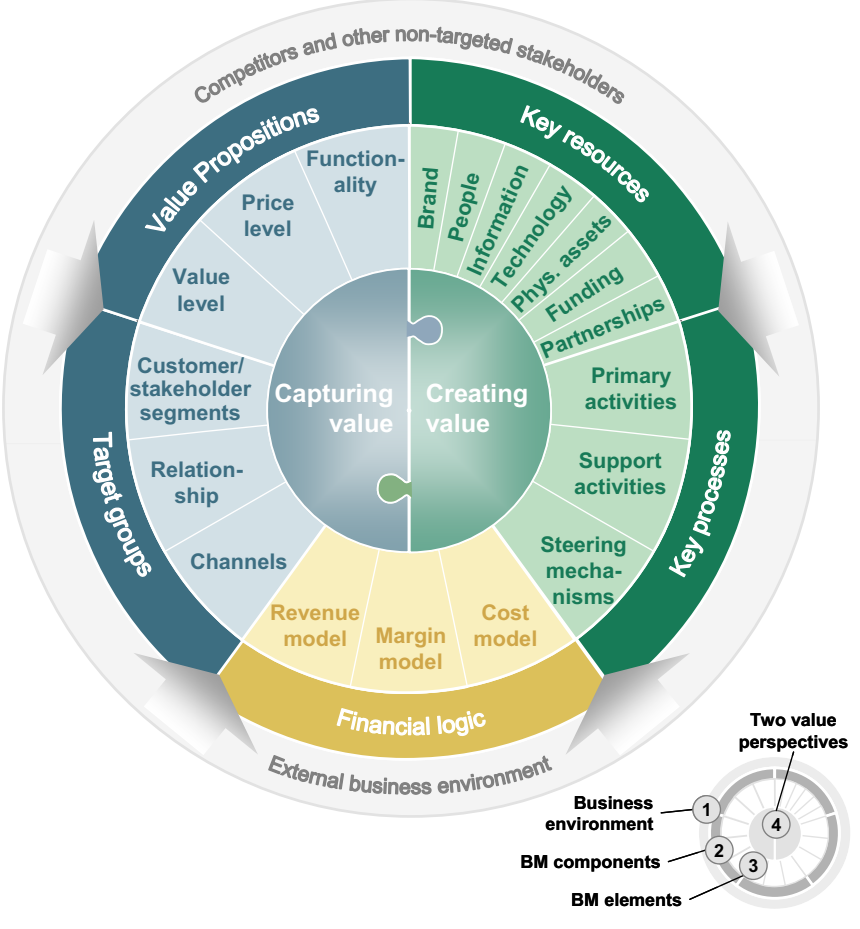

Fig. 4.9 Overview of business model elements

4.4.1 Value Propositions

The value propositions component is largely congruent with Osterwalder's *Product pillar* (see 4.3.1), but uses a more associative name (cp. Johnson et al. 2008; Osterwalder & Pigneur 2010). The ***functionality*** element refers to the value which a customer derives from the offering, as operationalised by Osterwalder's *Reasoning* and *Life Cycle* attributes. The elements of ***price level*** and ***value level*** correspond to the attributes of the same name by Osterwalder. As they are to be seen in conjunction with rivalling offerings, they bring in the competitive perspective. However, quality standards or absolute price points are of importance too. For example, even without a rivalling product, the price point impacts the adoption rate.

Green business models can distinguish themselves in various ways in terms of value proposition: For instance, a customer may derive reputational value from a green product (functionality), be willing to pay extra for a "high end" product (price level), or consider it more innovative than competitors' offerings (value level). Considerations are thereby not limited to simple substitutions of product characteristics: Rethinking the entire logic of achieving a certain function (e.g., by selling a service instead of a product) should be considered. Even manipulating prevalent customer needs as such is conceivable (e.g., by making the shortcomings of current offerings explicit) (for an example of a respective multi-level management framework (COSY) see Schneidewind 1995, 23ff.). Value propositions are thus always to be seen in conjunction with the next pillar, *target groups*.

4.4.2 Target Groups

Johnson et al. and Osterwalder differ on whether the target groups component should be subordinated to the value proposition. Osterwalder's variant that places them on the same level is preferable because it makes the duality between the two explicit. After all, attractive value propositions alone are not sufficient for market success without a sound understanding of target groups, and vice versa. An example in chapter 7.2 will illustrate how such neglect had almost catastrophic consequences in the course of a Green Business Model Transformation in the food sector.

The target group component is thus very similar to Osterwalder's original pillar, the *Customer Interface* (see 4.3.2). However, its scope is extended to also incorporate critical stakeholders that have direct impact on the two value perspectives of the business model (e.g., regulators for subsidised business models, NGOs that are needed to support business models in developing markets).

The first element, ***customer/stakeholder segments***, corresponds to Osterwalder's *Target Customer* element. It represents the firm's view on how the market should be segmented, and which groups the value propositions are intended to appeal to. Green business models can thereby create value by offering superior value to groups that are already addressed, or by facilitating access to new customer segments.

The ***relationship*** element is to be understood as explained above. It may, especially for consumer goods industries, gain in importance through Green Business Model Transformations.

Although the ***channels*** element may not play a role as crucial for green business models as for e-business models, it must still be designed appropriately and can be a source of innovation (e.g., see the case example in chapter 7.3).

The channels element has been assigned to the target groups component due to its direct involvement in delivering value to the customer. However, sophisticated channels can also be a key resource, one of the two value creation components. The same is true for target group relationships. These items are not listed twice, however, in order to avoid confusion.

4.4.3 Key Resources

Resources are the "stocks of available factors that are owned or controlled by the firm" (Amit & Schoemaker 1993, 35). Adapted from Johnson (2010, 40), seven main types of resources are distinguished:

Brand is worth dozens of billions of dollars for some companies, in certain cases also driven by green branding (Interbrand 2009). But it is maybe also the most vulnerable of all, with environmental blunders being a major source of value destruction (Vranica 2010).

People, i.e. employees with their "training, experience, judgment, intelligence, relationships, and insights" (Barney 1991a, 101), are a crucial resource for any company. While human resources can often be hired at short notice, some critical functions may be challenging to staff or need long-term planning (see Strack et al. 2008). In addition, an inspired, well-motivated workforce does not only greatly improve efficiency, it can also compensate for business model design flaws through commitment and creativity. Corporate culture is also a factor to consider, as certain business models may be incompatible with the existing culture of a company.

Information can relate to any business model element to be of value. Examples include information on customer preferences, or the firm's environmental footprint (often a prerequisite for managing a green business model). Some highly successful business models (e.g., Google) are built around this resource. Information is often dependent on sophisticated IT to be useful, but is frequently complemented by the tacit knowledge stored in employees' heads.

Technology can relate to both products and processes. It includes tradeable knowhow like patents or licenses, and the systems that a firm uses to run its business. Technology obviously plays a critical role in all clean technology business models. Examples in this book include green chemistry, electric cars, and even low-tech solutions like solar-powered lighting (see chapters 7.3, 7.6, and 7.8).

Physical assets include property, plant, and equipment (Amit & Schoemaker 1993, 35). Physical assets can be a powerful source of competitive advantage, but in some cases seriously impair business model transformations (Johnson 2010, 162ff.).

Funding may not play a central role for many business model transformations, as opposed to start-ups. It can still be important, however, if a new business model promises long-term profits at the expense of short-term cash flows, or if the firm is in turnaround situation.

Partnerships allow firms to access external resources. The topic has been discussed at quite some length (see 4.3.3), and Osterwalder considered Partnerships a building block on the level of, and separate from, resources (*Capability*). Partnerships are a special case in that they can provide access to all other resource types listed above. On the other hand, partnerships – e.g., think of a deep relationship to a key partner or a sophisticated supply chain – can be argued to represent a valuable resource in itself. Furthermore, partnerships "can be vehicles for new organizational learning, helping firms to recognize dysfunctional routines, and preventing strategic blindspots" (Teece & Pisano 1994, 545). Despite their pivotal role for the success of certain business models, the same can be argued for other resources, e.g. people (Umbeck 2009, 63). Hence, I follow the approach of Johnson et al. and view partnerships as an element of the key resources component.

The list of seven types of resource above may not be exhaustive, and for certain business models a different categorisation may be more appropriate. However, it has proven practical for general purposes as applied in the management framework of chapter 9.

In contrast to Johnson et al., Osterwalder combines key resources (*Capabilities*) with key processes (*Value Configuration*) in the *Infrastructure Management* pillar. Amit & Schoemaker (1993, 35) contrast resources and *capabilities* which "refer to a firm's capacity to deploy *Resources*, usually in combination, using organizational processes, to effect a desired end." This definition contradicts Osterwalder's separation into Capabilities and Value Configuration, but more importantly, it combines the distinct concepts of resources and processes. The concept of capabilities may be serviceable for the purposes of the RBV. Yet, a business model can fail to create value either because key processes do not work, because key resources are lacking, or because the interplay between the two is poor. Capabilities could blur these important distinctions. Therefore (analogously to the argumentation for the value capture perspective), the duality of resources and processes is made explicit, and the concept of capabilities is not used.

4.4.4 Key Processes

A process is "a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action." (Davenport 1993, 5). The term *key processes* is used instead of *key activities* (Osterwalder & Pigneur 2010, 17), because the concept is established in management practice and emphasises the conceptual nature of the component, as opposed to the atomic term *activity*.

Porter's distinction of ***primary*** and ***support activities*** is used (see 4.3.3), as it is well-established in management literature (Mintzberg et al. 2009, 108f.).

Depending on the industry or specific characteristics of the business model, a more granular or even different breakdown into elements may be useful for analysis purposes (e.g. to explicitly include environmental management). For instance, Osterwalder (2004, 83f.) has included the concepts of *value shop* and *value network*, and Holweg & Pil (2006) propose to use a *value grid* instead of a chain to gain a multidimensional perspective. Porter himself suggests using *activity-system maps* to study whether the activities of a company show strategic fit and how they can reinforce themselves (Porter 1996, 71ff.). Zott & Amit (2010) distinguish the design elements *content* (what activities), *structure* (links and sequence) and *governance* (who performs activities) for activity systems. The latter also includes that activities may be performed outside of the boundaries of the focal firm. To keep it simple, however, I use the classic value chain in figure 4.9. The non-linear, holistic nature of key processes will receive due attention by means of the systems thinking approach which is introduced in the next section (4.5).

An additional third element, ***steering mechanisms***, is located on the rules level (see Morris et al. 2005, 731f.) and represents important formal or informal means of influencing business practices and decision-making. This element follows the thoughts of Johnson (2010, 45ff.) who speaks of *business rules*, *behavioural norms* and *success metrics*. Because business model transformations change the fundamental logic of doing business, a search for new or adapted *routines* (Winter & Nelson 1982) is often essential for the business model to be executed effectively. Although this is not an entirely conscious, controllable process, inconsistencies with the new business model can presumably be identified in most instances by systematic efforts. Sometimes, higher-level rules that govern modifications of lower level rules (see Cyert & March 1963) may need to be changed, too. Necessary changes may differ greatly in magnitude, ranging from simple policy changes (e.g., hiring guidelines or sales incentives) to far-reaching organisational changes (e.g. founding a new unit to foster experimentation).

4.4.5 Financial Logic

The financial logic contains three elements: the ***revenue***, ***cost***, and ***margin model***. The cost and the revenue model are understood analogously to Osterwalder's explanations (see 4.3.4). As suggested by Johnson (2010, 36f.), the margin model (target unit margin) is treated as a separate item. It is important as it implies certain conditions (e.g., expected economies of scale and target volumes) for the business model to break even. For example, a new business model serving poor people in developing countries may generate satisfactory overall profits through larger volumes, despite lower gross-unit margins. Increased resource velocity (see Johnson 2010, 37ff.) can have similar effects.

As mentioned above, business models are characterised by systemic properties that can be addressed with the systems thinking approach. Systems thinking can be understood as a general problem solving approach that follows systems theory principles and will be introduced in the following.

4.5 Understanding System Behaviour

General systems theory (von Bertalanffy 1950) provides a shared platform for scientists from many academic fields as diverse as physics, biology, sociology, economics, and management science (Boulding 1956). As a result, practical tools and techniques based on systems theory – systems thinking being one of them – can be applied to a broad range of problem domains, including not only business models, but also sustainability and organisational change dynamics. It can thus help practitioners to design more potent green business models and to implement these business models more effectively.

4.5.1 Background and Basics of Systems Thinking

System dynamics research attempts to help us better understand complex systems by studying the interactions within and between systems. It originates the understanding that conventional, analytical decomposition of problems can lead to solutions that neglect the interaction between the individual parts of the problem (Forrester 2003). Even systems with a small number of components or options for decisions (low *combinatorial* complexity) can be highly complex due to interactions of system components over time (*dynamic* complexity) (Sterman 2001, 11).

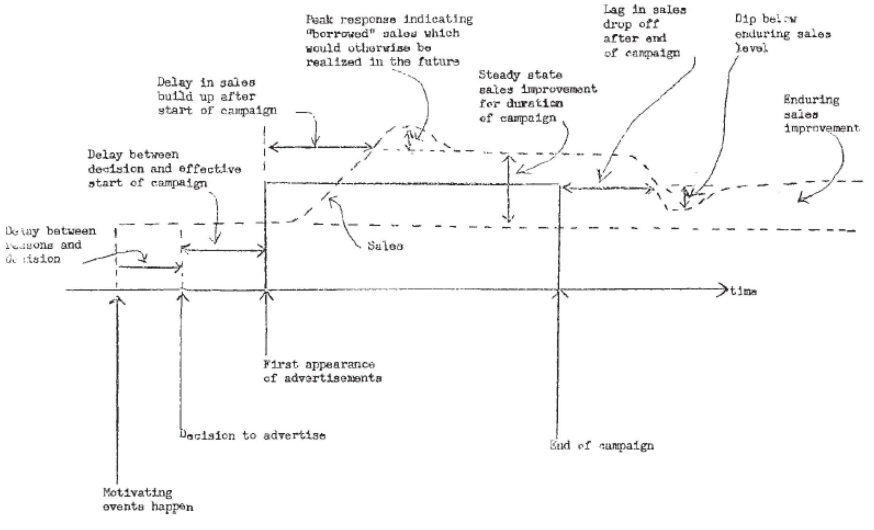

Fig. 4.10 Timing and extent of effects of an advertising campaign (Forrester 2003, 340)

Recognised as "the genesis" of system dynamics, Jay W. Forrester in a 1956 article discusses the shortcomings of existing models for economic systems and industrial organisations (Forrester 2003). One major shortcoming he identified was the negligence of *closed loop systems* of flows of money, labour, goods and

information that amplify or dampen disturbances and influence the time of occurrence of events that affect them. These systems are characterised by resistance to change (also see chapter 6.3.4), accumulation (e.g., fluctuating inventories, liquid assets), delays (e.g., between the occurrence of events, resultant decisions and their taking effect), quantising (e.g., periodic reporting), and policy and decision-making criteria (Forrester 2003, 332). The alternative, that is applying an *open loop system* (or event-oriented) *view*, can lead to short-sighted decisions, like boosting short-term profits through a cost cutting programme that – as an unanticipated side effect – hurts important capabilities and long-term profits (Sterman 2001). Forrester (2003, 340) illustrates often overlooked closed-loop system effects with the example of an advertising campaign (see figure 4.10). A company that is unaware of systemic delays and feedbacks may easily misinterpret changes in demand and consequently reach poor decisions with respect to production and inventory levels. There are other, more complicated cases than the advertising campaign depicted above. However, individuals and organisations alike regularly fail to grasp the dynamic nature of even the simplest systems (Sterman 2001).

Systems thinking aims to counter the above-mentioned problems. According to one of its most prominent proponents, Peter Senge and his co-authors, it simply means "stepping back and seeing patterns that are, when seen clearly, intuitive and easy to grasp" (Senge et al. 2008, 23). They suggest that people conceive reality based on four levels of the *Systems Thinking Iceberg* (Senge et al. 2008, 172ff.): The top layer comprises observable *events* that we can react to. The second layer consists of *patterns and trends* which we can anticipate. These in turn are formed by *systemic structure*s (the third layer) that we can design. Unlike events, these two layers already tend to be hidden below the surface. The fourth layer concerns our *mental models*, i.e. core beliefs and basic assumptions, that may need to be transformed in order to see and adapt the system to work in a more favourable way.

One simple yet alarming real-life example out of the sustainability domain that Senge et al. (2008, 170ff.) use to demonstrate the adverse effects of ignoring system dynamics is the depletion of fish stock due to overfishing: Following high demand, fishing companies increase their fleets and employ more effective fishing techniques. However, while the output grows and grows, at some point, the regenerative capacity of the fish stock is reached. The problem is that this tipping point is not accompanied by observable events (such as reduced catch). To the contrary, the fish catch grows well beyond that point until, at its maximum, the decline of the fish stock is the greatest.

The example of overfishing reveals a class of serious problems that can prevail even after the long-term consequences of issues like that of overfishing are understood: *the tragedy of the commons* (Senge 2006, 397f.). If one fish company reduces its catch, the others can – and likely will – catch more (see Senge et al. 2008, 170ff.).

With his seminal book "The Fifth Discipline" (Senge 1990), Peter Senge has made systems thinking popular to a much wider audience than ever before. *The fifth discipline* (the term he uses to refer to systems thinking) integrates the other four

disciplines – *personal mastery*, *mental models*, *building shared vision*, and *team learning* – which he deems necessary to achieve the organisation's ideal state of the *learning organisation*.

Senge (2006, 57ff.) lists 11 "laws" of the *fifth discipline* which managers should keep in mind when dealing with systemic problems. They state that …

- … current problems often stem from past interventions
- … systems tend to "push back"; one needs to work *with* the system's forces
- … low-leverage interventions improve system behaviour before it deteriorates
- … easy-to-see solutions often do not solve the underlying problem
- … a (non-systemic) "solution" can even make things worse
- … lasting solutions may take time
- … the link between cause and effect may be non-obvious and comprise a longer delay
- … small (but often non-obvious) interventions may have big effects
- … trade-offs may disappear if interrelated goals are considered over time
- … some problems are indivisible; seeing only parts of the problem does not suffice
- … in systemic problems, there is no one to blame (everyone is part of the system)

Although the issues around system behaviour are known in academic circles for half a century by now, systems thinking and new mental models have not been adopted broadly: Politicians have been found to show little consideration of system dynamics, managers still use heuristics that are based on simplistic cause-and-effect relationships (Sterman 2001), and even well-educated elite business school students perform very poorly in respective tests (Sweeney & Sterman 2000). Nevertheless, a yet limited but increasing number of managers practising systems thinking may change this in the not so distant future (Senge 2006, 256f.). The business model concept naturally invites even managers not familiar with systems thinking to take a holistic perspective.

4.5.2 Practical Application of Systems Thinking

In order to recognise cases where systems thinking should be applied, one must first identify dynamically complex systems. They are characterised by the following (Senge 2006, 71): (1) short-term effects of actions differ significantly from long-term effects; (2) consequences differ locally from those in other parts of the system; (3) "obvious interventions produce non-obvious consequences". Another hint for dynamic systems being at work can be if interventions show no significant effect at all, despite large efforts (Senge 2006, 86). In the following, the most important tools and techniques are presented that can be used in management practice.

4.5.2.1 Causal Loop Diagrams

In order to understand and manipulate system dynamics it is helpful to use graphic representations of the problem. A very simple yet effective way is to use so-called

causal loop diagrams (CLDs). They comprise type and direction of feedback loops, including potential delays that are important as they can mask the system's underlying patterns.

There are only two types of feedback loops (Sterman 2001, 17): (1) positive – or self-reinforcing, and (2) negative – or self-correcting, balancing loops. Examples for self-reinforcing feedback loops are nuclear arms race, price wars, or the diffusion of a new product through word-of-mouth. Balancing feedback loops include limits to regenerative capacity of resources (e.g., in the fish stocks example), and market saturation (growth stalls once saturation approaches 100 percent at the latest). Figure 4.11 shows a graphic representation in the form of a CLD for the introduction of a new product with a self-reinforcing feedback loop (marked with an "R") that represents contagion through word of mouth, and a balancing feedback loop (marked with a "B") that represents market saturation. Plus and minus signs next to the arrow indicate the relation between cause and effect. That is, a *plus sign* means that the two variables move in the same, a *minus sign* that they move in the opposite direction:

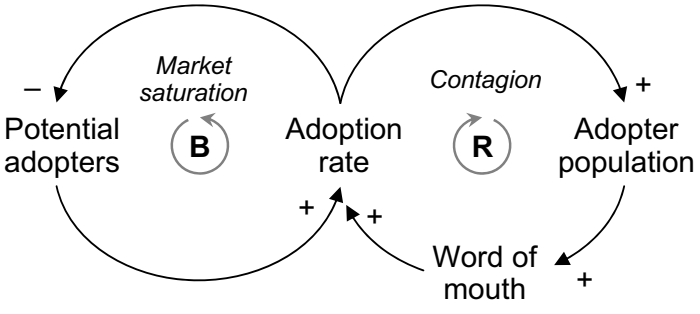

Fig. 4.11 Causal loop diagram for the adoption of a new product (Sterman 2001, 18)

On the one hand, the adoption rate is self-reinforcing since new adopters cause others to adopt it as well, who again spread the word (all "+"). This can result in exponential growth of adopters. However, at some point, the balancing feedback loop kicks in: Because of the growing number of adopters, the number of remaining potential adopters is decreasing ("–"). Eventually, the adoption curve will flatten out and converge to a certain saturation point (Sterman 2001, 18ff.).

4.5.2.2 Using Simulations to Understand System Behaviour

CLDs are very valuable in making the systemic structure explicit. In practice, there will be more relevant feedback loops than the two shown in the example of figure 4.11 (e.g., price reductions enabled through economies of scale, cannibalisation with other products, and new entrants). In some cases there will be *many* more relevant feedback loops. Then, it is virtually impossible to determine their cumulative effects without simulation. This can be done by using dedicated

simulation software – some of which already offers very easy to use interfaces for non-scientists (Sterman 2001, 19ff.).

However, it should be emphasised that it is often already a big step to make decision makers aware of systemic structures and the potential patterns these might produce. It makes them aware that their decisions may be too short-sighted or based on unrealistic (static) assumptions. On the other hand, because even small dynamic systems can behave in ways that qualitative systems thinking cannot predict, this approach is oftentimes not sufficient to understand what a good decision would look like. Then, simulation through building sophisticated formal models is a necessary next step (Richardson 1996, 7f.; Sterman 2000, 37ff.; 2002, 524f.). However, even large mathematical models are often highly sensitive to estimated parameters and initial conditions – which can severely limit their accuracy in predicting the system's behaviour (along with simplifications of the model itself, of course). Nevertheless, simulations can expose dominant feedback loops and turn attention to some dynamics that may be subtle or counter-intuitive at first glance (Sterman 2001; Sterman 2008).

When a company wants to employ simulation models, an augmented causal diagram including underlying equations needs to be constructed. In the example above, the CLD can be enhanced by showing the stocks (potential and actual adopters) and flows (the conversion of potential into actual adopters) of the adoption model. Below, the word-of-mouth process is modelled in a more detailed way (see figure 4.12). It now depends on the frequency of social contacts and the share of adopters among these as well as the conversion rate after such contacts.

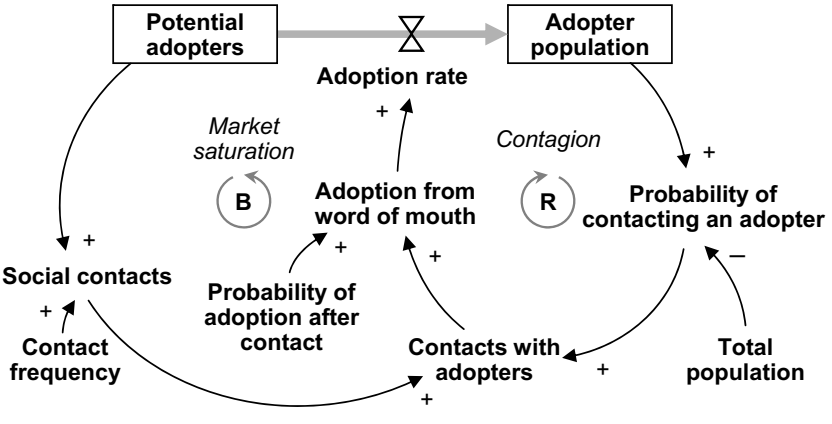

Fig. 4.12 Causal diagram showing stocks and flows of product adoption (Sterman 2001, 18)

Parameters like the *probability of adoption after contact* need to be estimated, e.g. through market research, expert interviews, or data from analogous cases (Sterman 2001, 21).

The respective equations that represent the causal diagram and translate it into the formal model are as follows (Sterman 2001, 19, formatting changed):

- *Adoption rate = Adoption from word of Mouth* [*+ Adoption from other sources*]
- *Adoption from word of mouth = Contacts with adopters * Probability of adoption after contact*
- *Contacts with adopters = Social contacts * Probability of contacting an adopter*
- *Probability of contacting an adopter = Adopters / Total population*
- *Social contacts = Potential adopters * Contact frequency*

A causal diagram like the above is equally suitable to model the adoption of a new business model by customers. It is thereby critical to concentrate on the dominating loops only that represent the most important success factors. One way to mitigate the risk of overwhelming complexity is to first try to understand the type of system the company is dealing with.

4.5.3 Systems Archetypes

Many problems that are based on dynamic complex systems can be allocated to certain classes of frequently occurring *systems archetypes* like the already mentioned tragedy of the commons. Once a problem is correctly recognised as one of the systems archetypes, it is considerably defanged since systems archetypes can be addressed with the same kinds of solutions (although real-world problems often contain additional variables; system archetypes should therefore be considered basic building blocks only).

Consequently it is useful to briefly summarise the most important systems archetypes and suitable solution strategies. The following explanations are largely based on Senge (2006, 389ff.) and specifically put into context of issues related to business models, environmental sustainability, and organisational change.

Balancing process with delay

This most simple of the systems archetypes only consists of one *balancing loop with a delay* (Senge 2006, 389f.) (delays are represented graphically by two parallel lines that break the respective arrow). This causes individuals, groups or organisations to overshoot corrective actions during the time when the expected impact has not materialised yet. Examples include production and inventory cycles with inadequate responses to market reactions.

Managers facing this archetype can either wait patiently until their corrective actions take effect or improve the system's responsiveness (Senge 2006, 390). New green business models may thus require a redesign of interactions between certain elements. For example, a retailer that changes food offerings from conventional to organic produce may find it difficult to ensure availability due to – formerly unproblematic – delays within the supply chain of fewer and smaller suppliers.

Shifting the burden

Shifting the burden (Senge 2006, 391ff.) describes a case when a symptomatic, short-term "solution" is chosen to deal with a problem instead of applying a fundamental solution. This behaviour is problematic in several ways: First, the solution usually only cures the symptoms, and hence the problem comes back. Second, repeatedly relying on a symptomatic solution often impedes the ability to apply a fundamental solution (side effect).

In a business model context, a company that observes deteriorating results may initiate a cost cutting programme instead of reconsidering its business logic or strategy. For a while, the cost cutting efforts may restore profits, but after some time results will deteriorate again if the business model itself was inadequate (and not just inefficient). Worse even, the reliance on the symptomatic solution – imprudent cost cutting – often leads to a loss of valuable people and competencies, increasing the difficulty of finding a fundamental solution in the form of a new business model. As a result the organisation can become reliant on external experts or consultants to turnaround its business. This special variant of the systems archetype is called *shifting the burden to the intervenor* (Senge 2006, 393f.).

Ironically, the approach proposed in this work de facto also follows a shifting the burden structure: Almost by definition, a company that undergoes its first Green Business Model Transformation does not possess all the competencies to manage this task internally, and hence relies on external help. However, as long as these capabilities are built successively during and after the transformation there is no significant risk involved of falling trap to shifting the burden issues.

In the sustainability domain, shifting the burden structures can manifest themselves in the form of end-of-pipe solutions that ignore fundamental redesign options. For instance, instead of changing the process to prevent the creation of toxic waste, it is treated afterwards. Finding a solution that prevents pollution then becomes even more unlikely as the company has already invested in expensive treatment equipment.

To deal with this systems archetype effectively, one must concentrate on the fundamental solution and ideally weaken the symptomatic one. Applying a symptomatic solution may be necessary due to short-term pressures. However, the long-term consequences of choosing the (usually easier) symptomatic solution have to be articulated clearly in order to gain support for developing a fundamental solution (Senge 2006, 109f.).

In certain cases, sustainability is not part of the problem, but represents the fundamental solution to a shifting the burden structure: Consider the case of the European premium frozen foods producer Frosta AG (see 7.2 for a more detailed discussion): Ever increasing margin pressure led the company to use an increasing amount of inferior ingredients in order to save production costs. However, eventually the quality of the food was approaching that of the discount competitors. As a result, not only did the company offer less healthy and tasty food, but it also started to deprive itself of its market differentiation. The underlying problem was that the relatively small difference in product quality to the products of the discount competitors did not allow for defying the margin pressure from retailers. To solve this problem in a lasting way, the company had to improve its products and

decided use only healthy, high-quality ingredients. This way, the difference to the low-cost alternatives could be demonstrated more clearly to the consumer, the company was able to justify a significant price premium with its retailers, and significantly improved overall profitability.

Eroding goals

In another related structure called *eroding goals* (Senge 2006, 394f.), the short-term solution represents sacrificing long-term goals to reduce the gap to the aspired condition. The fundamental solution, namely taking actions to improve the condition and thereby reducing the gap, is associated with a delay that pressures management to let the goals erode. The eroding goals systems archetype contains the archetype balancing loop with a delay. However, in this case the problematic reaction is inactivity that threatens long-term performance rather than overshooting.

Eroding goals can also have adverse effects on sustainability as it can lead to sliding environmental targets. One way to mitigate eroding goal structures is to set up smart business model monitoring, combined with early actions on observed performance gaps.

Fixes that fail

Fixes that fail (Senge 2006, 399) are characterised by short-term success combined with unintended (longer-term) consequences. This systems archetype sounds very similar to shifting the burden but differs in that fixes that fail directly worsen the problem while shifting the burden emphasises dependence on solutions that help to relieve the symptoms but ignore the underlying problem. For example, when a company gets bad press because it is attacked by an NGO for low environmental performance, the company may consider the problem a public relations issue and rely on denial or greenwashing. However, this behaviour directly worsens the problem as the NGO then feels urged to intensify its efforts to point out existing grievances and look for additional ones. Obviously, fixes that fail should be avoided, although in certain situations it may be sensible to use them consciously to gain time to develop a fix that works (Senge 2006, 399).

Escalation

Escalation (Senge 2006, 395f.) describes an unhealthy form of competition in which each party defines its results relative to the results of competitors, leading to a rat-race. Although the same structure can incite rivalling athletes in sports to great performances through more effort and training, escalation structures can have devastating effects in business, e.g. in the form of price or advertising wars or unhealthy fighting for resources within companies (for example, through inflated budgets). The escalation system archetype is best represented as two connected balancing loops – one for each contester (in contrast to one reinforcing loop as described earlier). This way, it is easy to grasp why the escalation structure can be so treacherous: each party is caught in its own balancing loop, eagerly trying to improve one's own relative position. Each party will thus usually feel to act defensively and blame the other side for the escalation.

Luckily, the vicious circle can often be ended unilaterally through (potentially symbolic) non-aggressive acts. Victims of this structure should search for win-wins to stop the escalation (Senge 2006, 395). Moreover, companies that want to introduce new green business models should also be aware of the possibility that competitors that feel threatened may start an escalation that destroys the viability of the business model (for all). If this possibility poses a significant threat, contingency actions should be considered, e.g. through some form of cooperation with the most important competitors (also see chapter 8.3).

Accidental adversaries

Even with partners, however, escalation-like dynamics can unfold: partners may become *accidental adversaries* (Senge 1994, 145ff.). This system archetype starts with an intended virtuous circle of mutually beneficial activities. Then, one party applies a fix to improve its own performance, unknowingly obstructing the partner's success. This sets in motion a spiral of escalation that – if not suspended early enough – can destroy all synergies and benefits of the partnership. The better the mutual understanding and the more powerful the shared vision of the partnership, the less likely are escalation structures to become severe or start in the first place. To end an escalation, partners should jointly seek to understand the adverse effects of their seemingly isolated fixes and renew their partnership on this basis.

As explained earlier, partnerships and alliances are of specific importance to many green business models because some required capacities will (should) not be available in-house. Some partnerships will involve unfamiliar types of partners like NGOs, in which case partnerships are especially vulnerable to accidental adversary processes (Dahan et al. 2010, 336). Firms should also be careful not to exploit their stronger power base vis-à-vis partners inconsiderately. Recent far-reaching sustainable supply chain initiatives by mighty IBM and Wal-Mart could potentially hurt suppliers and set in motion unwanted dynamics. IBM therefore allows some flexibility in the advanced environmental management that it now requires from its suppliers. Both Wal-Mart and IBM also intend to help their suppliers in meeting their powerful customers' demands in order to ease the potentially thorny adaptation process of suppliers (IBM 2010a; Wal-Mart 2009b).

Limits to growth

Limits to growth (Senge 2006, 390f.) is a central systems archetype for the introduction of new business models. The adoption of a new product as illustrated in figure 4.11 is an example for limits to growth. The mistake often made when growth slows is trying to strengthen the reinforcing loop; instead the limiting condition should be removed or weakened. In the example, the new product could be introduced to new geographic markets or customer segments.

For example, German organic beverage producer Bionade, which saw wild growth in recent years, ran into such a limit to growth: it had difficulties sourcing organic lychees, a key ingredient. Bionade started to add some conventional fruits to cope with the shortage and, as a result, got criticised in the media and tainted its green brand (Arnann 2009).

Two often cited limits to growth in the renewable energy domain are grid capacities required for large-scale solar or wind generation, as well as missing electricity storage capacities (Hoffert et al. 2002).

Limits to growth patterns can also be observed in many change initiatives: After great initial success, strong resistance suddenly appears within the organisation. Due to the success of the initiative, some people start to feel threatened and try to reverse the change (Senge 2006, 98f.). Senge et al. (1999) identified several specific types of balancing loops that endanger sustained success of change initiatives. They are: objections of control-oriented managers, costs of change that become visible before the benefits, strong polarisation between converts and resisters, and fragmented management structures in which innovators stay disconnected. Again, Senge (2006, 99ff.) recommends removing the source of limitation or resistance, and not pushing harder. Sometimes several limiting factors may be at work in parallel; in this case it is necessary to understand how they relate to each other and in which order and with which priority they should be addressed. Ideally, the limits to growth are removed even before the balancing loop takes effect.

Growth and underinvestment

Growth and underinvestment (Senge 2006, 399f.) describes a case in which an activity gets allocated too few resources – paradoxically despite its initial success. It contains the limits to growth archetype and is often associated with eroding goals: Following high demand, the company initially shows strong growth, but does not invest (early) enough to sustain its performance level (e.g., delivery times, product and service quality). Gradually, the deteriorating performance negatively affects demand. Ironically, the diminishing demand is then used as an argument *not* to invest; instead, the original growth targets are adjusted downwards. In retrospective, it seems like initial demand forecasts were unrealistically high – de facto, however, the company was itself responsible for the decline (also see Senge 2006, 114ff.).

This systems archetype is a real danger for new green business models. Even if it has been tested with a pilot, growth and underinvestment dynamics can still prevent its breakthrough on a larger scale. Management needs to keep an eye on relevant performance levels and proactively plan for capacity extensions. This involves upfront cost and some risk-taking. External demand indicators can help to objectivise capacity investment planning for this purpose.

Success to the successful

Success to the successful (Senge 2006, 396f.) means that one of two (or more) activities, individuals, or groups perform better than the other, and therefore get a large share of the resources – which further increases the performance gap, and so on. The initial performance difference may be random or structural, e.g. if product A is an immediate market success and B, although equally promising in the long run, needs more time to develop. An example where this system archetype did *not* unfold its harmful effects is the Toyota Prius (also see chapter 7.8): The Toyota

Prius was introduced in 1997 in Japan and three years later in Europe, North America and other regions (Toyota Motor Corporation 2008). Although it showed poor financial returns at first (Maynard 2007; Toyota Motor Corporation 2008), Toyota believed in the hybrid concept and resisted temptations to abandon the Prius and jump on the sports utility vehicle bandwagon – like American car producers did. A decade later the conclusion of the story is clear: Toyota dominates the growing hybrid market and shows huge ensuing gains in brand value: According to brand management firm Interbrand, Toyota has gained US$ 15.2 billion or 81 percent of corporate brand value from 2000 to 2008 (Interbrand 2001; 2008). Interbrand stresses the strong contribution of the Prius to this gain. For example, the 2008 report states: "Toyota continues to benefit from the 'green halo effect' of the Prius, which is still widely talked about in the media." (Interbrand 2008, 26). Meanwhile, struggling competitors like General Motors are criticised for their short-sighted product development strategies (Vlasic & Bunkley 2008).

Especially because of the long-term benefits of green initiatives it may be sensible for companies to decouple them from other initiatives to prevent unhealthy competition for resources. However, as the saying goes, one should not throw good money after bad; judging whether the struggling activity really is promising or not will always stay one of the most difficult management tasks. Nevertheless, short- and long-term interests of the firm must be balanced as is seen by the decline of General Motors.

The tragedy of the commons

The tragedy of the commons systems archetype (Senge 2006, 397f.) describes how each party tries to maximise its returns through increased activity. However, the gain *per* activity diminishes – with a delay – due to the resource limit. This systems archetype has already been introduced in the context of overfishing. In fact, all types of common resource depletion through extraction and ecosystem destruction through pollution (including climate change) are subject to this structure. The structure also applies when organisational units use a shared resource (like a pool of experts) in an uncontrolled way.

To overcome the tragedy of the commons, Senge explains that the "commons" need to be managed, e.g., through education, self-regulation and peer-pressure, or by introducing a respective formal mechanism with suitable sanctions.

Within industry sectors that heavily rely on resource usage or cause significant pollution, there are many opportunities to take a leadership role and innovate green business models that help to control tragedy of the commons structures.

4.5.4 Dynamics for Growth with New Business Models

Of course, not all system dynamics are harmful and treacherous. Sterman (2000, 364ff.) provides an excellent overview of the dynamics ("engines") that determine corporate growth. Companies seeking to transform their business models can thus exploit non-linear behaviour of markets while avoiding the dampening effects and vicious circles mentioned above. Table 4.2 summarises ten growth engines adapted from Sterman (2000, 364ff.):

Table 4.2 Engines for corporate growth and related levers, market effects, and strategies

Growth engine	Levers (means)	Related competitive strategies (examples)
1. Product awareness	▪ Advertising ▪ Direct sales effort ▪ Word of mouth ▪ Media attention	▪ Hype-based strategies, viral diffusion ▪ Defend saturated market share
2. Unit cost	▪ Shared fixed cost (e.g., development) ▪ Production unit cost (economies of scale & scope, learning curve, process improvement)	▪ Classic cost leadership strategy to dominate through price ▪ Low initial price to encourage broad adoption and grow market volume
3. Product differentiation	▪ Improved value proposition features	▪ Classic differentiation strategy to reduce price-based competition
4. New products	▪ Uniqueness ▪ New uses, new needs	▪ Innovation leadership ▪ Contain imitators (keep their margins low)
5. Network effects	▪ Community and compatibility effects ▪ Complementary goods (vertical or horizontal expansion)	▪ First or fast second mover ▪ "Get big fast" strategies (e.g. with free products and openness)
6. Market power	▪ Market leadership, monopolies ▪ Buying power ▪ Lobbying ▪ Public engagement	▪ Monopolistic strategies ▪ Changing the "rules of the game" ▪ Standard setter
7. M&A	▪ Mergers, acquisitions, joint ventures, etc. for vertical or horizontal integration	▪ Eliminating (future) rivals ▪ Internalising value chain profits ▪ Portfolio extension, buying market share ▪ Buying key resources
8. Employer attractiveness	▪ Employer branding ▪ Corporate culture ▪ Wages and other benefits ▪ Job security ▪ Career opportunities	▪ Employee development strategies ▪ Good corporate citizen strategy
9. Cost of capital	▪ Investor relations	▪ Eliminate environmental risks
10. Aspirations	▪ Stretch targets	▪ Moonshot visions

Each of the ten growth engines listed above is powered by one or more self-reinforcing feedback loops. Hence, once these loops work in favour of the firm, it enjoys sustained growth and profitability. However, balancing loops sooner or later limit growth dynamics. Moreover, the dominance between the positive feedback loops can shift (and start to work in favour of competitors instead). Worse even, self-reinforcing loops can become vicious circles once the dynamics have reversed, leading to substantial losses or even bankruptcy (Sterman 2000, 382ff.).

The first growth engine listed in table 4.2, *product awareness* (Sterman 2000, 365ff.), encompasses four principal levers that that can be used to make the product a best seller: Advertisement can be used to jump-start a market, and the generated revenue can be reused for additional advertising. This is particularly effective for new products (ideally, a hype is initiated) and in mature, consumer-oriented markets where every point in market share counts (e.g., soft drinks). In other markets (especially business-to-business), direct sales force efforts are a bigger leverage. Increased customer awareness can both increase market share and the size of the total market. Once a product becomes "hot", word of mouth and media coverage often greatly contribute to the virtuous circle of success. However, in contrast to advertising and direct sales effort, these are much harder to control. Nevertheless, they can create extraordinary success stories: For example, Bionade, the German maker of an organic beverage of the same name managed to create exponential growth from a couple of million bottles per year to 200 million in just four years – roughly tripling sales every year. Bionade created this growth in a highly competitive market without classic print or TV advertising by using a viral marketing strategy that fosters word of mouth and media coverage (Treumann 2007; Dengel 2008).

The second growth engine, *unit cost* (Sterman 2000, 367ff.), is based on several effects. If more units are sold, fixed upfront cost for development can be split on more units. If this (expected) unit cost reduction is transferred to the customer through lower prices, more units are sold and unit cost fall even further. Hence, an early, aggressive pricing policy can result in significantly larger revenue over the course of the product lifecycle. However, the company needs the financial strength to cope with negative cash flows at the beginning and carries the risk to remain unprofitable if the expected volumes do not materialise. Sterman points out that apart from spread fixed cost, unit cost is driven down by economies of scale and scope, learning curves, and process improvements. If production capacity, distribution channels, expertise and other resources can be shared for certain product lines or units, economies of scope arise. Moreover, accumulating experience in production usually leads to better procedures with less errors and higher throughput. Low unit cost provides the basis of Porter's classic *cost leadership* strategy (Porter 1980).

The third growth engine corresponds to Porter's second classic strategy, *product differentiation* (Sterman 2000, 371ff.). It follows a different rationale: The generated revenue is not used to reduce the product's price, but to invest in developing new product features that make it more attractive for customers, including new ones. Differentiation tends to reduce direct comparability of products and thus eases pressure on prices. Alternatively, companies can pursue Porter's third and last generic strategy, *focus* (Porter 1980, 38f.). By giving up industry-wide

growth aspirations, a company may tailor its products to the needs of a specific customer segment or market and therefore serve these customers better or more efficiently.

New products (Sterman 2000, 373f.) can also offer significant price premiums. Some firms manage to enjoy high growth and profitability at the same time due to a successful innovation leader strategy (e.g., Apple). New products can also be used as a means to generate replacement purchases. For example, ever increasing hardware requirements of software helps to shorten buying cycles. Another viable strategy is to use a margin model that uses profits from new products to keep prices for older products low. This way, the profitability of imitators is kept at a low level. Hence, their financial power and ability to develop high-end products remains limited.

The fifth growth engine is *network effects* (Sterman 2000, 370f.). Network effects are often highly non-linear and create winner-takes-all markets. They become relevant once a certain threshold of installed base is reached and dramatically increases the utility of a product. Examples include fax machines, VCRs, or social networks. Successful strategies include becoming big fast, e.g. by offering the product for free (Facebook), or by incentivising other participants to create value (e.g., Apple's App Store for the iPhone). Once the market leader reaches a certain size, it is very difficult to break its dominance. However, aggressive followers can be successful if they act early enough (e.g., Apple's Macintosh vs. the technically inferior Wintel platform).

Firms that have enjoyed growth through some of the above-mentioned growth engines will eventually command significant *market power* (the sixth engine) (Sterman 2000, 374f.). This market power further strengthens the position of these companies: Suppliers are forced to grant them preferential treatment and better contract terms, they can introduce industry standards that are in line with the firms' best interests, and customers are often locked in (e.g., due to high switching cost or network effects). Some corporations also become opinion leaders or use lobbying to exert significant influence on public debates and political processes (Sterman 2000, 380). However, too arrant exploitations of market power are subject to anti-trust proceedings and may cause backlashes from consumers and civil activists.

Market power and other growth engines may result from organic growth or be bought through *M&A* (Sterman 2000, 375f.). Types and motivations of M&A can differ greatly: Some companies buy market share and swallow smaller competitors to improve their market position (e.g., Oracle Corp.). Other deals are supposed to create synergies and economies of scale (e.g., the (failed) merger of Daimler-Benz and Chrysler), or to reduce cost and internalise value chain profits through vertical integration (M&A of suppliers or customers). Firms may also buy market access to certain regions or customer segments (e.g., the acquisition of The Body Shop by L'Oreal) or buy know-how and competencies (e.g., Daimler's acquisition of stakes in electric car pioneer Tesla). While M&A can lead to the virtuous circles described above, many deals turn out to be unsuccessful. One common challenge is to prevent the best people from leaving the firm.

A high workforce quality leads to better products and market success. The generated excess revenue can be used to pay higher wages and invest in employee development, further increasing the *employer attractiveness*. A successful firm also offers good career opportunities which increases loyalty even more (Sterman 2000, 376ff.). Being a good corporate citizen and operating green business models also fosters identification of employees with the firm.

A successful firm also has another advantage over its less successful competitors: It has *lower cost of capital* (Sterman 2000, 378f.). As the capital markets gain trust in the financial performance of the firm, risk premiums (i.e., interest rates) decrease and the company can raise more capital. One possibility, as mentioned earlier, is to avoid any environmental risks (Sharfman & Fernando 2008).

The last of the growth engines, *aspirations*, is largely a psychological phenomenon (Sterman 2000, 380ff.): Organisations have produced extraordinary results when their leaders showed great ambition and set stretch objectives. The scope of such objectives can range from organisations as a whole to the individual level. Like all of the growth engines, aspirations are a double-edged sword: If the tension becomes too great, frustration, burn-out or even unethical behaviour can be the result.

Traditional economic theory implies that balancing loops dominate the economy, thereby preventing companies from enjoying substantial above-average returns over long periods of time. However, empirical evidence indicates that self-correcting market forces function only partially, and instead frequently follow the positive feedback structures presented above (Sterman 2000, 382).

Furthermore, winner-takes-all conditions are path dependent, i.e. small, seemingly insignificant events at an early stage can determine who that winner will be (Sterman 2000, 349ff.). Hence, it is critical to intervene early enough while market dynamics are still responsive to respective policies. For example, it becomes increasingly difficult to compete on price with a larger competitor once a certain threshold of units produced is reached and economies of scale become significant. An early price reduction or advertising campaign can turn the tide in favour of a follower while respective efforts would be in vain in a more mature market.

Sterman (2000, 382ff.) remarks that successful firms tend to use several growth engines in combination. It is vital to understand which growth engines are relevant in the market at which point in time. Moreover, not all growth engines can be used together. For example, product differentiation and unit cost are based on conflicting dynamics. This does not mean, however, that a firm cannot use them sequentially: In an early phase it may be sensible to seek for low unit cost to penetrate the market and contain early imitators. Later, when certain once unique capabilities have become readily available to imitators, product differentiation can be used to evade price-based competition and acquire more demanding customer segments.

All growth engines will stall sooner or later. In the case of beverage producer Bionade, the business model got into several difficulties at once: Not surprisingly, the success of Bionade attracted imitators that tried to steal market share. The scalability of the business model also became a problem (availability of organic raw materials) (Arnann 2009).

In summary, the implications of system dynamics for successful business model transformations are threefold: (1) Firms need to understand and exploit dominant business dynamics before launch, (2) respond timely to changing dominance of feedback loops, and (3) remove limits to growth, ideally before they are reached.

4.6 Business Model Change and Evaluation

The importance for business model change and innovation can hardly be overestimated: According to Johnson et al. (2008, 52), "fully 11 of the 27 companies born in the last quarter century that grew their way into the Fortune 500 in the past 10 years did so through business model innovation." In chapter 6, the theoretical basis of organisational change and innovation is discussed in detail. Hence, only a short overview is presented as the conclusion of this chapter.

The first task is to define what kind of organisational changes constitutes a *business model transformation*. Linder & Cantrell (2000, 10ff.) distinguish four different approaches to business model change, which they refer to as *change models* (see figure 4.13):

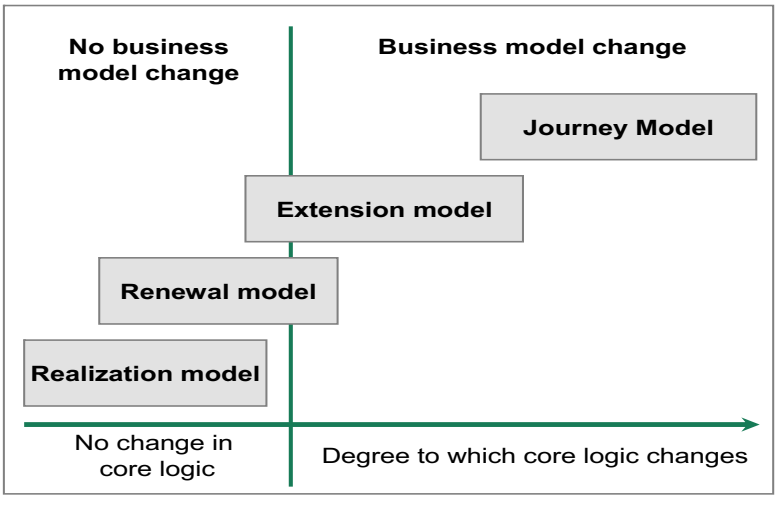

Fig. 4.13 Change models (adapted from Linder & Cantrell 2000, 13)

Realization models do not change the core logic and hence represent no business model change. They are an attempt to maximise profits from the existing business model. This can include brand maintenance (e.g., advertising), product line extensions, geographic expansion, penetration (share of wallet), additional sales or service channels, or roll-up (consolidation of firm fragmentation).

The second change model, the *renewal model*, usually encompasses isolated innovations or adaptations that do not represent a true business model change either. New service offerings or brands, entry in untouched (and different to existing) markets, new retailing formats, or disruptive new product or service platforms all belong to this category.

The third change model, the *extension model*, usually brings along significant change to the core logic of the firm. It adds new – rather than replaces – business operations. It can be realised through value chain integration, i.e., backward (e.g., through private label brands), forward, or horizontal. Alternatively, a company externalises an internal capability.

Linder's and Cantrell's last change model is called the *journey model* and is the most radical. It comprises commoditization (which changes the nature of the value proposition focus from product to price), avoiding commoditization (e.g., through services or solution offerings), globalization (coordinated, global reach and capabilities), moving upmarket in products (e.g., through speed and agility), and moving upmarket in services (e.g., through brand or expertise). The journey model thus represents a new strategy that implies a lasting change of the firm's overall direction.

In summary, Linder & Cantrell (2000, 10ff.) offer a long list of means to change elements of a business model, yet two of the four identified types of change models are ambiguous with respect to whether or not the business model as a whole is changed fundamentally.

The following definition aims close that gap:

> *A **business model transformation** is a fundamental change to the logic of doing business with the purpose of improving or sustaining financial performance.*
>
> *Value is thereby created and / or captured in a fundamentally different way than before. That is, at least one of the business model components – value propositions, target groups, key resources, key processes, or the financial logic – is changed considerably, and the interplay of business model elements is consequently altered, too.*

Business model transformation is no end in itself – business models need to be evaluated in order to identify the need to adapt or transform them in the first place. Johnson et al. (2008, 57) name five strategic circumstances that can necessitate a business model transformation:

1. Opportunities from so far unserved customer segments, e.g. in emerging markets.
2. Opportunities to introduce new technology into an existing market or vice versa.
3. Opportunities from unmet customer needs neglected by established players.
4. "The need to fend off low-end disrupters."
5. "The need to respond to a shifting basis of competition."

Osterwalder & Pigneur (2010, 216ff.) provide a catalogue of questions that can be used to evaluate the strengths, weaknesses, opportunities, and threats (SWOT analysis) of the current business model with respect to each business model building block.

Several authors have addressed the issue of what the process of business model transformation should be like. Earlier approaches are often specific to business models of the digital economy. The ones discussed by Osterwalder (2004, 37f.) include Tapscott et al. (2000) and Gordijn (2002) who propose approaches following a deconstruction-reconstruction logic. Petrovic et al. (2001) emphasise the connection between transforming business models and underlying mental models. Papakiriakopoulos et al. (2001, 453ff.) propose changing e-business models in a four-stage process that considers stakeholders, value flows, competitive forces, and feedback chains (i.e., adaption to market needs).

More generally applicable is the three-step approach of Johnson et al. (2008, 54ff.): The first step is to think of the opportunity to satisfy a customer's needs. Only in the second step the company should start to think about a blueprint, i.e. business model design, for how to fulfil that need profitably. The third step is to compare the blueprint to the existing business model and identify what needs to be changed. Johnson (2010, 107ff.) emphasises that business model design and implementation thereby have a strong element of experimentation as opposed to rigid execution.

Osterwalder & Pigneur (2010, 244ff.) present a five-phase process for designing new business models. The first phase, called *mobilize*, is intended to set the stage. The second phase, *understand*, is used to create the knowledge necessary to successfully carry out the *design* phase. The business model design is then executed during the *implement* phase. Finally, the business model's further evolution is fostered during the *manage* phase. The process described by Osterwalder and Pigneur differs in some important aspects from the management framework presented in chapter 9, inter alia, because it does not focus on green business models. However, it follows a similar underlying logic and with its many illustrations and additional examples their book may serve as an informative complement for practitioners.

Eventually, the old business model and the new design have to be compared in economic terms. In this context, Osterwalder (2004, 38f.) contrasts the approaches of Hamel, Gordijn, and Afuah & Tucci. Hamel (2002, 99ff.) determines a business model's "wealth potential" by assessing four factors: Efficiency, uniqueness (which allows high prices), consistency of elements, and usage of means to boost profits like competitor lock-out and strategic economies. Gordijn (2002, 120ff.) proposes to create a profitability sheet for all involved actors and the valuation of objects they exchange in order to evaluate e-commerce ideas. He further proposes using "evolutionary scenarios" related to possible future events and potentially wrong assumptions to represent expected changes of profitability over time. Afuah & Tucci (2001, 79ff.) assess business models in terms of profitability measures (earnings and cash flows), profitability predictor measures (profit margins, market

share and revenue share growth rate), and provide benchmark questions to evaluate individual business model components.

Johnson et al. (2008) suggest testing the market "fit" of the aspired value proposition with the current business model, i.e. evaluate if it still works with respect to the *Profit Formula,* if it can be realised using most or all existing resources and processes, and if the current core metrics, rules and norms are still valid. Johnson (2010, 162) lists the following business model metrics for consideration:

Table 4.3 Examples of business model metrics (Johnson 2010, 162)

Financial metrics	Operational metrics	M&S / R&D / HR metrics
▪ Gross margins ▪ Opportunity size ▪ Unit pricing ▪ Unit margin ▪ Time to break even ▪ Net present value calculations ▪ Credit items	▪ End-product quality ▪ Supplier quality ▪ Owned versus outsourced manufacturing ▪ Customer service level ▪ Channel options ▪ Lead times ▪ Throughput	▪ Pricing ▪ Performance demands ▪ Product-development life cycles ▪ Basis for individuals' rewards and incentives ▪ Brand parameters

The considerations presented above for the most part relate to identifying economically viable design changes in business models. However, realising business model changes in practice is more than just an analytical challenge (Chesbrough 2010). Comprehensive business model transformations require a much deeper analysis of organisational change, starting with a thorough understanding of organisations itself. Before the theoretical background of this field of research will be laid out in chapter 6, I complete the theoretical examination of business models with the development of a taxonomy for green business models.