Innovation Management with an Emphasis on Co-creation

Dominic Hurni and Stefan N. Grösser

Abstract Innovation management is a means of supporting an understanding of an organisation's operating environment and enables the organisation to create and manage innovations more systematically throughout a system's life-cycle. This chapter introduces innovation management and co-creation in general, and details the methods of design thinking and business model canvas, thereby enabling organisations to professionalise their collaboration with customers and manage complex supply chains. Through co-creation organisations potentially improve their ability to innovate, optimise processes, adapt products and services to customer's actual needs, encourage stronger customer buy-in, hence creating a more sustainable market position through a more flexible organisational culture

Keywords Innovation management · Co-creation · Design thinking · Business model canvas · Open innovation · Management tools

1 Introduction

Innovation management is about rapidly transforming good ideas and inventions into innovative products or services. It is this commercialisation which the German Federal Ministry of Education and Research seeks to promote in its high-tech strategy for European industry published in 2015 (Bundesministerium für Bildung und Forschung 2015a). Although industry in Europe faces new technology such as "Industry 4.0" (Bundesministerium für Bildung und Forschung 2015b) and more intense global competition (Lusch and Vargo 2015), even more challenging seems to be enabling employees to remain agile in fast-changing business environments.

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According to the report "Fast Forward 2030" (Fast Forward 2030 2014), 50% of current occupations in corporations will fundamentally change in the next ten years. It is possible that European industry with its "zero-defects principle" finds itself locked-in this culture, focusing exclusively on optimizing existing products and thereby missing these other changes (Divernich 2007). Executives in Europe are aware that different approaches to innovation management are required. Often companies set up innovation projects free from the constraints of normal production to speed up the innovation process (Assink 2006). However, this separation fosters the creation of sub-cultures in the company and has to be avoided. Another crucial requirement to run projects successfully is user involvement (CHAOS Manifesto 2013 2013). Companies which have a rapid in- and outflow of relevant knowledge have a higher internal innovation rate (Chesbrough et al. 2005). But the implementation of open structures in companies appears to be challenging. Innovation management in general, and co-creation in particular, are approaches to address these.

Such challenges are also addressed by the Use-it-Wisely (UIW) project (see Reyes, Chapter "The Challenge", and Granholm and Groesser, Chapter "The Use-It-Wisely (UIW) Approach" in this book). In this chapter, we detail several approaches to innovation management and thereby offer a rich source for practitioners and researchers to innovate process, products, services, and subsequently business models.

This chapter is structured as follows: Sect. 2 provides both a definition of innovation management and a generic overview. Then, Sect. 3 details the general approach of co-creation and examines in detail "design thinking" methodology and the method "business model canvas". Section 4 discusses and concludes the chapter.

2 Generic Overview of Innovation Management

This section provides an overview of innovation management and includes discussions of various definitions that have been proposed within the field. This section aims to provide a theoretical foundation for the subsequent section on co-creation and design thinking in practice.

2.1 Definition of Innovation Management

Innovation management has arisen as a logical consequence of Schumpeter's (1934) concept of creative destruction. Innovation management is the process of handling the development of a product or service including successful market launch. Invention represents the creative act of developing a product or service and is the logical first step of an innovation. There are multiple definitions of innovation management; for example Edison's et al.'s (2013) literature review found more than

40 definitions of the term and declared Crossan's and Apaydin's (2010, p. 1155) as the most complete: "Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome." Therefore, innovation refers not only to product, service or market development, but also to organisational development. Consequently, innovation management is the discipline of planning, executing, steering, and controlling a systemic process (Bergmann and Daub 2008; Hauschildt and Salomo 2011; Müller-Prothmann and Dörr 2009; Vahs and Burmester 2005) in an interdisciplinary team (Bergmann and Daub 2008; Hauschildt and Salomo 2011; von der Oelsnitz 2009) to create innovation.

2.2 *Management of Innovation*

According to Gassmann and Sutter (2011), innovations and technologies have to be managed at the normative (Fig. 1—blue rectangle), strategic (Fig. 1—white rectangle), and operational level (Fig. 1—development funnel) which are indicated in Fig. 1. Simply supervising technology development is not sufficient for innovation management. On the normative level, for instance, values and cultural norms of society influence the vision and mission statement of an organisation as well as the market and technology development in general. One normative question is: How should we use and control "artificial intelligence" in our organisation? It has to be answered congruently with the internal and external self-image of the organisation otherwise its credibility and also the trust in its strategy suffers.

From the perspective of strategy, innovation is both a strong source for short-term reduction of costs and for long-term sustainable competitive advantage. When technology is a source of an organisation's core competences, the protection

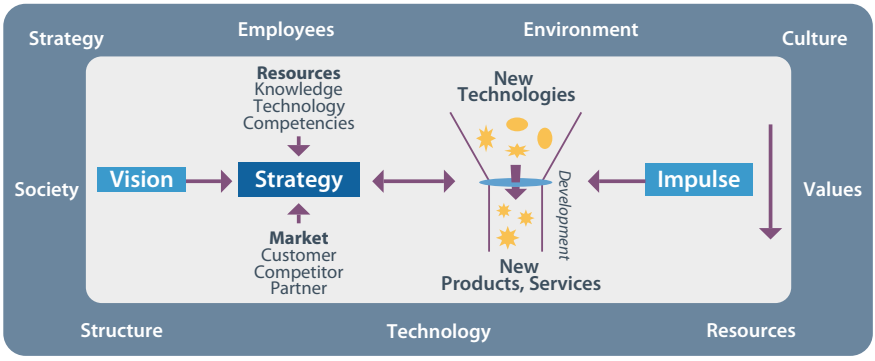

Fig. 1 Innovation management (taken from Gassmann and Sutter 2011, p. 8)

of intellectual property (IP) rights becomes crucial. From an R&D perspective, the issue of the protection of IP rights becomes especially critical in countries where legal frameworks are unsupportive. The strategic-level of innovation management builds the link between more abstract normative-level and highly detailed operational-level management. Moreover, the strategic-level has to position the company internally with regards to employees as well as externally with regards to customers and partners (Fig. 1). Operational-level management focuses on innovation processes which use methods and tools to control performance, quality, costs, and time.

2.2.1 Objects and Degrees of Innovation

Often it is recommended to use innovation portfolio tools to obtain an overview of current innovation projects. Tidd et al. (2001) provide one example of such an innovation portfolio tool. They distinguish four potential innovation objects and three degrees of innovations. The object is the thing being innovated and is categorised as a process, product, service, or business model (Table 1).

Degrees of innovation can be understood in several ways (Crossan and Apaydin 2010; Edison et al. 2013) and a scale of innovation degrees which fits our purposes here stems from Damanpour (1991). Incremental innovation represents variation in existing routines and practices. Radical innovation induces fundamental changes and is a clear change of existing organisational practices. Disruptive innovation changes not only organisational practices, but whole markets by creating new market opportunities as well as value networks and probably displacing established market leaders and alliances (Bower and Clayton 1995). The higher the degree of innovation, the larger the potential influence on the market and the more significant the challenge is likely to be for a company. As Nünlist (2015) stated when talking about competition: "We are not afraid of our competitors, rather more of a sudden game changing start-up that set new market rules." But why are large enterprises with more resources than start-ups not disruptively innovating themselves? One reason is that such companies might not be able to adjust to fast changing market needs with a workforce of, say, 2500 employees compared to a start-up with only 8

Table 1 Object and degree of innovation with examples from Tidd et al. (2001)

Degree of innovation	Disruptive (high)	Direct democracy	Internet	E-mail	Freeware
	Radical (moderate)	Agile software development	Smartphone	Telealarm	Self-assembly of furniture
	Incremental (low)	Discard redundant forms	Thinner solar panels	Faster food delivery	Maintenance contracts for dishwasher
		Process	Product	Service	Business model
		Object of innovation			

employees—it is as comparing the manoeuvrability of oil tankers with speed boats.: Speed and flexibility is an advantage of start-ups.

2.2.2 Innovation Inhibitors

New technologies can change markets. Given that the market defines what is needed from companies, those companies that can adapt to market needs will survive and others will perish irrespective of their company size. One prominent example is Nokia that missed the changing market demand for smartphones (Lääperi and Torkkeli 2013; Lindholm and Keinonen 2003). But why did this happen? Assink (2006) examined factors that impair companies' ability innovate in a disruptive manner. Figure 2 summarises these barriers to identify disruptive innovation.

- **Path dependency (Field 1)**: Companies which focus on their successful dominant product and service designs tend to concentrate exclusively on incremental innovation (Paap and Katz 2004). With this strategy, companies fail to recognize the emergence of important enhancing technology in their field (Divernich 2007). Nokia, which was slow to react to the emergence of the smartphone concept, is one example (Lääperi and Torkkeli 2013).
- **Inability to unlearn old patterns, logic, and methods to adapt to something fundamentally new (Field 2)**: Companies are forced to change mental models and their theories-in-use to be able to adjust to market dynamics. This requires a learning organisation in which employees master their own development which includes unlearning of old patterns and learning new ones (Senge 2011). Sinkula and Baker (2002) distinguish three innovation drivers which have an influence on a learning organisation: first, management-driven which is mainly incremental; second, market-driven which is also predominantly incremental; and third, engaged generative learning driven which leads to radical or disruptive innovation.

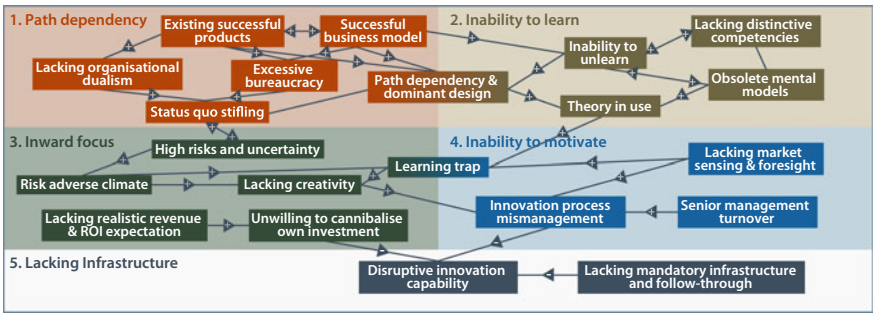

Fig. 2 Model of limiting factors for disruptive innovation (Assink 2006)

- **Inward focus (Field 3)**: Companies are occupied with internal risk optimisation and stabilisation. Required external changes do not register on the company's risk radar. The company exists in a bubble, oblivious to required changes from the outside world. New challenges are tackled by routine processes that have been successful in the past. This leads to biases and distorts realistic revenue expectations, often combined with reluctance to write-off previous unsuccessful investments. All of this severely hinders the development and exploration of disruptive ideas or proactive behaviours (Sandberg 2002).
- **Inability to motivate employees for innovation (Field 4)**: Companies lack the ability to motivate or attract creative and innovative employees with ground-breaking ideas (Stringer 2000). Often these companies observe the market with conventional methods which then result in incremental innovations (Trott 2001).
- **Lacking infrastructure (Field 5)**: Companies might lack the necessary infrastructure, for instance, the transfer of computer files changed drastically with the introduction of internet and wide-area networks (Paap and Katz 2004). It is also possible that there is an insufficient support of infrastructure (Innovatie in Nederland 2003).

Reflecting on the factors which limit disruptive innovation, Chesbrough (2006a) introduced the open innovation approach.

2.2.3 Open Innovation

Open innovation assumes that organisations can use external ideas and externally created paths to market as well as their own pre-existing internal mechanisms.

Table 2 Closed versus open innovation (Chesbrough 2006b)

Closed innovation	Open innovation
The smart people in the field work for us directly	Not all the smart people work for us directly. We need to collaborate with smart people inside and outside our company
To profit from R&D, we must discover, develop, and ship R&D ourselves	External R&D can create significant value; internal R&D is needed to claim some part of it
We will get it on the market first, if we discover it ourselves	We do not have to originate the research to profit from it
The company that first gets an innovation to market wins the race	Building a better business model is more important than being on the market first
We win if we create the most and the best ideas in the industry	We win if we make the best use of internal and external ideas
We should control our intellectual property (IP), so that our competitors do not profit from our ideas	We should profit from others using our IP and we should buy others' IP whenever it advances our business model

Research shows that companies which employ open innovation principles are more likely to create radical or disruptive innovations and tend to sell a greater number of new products (Innauen and Schenker-Wicki 2012). Table 2 compares the characteristics of open and closed innovation (Chesbrough 2006b).

The awareness of opening a company's doors to co-create with outside stakeholders is a crucial factor to the innovation process. The top-management team of a company needs to establish the required framework and space to innovate processes, products, services, and business models. This is not easy, as Google demonstrates. Larry Page and Sergey Brin admitted in Google's IPO Letter for investors 2004, "We encourage our employees, in addition to their regular projects, to spend 20% of their time working on what they think will most benefit Google. This empowers them to be more creative and innovative. Many of our significant advances have happened in this manner." This famous 20%-policy often falls victim to productivity ranking tools designed to appraise management efficacy. These tools force managers to focus on the "here and now" rather than allocating time to more "out there" ideas which do not currently contribute to the bottom line (Ross 2015). Implementing a culture of innovation can take many years. However, a beneficial starting point is moderated pilot projects in heterogeneous groups with stakeholders from the supply chain outside the company. This helps to unfreeze the mind-sets of employees (Lewin 1947).

3 Co-creation in Innovation Management

The reality of innovation management is that data gathering for new products or services in fledgling markets often focuses on internal capabilities and on quantity of data, not on data quality (Kohn 2006). Furthermore, the insight produced from market data is often limited since it can only describe patterns about how customers use already existing products; the data seldom indicate the motivation behind the actual usage of products or the deeper needs of customers. Co-creation fills this gap by involving customers or stakeholders directly in product or service design. In the last ten years, the role of knowledge about users and their respective needs has advanced from specifying functional, usability, and performance requirements alone to also capturing deeper, more affective needs (Schütte et al. 2004). For instance, Apple does not only understand the functional needs of their customers, but also knows the lifestyle, wishes, and emotional states of their clients. Unlike traditional waterfall models of software or product development, user-centred design approaches, e.g. design thinking, uncovers these affective demands. It defines phases in developing innovations by observing stakeholders and eliciting feedback about their state of mind. ISO 9241-210 is a generic example of user-centred design processes for specific technologies including collaborative work systems (Wobbrock et al. 2009). When customers not only provide feedback, but are also integrated in the development process as partners to produce a valued outcome it is called co-creation (Prahalad and Ramaswamy 2004b).

In a supply chain context, this can be seen as co-creation between customer and product or service provider. Co-creation is an approach to value creation through interactions between stakeholders across and even from outside the supply chain to shake up existing, rigid collaboration patterns. Crucially, these stakeholders include the customer who had hitherto been regarded as simply someone to be offered a value proposition (Prahalad and Ramasawamy 2004a, b). From a human factors perspective, collaboration and not only contribution within the supply chain requires skills such as communication, community, shared spaces and open thinking has to be anchored in a company's culture to create mutual benefit. It is a change management challenge to work together as partners instead of a supplier-customer relationship. Design thinking goes even further by placing one partner in the position of naïve apprentice in order to learn from other partners within and also outside the supply chain. The objective is to obtain feedback about a project from a person in the natural setting of the product or service application. Take the example of post-it of Minnesota Mining and Manufacturing (3M) Company: In 1968, Spencer Silver intended to invent the strongest glue ever—but his result was only a weak removable adhesive that failed the goal. In 1974, Art Fry, a friend of Spencer, got annoyed because his little notepapers fell out of his choir book. He asked Spencer to use the removable adhesive to fix his notepapers. The notes adhered without damaging the music sheets when they were removed and so Post-It's found their final purpose through a stakeholder who was not a part of the supply chain (3M 2005). A closed approach may well seek to limit this seemingly unauthorised use, whereas an open co-creative perspective would invite these new users to explain how they are using the product and to possibly build their requests into future iterations, provide schematics, or make the product easier to adapt. A further example of harnessing the ideas of users for product developing is the computer game industry: it actively cultivated fan forums to develop and beta-test their games. Mutual value is therefore created by the company locating interest and therefore a new market and the consumer a new requested game experience.

Design thinking is both a methodology and a mind-set for designing innovations by means of a co-creational process thus bringing a culture of innovation to companies. The change of existing mind-sets starts when participants realise the potential success of the design thinking approach and start to question habitual processes in their company (Brown and Martin 2015). Co-creation and design thinking are gaining more awareness and traction in the business world. More and more large organisations have started collaborating with external parties. Procter and Gamble, for instance, has created the position of "Director of External Innovation". Based on open innovation, new collaboration forms emerged, through which engagement and compelling experiences, new ideas and approaches from various internal and external sources are integrated in a platform to generate new value for customers (Lee et al. 2012). Brown (2008) describes first experiences with design thinking as a methodology of meeting people's needs and desires in a technologically feasible and strategically viable way. In iterative loops visualised assumptions in the form of prototypes are verified by stakeholders or customers.

Osterwalder and Pigneur (2010) created the business model canvas as a supportive tool to visualise prototypes of a business model for iterative development.

"If three people get together, you get the wisdom of not just three, but that of ten people". This Japanese saying shows the power of co-creation, where people with different knowledge and experiences come together to solve a problem (Fast Forward 2030 2014). "Co-creation is the joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically" (Galvagno and Dalli 2014, p. 644). Their framework of co-creation (Fig. 4) provides an overview of existing literature on value co-creation. The framework originated from the fields of service science, marketing and consumer research, and innovation and technology. It is organised into two topics: first, theory of co-creation that contains four areas to outline and define co-creation approaches: Service Dominant Logic (SDL), co-creating value through customer experience and competences, online and digital customer involvement, and development of service science. And second, collaborative innovation in new product development which comprises two approaches applied in co-creation: Service innovation and individual consumers and communities, collaborating with companies (Fig. 3).

"Theory of Co-Creation" and "Collaborative Innovation in New Product Development" are described in more detail in the following:

– **Service dominant logic (SDL)**: In SDL, Vargo and Lusch (2008, p. 7) state that "service is the fundamental basis of exchange". This perspective allows a car seller to support the customer with much more than just the car. Now, security support such as driving insurance, or exercises to prevent back pain on long journeys add possible value. Over the last decade Vargo and Lusch (2016) have developed various SDL axioms and premises. Their model envisages co-creation as customers working with companies to build a shared future. Therefore methods, techniques, and tactics to engage productive dialogues need to be developed; additionally, research into motivation for co-creation is overdue and should be carried out (Lusch and Vargo 2015).

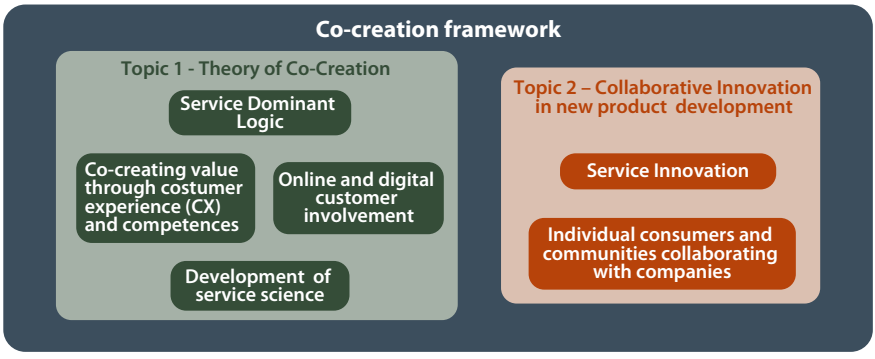

Fig. 3 Value co-creation topics and respective areas (Galvagno and Dalli 2014)

- **Co-creating value through customer experience (CX) and competences**: Customer experience is "the cognitive acknowledgment or perception that follows from stimulated motivation of a customer who observes or participates in an event. Such acknowledgment or perception consequently enhances the value of products and services" (Chen and Lin 2015, p. 41). Verhoef et al. (2009) proposed a conceptual model of the determinants which influence a customer's experience.
- **Online and digital customer involvement**: Nambisan and Nambisan (2008) formulated five different virtual customer roles for innovation and value co-creation: product conceptualiser, product designer, product tester, product support specialist, and product marketer. Brodie et al. (2013) highlight the importance of enhancing loyalty, satisfaction, empowerment, connection, emotional bonding, trust, and commitment of virtual community members.
- **Development of service science**: Maglio and Spohrer (2008, p. 18) defined service systems as "configurations of people, technology, value propositions connecting internal and external service systems, and shared information (e.g., language, laws, measures, and methods). Service science is the study of service systems aiming to create a basis for systematic service innovation." In an attempt to integrate service research from different disciplines to meet complex business and societal challenges, four core principles are described by Maglio and Spohrer (2013, p. 669). First, service system entities dynamically configure four types of resources: people, technologies, organisations, and information. Second, service system entities compute value given the preferences of multiple stakeholders. Third, the access rights associated with entity resources are reconfigured by mutually agreed value propositions. And finally, service system entities plan and coordinate actions with others through symbolic processes of valuing and symbolic processes of communicating.
- **Service innovation**: "Service innovation is a new service or a renewal of an existing service which is put into practice and thus providing benefit to the organization that has developed it; the benefit usually derives from the added value that the service innovation provides the customers." (Toivonen and Tuominen 2009, p. 893). Snyder et al. (2016) propose four emerging themes out of 43 service innovation categories: degree of change, type of change, newness, and means of provision.
- **Customer involvement, individual consumers and communities collaborating with companies**: Within SDL, it is recognised that socio-technical systems are dynamic in as much as they simultaneously function and reconfigure themselves (e.g., Vargo and Lusch 2011). It is also recognised that typical product development stage-gate plans are of limited use when something such as a system adaptation has to be developed in an unknown way and involves predominantly tacit knowledge. Rather, methods that enable the creation of a

shared experience are seen as more effective. The UIW-adaptation system (Chapter "The Challenge" and "The Use-It-Wisely (UIW) Approach" of this book) involves collaboration and self-organisation in the concurrent design of goods, services, business models, and production processes based on evolving and interoperable human and machine knowledge.

In the next section we introduce the methodology of design thinking.

4 Deep Dive 1: Design Thinking

4.1 Purpose of the Methodology

The design research community has yet to clearly defined design thinking (Dorst 2011), but according to Brown (2009), "design thinking functions within a framework of three intersecting 'constraints.' They are 'feasibility', which is what can be done; 'viability', what you can do successfully within a business; and 'desirability', what people want or will come to want." The principle underlying the intersection of desirability, feasibility, and viability is an iterative process. This process includes the development of visualized prototypes, then demonstrating them to customers and observing the customers to learn what they really desire (Maurya 2012). Although this process leads to more failures than successes, it tent to reveal customers' current needs (bootcamp bootleg 2015). To navigate through this process requires a different mind-set and also a high level of empathy for people, hence a human centred approach. The objective of design thinking is to improve the rate at which successful product, service, and business model innovations are brought to the market (Harvard Business Review 2015).

4.2 The Application Process

Even though different design thinking processes are in use (SAP 2016; Tschimmel 2012), all of them apply an iterative exploration and learning process following the 'trial and error' principle. Trial and error is understood as learning by unearthing assumptions and falsifying them in the real world by means of iterations until a sufficient match between problem and solution is found. Figure 5 shows a typical design thinking process. It is the amalgamation of the processes suggested by d. school (bootcamp bootleg 2015) and the Hasso Plattner Institute (2016). The iterative process ceases when the resulting prototype fulfils both people's needs, is technical feasible, and economically viable. The process consists of the six phases: understand, empathise, define the problem, ideate, prototype, and test the solution (Fig. 4).

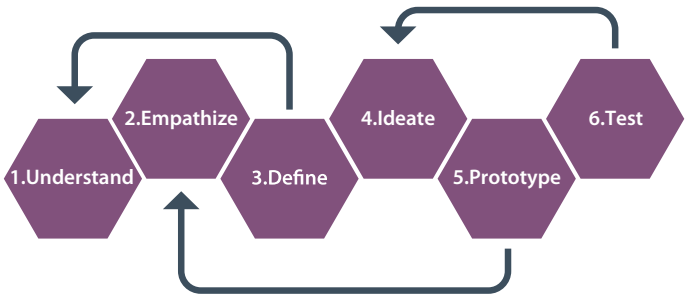

Fig. 4 Amalgamated design thinking process

In the following, we look at these phases in more detail and provide guidance for concrete applications. Here, we do not provide specific techniques for each phase. The interested reader should consider the following references for more details (Curedale 2016; Stickdorn and Schneider 2014).

Before we consider the design thinking process, a short word on the design team. In general, a heterogeneous design team produces a brother range of insights and ideas, but suffers of misunderstandings because different use of expressions. Team setup depends on the type and degree of innovation project (Table 1).

4.2.1 Phase 1: Understand

The phase 'understand' first defines the design scope within a number of actors interact with each other in certain places, and it is within this scope that the design team carries out its search for innovation. Secondly, it helps the design team to communicate their knowledge with mental pictures about actors, places, and reasons in such rather chaotic situations to build up a common understanding in the team. For instance, the design scope for the case of public transport: A design team member shares his knowledge that on average, a commuter (actor) arrives 5 min before boarding a train on the platform in the train station (place) to make sure not to miss the train (reason). The design scope is not fixed. In case new insights emerge in the following phases, the design scope can be adjusted. For example, at the beginning the design scope about public transports includes only trains and buses. Then, through insights from iterations the team includes the last mile and a bicycle sharing in the design scope. Within the design scope, a team elaborates their initial assumptions about a topic leading to a common understanding about actors, places and reasons. This is similar to the boundary of the context used in requirement engineering (Hull et al. 2011).

Hint: Team members often share they knowledge related to existing products or services that can be collected as existing solutions or hints for existing problems. In business, the customer explains his problem based on that a **design challenge**. For example: How can we make public transport for passengers smarter?

4.2.2 Phase 2: Empathise

The goal in this phase is to empathise with people especially target stakeholders to understand their physical and emotional needs and to visualise them. The guiding principle is to walk in the shoes of others. One way is to shadow target stakeholders in their everyday life. For instance, the actor Dustin Hoffmann spent time with Kim Peek, an autistic person, preparing himself for his role in the movie "Rainman". In the example of smart mobility in public transport this could require following different stakeholders, e.g. commuters, bus drivers, bicycle parking clerks, ticket collectors, disabled passengers, but also extreme users such as fare dodgers, football hooligans, or carnival bands. These groups should be observed not only at the train station or bus stop, but also on their way from home to their destination. Besides participatory observation of their behaviour, taking pictures and videos of problematic or challenging situations is also useful. Another possibility is interviewing people about their positive and negative experiences while using a product or a service. If they feel functionality or information is missing it is known as a "pain point". If they experience satisfaction, this is called a "gain point". An important aspect in this phase is to approach uninvolved people and to listen to their stories naively, i.e., without using your previous knowledge. Assume a state of a neutral observer and reporter. Then, create fictive stories that summarise the gained insights during the empathising phase. This helps to convey them to the design team. For instance, Peter (WHO) commutes every day and has to look for a free seat on the train every day during rush hour gets annoyed (WHAT) because he loses ten minutes working time because of this search time (WHY). While WHO and WHAT are visible, some WHY's are formulated by the stakeholder, but some motives are latent and have to be assumed by the design team. For instance, commuter Peter mentions he needs a seat to work in the train. But latently, he needs to go from A to B and able to work on his laptop during this time. Therefore, the seat is not necessarily a part of the solution to fulfil this needs. Latent motives partly surface in this phase or during phase 3. The team members can imagine such story-based situations and are able to add their comments. For this purpose, team members can visualise their stories on flipcharts. This phase ends, when all obtained stories are communicated and discussed.

Hint: Use story-telling. Every team member has one minute per story to communicate to the team the task in the journey as well as pain and gain points of the stakeholder. Then, the team asks questions and provides feedback to formulate insights within four minutes. An insights for the commuting case is, for example, that a seat is not necessarily needed.

4.2.3 Phase 3: Define

The 'define' phase develops a problem statement with a clear **point of view** (**POV**). A POV is the formulated perception of a chosen stakeholder group, about their behaviour and their needs/requirements and motives within the design scope based on the analysis of stories and insights from the previous phase. The analysis consists of

discussing and clustering information of the story or insights to reveal latent motives and solution requirements. The following is a possible template: **Who** (stakeholder A) needs **what** (requirement) to do **what** (task) to fulfil **what** (motive). For instance, Peter **needs** a calm place with electricity supply and place for his laptop **to** work in the train **to** reduce his workload to gain time (motive) **to** feel that the time has used meaningfully (latent motive). This POV has once again to be validated by the chosen stakeholder group. Especially the reaction of the stakeholders by confronting them with the latent motive might lead once again to new insights. One example, what else besides work brings a feeling of use time meaningfully in train?

Hint: Technique to reveal latent motives are also called and described as "job to be done" (Silverstein et al. 2012). Another technique is "persona" that describes ab archetype of a stakeholder group.

In principle, the define phase ceases when an accurate definition of a POV exists. However, it might be that new insights emerge during the remaining three phases which require the POV to be reformulated and re-explored. Since this is possible, the speed by which the remaining three phases are executed becomes crucial. It is feasible to have a full-fledged POV within three or four days, when the team has expertise about the design scope. By formulating the POV the working mode of design team changes from formulating customer's needs to finding solution for those needs. For our example: How might we support Peter in working efficiently while he is travelling home from workplace during rush hour? The POV forces the team to focus. Without this focus the team finds itself in an ongoing search without any result, therefore moderation within the design thinking process is recommended.

4.2.4 Phase 4: Ideate

This phase generates ideas for solving the design challenge. A design team may use the technique brainstorming to post ideas on an empty pinboard. A standard brainstorming session consists of three steps under time pressure: First, the design team answers the design challenge by collecting all thoughts and ideas that come to mind without criticizing them (7 min). Second, the team sorts and clusters the ideas and provides headlines (10 min). During this process, new, complementary, or lateral ideas are welcome. And finally, the design team evaluates and rates clusters to decide which solution to prototype in the next phase (8 min). Another way to find novel ideas besides brainstorming is to image how a fictional person might face the POV needs. For instance, what spell would Harry Potter use so that Peter finds space to work while travelling home from work?

The criteria to evaluate and select which idea should be prototyped emerges from the verified requirements of phase 3, for instance, calmness to concentrate or electricity supply. If the idea does not fulfil these validated motives, it should not be prototyped. But ideas should not be rejected too fast; sometimes wild ideas open a new view on the design scope and therefore open up new opportunities. Sometimes it is true that the wilder and newer the idea, the fewer people have thought about this. In our example, if Peter is placed on the top of the train in a glass dome his needs might be fulfilled.

4.2.5 Phase 5: Prototype

In the prototype phase, ideas get visualised in a form that stakeholders can interact with. This may be, for example, a drawing, a business canvas, a storyboard, a cardboard construction combined with role-play, or a LEGO model to allow a "walk through". It is crucial in this phase that the design team focusses on functionality instead of appearance. It is not important how the prototype looks as long as it is recognized as one and the test persons recognise the functionality. However, prototypes can create barriers to progress. Often, the longer a person works on a prototype, the more the person defends it, which is likely to be counterproductive from a learning perspective. It is recommended that the team formulates what they want to explore or test with a prototype before they visualize the function in a most rapid and cost-efficient way. Uebernickel et al. (2015) list several types of prototypes according to the state of the project. In our example the team might construct a cardboard prototype of a train carriage with a plastic dome, showing how it could be accessed.

4.2.6 Phase 6: Test

In this phase, you solicit feedback from your stakeholders about the prototype to learn about the context and gain new insights. Ideally, the prototype is shown without any explanation and creates an experience for stakeholders. The experience is more intensive in an appropriate location. For example, the glass dome prototype is likely to receive more accurate feedback on a noisy train track platform than in a calm restaurant because it is an authentic environment. In the role of a naïve reporter (phase 2) using the technique "5 why's" to inquire about cause-and effect relations to reach a profound level in the test. Perceiving verbal and non-verbal feedback to gain new insights. These new insights might result in reframing the design scope (phase 1) and start a new iteration of the design process. It is important to work through all of the six phases quickly to prevent too much frustration resulting from failing prototypes. After several, sometimes hundreds of, rounds of prototyping, a fitting solution to a problem or even an innovation may be found. Moreover, the design team should have gained a lot of knowledge about the design scope.

4.3 Expected Results of Applying the Methodology and Limitations

Design thinking is a methodology which seeks to reveal unknown opportunities for innovation because neither the designer nor the test person nor the stakeholder knows the outcome of a design project. Design thinking is a human-centred approach and therefore suitable for every human interaction with products, services, processes or proof of concepts development. Design thinking is meant to be used

for radical or disruptive innovations. It is less useful in contexts of incremental innovation projects, because it reveals and focuses on unknown or latent needs of stakeholders. IDEO's example of the first computer mouse for Apple is exemplary for a radical innovation. Financial resources alone are not sufficient for successful design thinking projects. What is required is a mind shift of team members, who learn to deal with failing by focusing on generating insights and learning, instead of being correct in their assumptions. Design thinking helps to transform companies into learning organisations (Senge 1996).

Pangaro (2012) describes design thinking as an improvement over analytical thinking in business. But he also states that design thinking will not solve problems, because it is neither a discipline nor a methodology and hence lacks clear process descriptions. He rather sees design thinking as a set of techniques. Meinel, Plattner and Leifer address this lack and establish a design thinking research program to improve and describe design thinking in more detail (HPI—Stanford 2016). Initial research into performance measurement of design thinking in co-located and business teams has been published (Meinel et al. 2012), and their results show that, amongst other things, the concept of mind shift or strengthening the development of epistemological viewpoints (POVs) improve in participants while performing design thinking projects. HPI provides further examples of the impact of design thinking in practical applications (HPI 2016).

5 Deep Dive 2: Business Model Canvas

Business model is one of the four types of innovation (Table 1). The following section outlines the business model canvas, which is relatively quick and simple way of capturing nine important elements of a business model. These nine elements are clustered into the revenue and expense section of the table thus reflecting more profoundly the relationship between customer profile and value proposition (Fig. 5).

5.1 Purpose of the Method

To keep up with this pace of change, tools are required to assemble and visualise the most important facets of potential business opportunities. The business model canvas (Osterwalter and Pigneur 2010) is one such tool used to analyse and develop business models. It focuses on the most important elements to obtain a quick overview of an organization's business model, thereby providing a basis for discussions. The canvas method was developed to create a common understanding and thus increases the effectiveness of teams. The business model canvas specifies nine elements and follows a clear procedure, which will be dealt with in section "Applying the method".

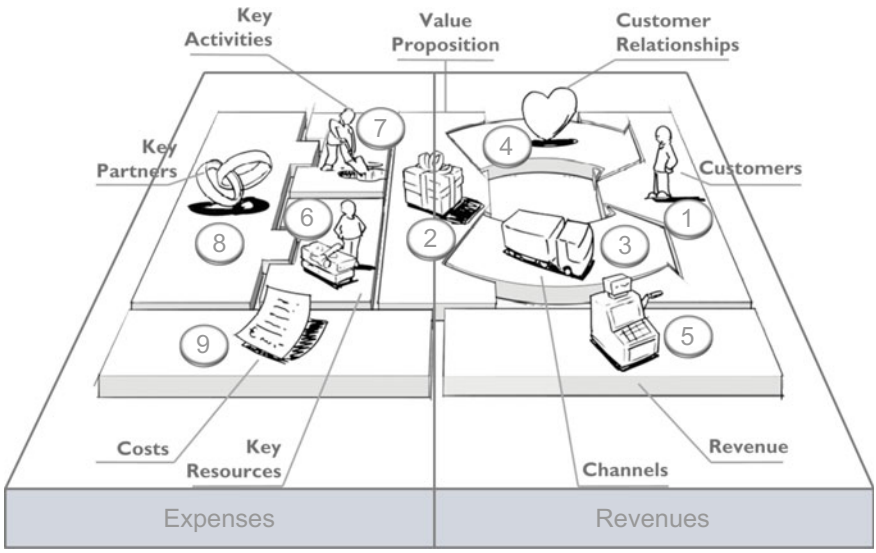

Fig. 5 Elements of business model canvas (Osterwalter and Pigneur 2010)

5.2 Applying the Method

When following the business canvas method, we recommend copying the template (Abb. 4.5) to a flipchart, providing the team with markers and using Post-It's to describe each element with content in the provided field. A team workshop typically requires 45 min. The process of describing the nine elements (3 min for each element, in total: 27 min) is followed by a phase for sorting and discussing the intermediate results (13 min) and ends with a wrap-up phase (5 min) to finalize the canvas. This section briefly describes the process, guiding questions, and recommendations for each element.

1. **Customers**: Customers pay for the offered value proposition and they are segmented for the purpose of the canvas. For whom are we creating value? Potential customer segments are listed. The level of detail in the segmentation depends on the type of market (e.g., niche vs. mass market). In the creation of a business model for new products and/or services, it is important that the team identifies and empathises with promising customers, as described in first deep dive about design Thinking. For instance, commuters with an ICT affinity, who work with laptops on their way home.
2. **Value Proposition**: The value proposition is not necessarily a product or a service, it can be any added value. For instance, commuting by train is not just the physical transfer but there is also the ecological life style aspect, which certain customers will value. What value do we offer to our customers? A list with monetary, emotional, environmental or sustainable values is created. To

avoid confusion, we recommend choosing only the most promising customer segments for which the value proposition is then defined. One example is the working ICT affine commuters, who are concerned about their ecological footprint. The match between customer and value proposition is essential as we explain later in more detail.

3. **Channels**: How does our value proposition reach the customer? Both current and potential information and distribution channels are listed here. It is helpful to imagine a typical customer journey and concentrate on the points of contact with the customer. It is important that the selected channel fits to the customer's expectation of the value. Hence, the channel supports or enables the value proposition. For instance, ecological ICT affine commuters might identify a glossy brochure as a waste of paper.
4. **Customer Relationship**: What is the relationship to our customer? The answer depends on how the company segments its customers. The relationship to a key customer may be different than to a sporadic customer. The needs of an infrequent holiday train traveller can be distinguished from a daily commuter. One idea is to use the customers' images and add attributes to define the relationship. For instance, the personalised customer's image of a railway company might be a conductor in uniform who emits reliability and kindness. This picture changes or solidifies through experience with the railways.
5. **Revenues**: What are the revenue streams? All revenues streams the organization can possibly generate should be listed. It is best to distinguish between unique payments, licencing royalties, rental payments or membership fees to estimate recurring revenues. For instance, Swiss National Railways offers annual cards (allowing "free" travel or half price), monthly cards or day/return/single tickets. In addition Swiss National Railways is a partner of a bicycle renting company located at train stations, where travellers can rent bicycles.
6. **Key Resources**: What is needed to create the value? Resources required to create the value proposition have to be detailed. Key resource might be infrastructure resources (trains and tracks), human resources (conductor), knowledge resources (research reports, intellectual property rights.
7. **Key Activates**: What has to be done to create the value? List all the activities that resources from the previous element have to fulfil. A mental walkthrough through the value creation process is the best way to discover these important activities. Resources without any activity in the value creation process are eliminated. Moreover, activities without any internal resources should be outsourced to partners. In our case of the commuter example this would be the train wagon interior equipment and services offered for commuters during the train ride.
8. **Key Partners**: What key partner do we need to guarantee the key activities? Reflect on the partners needed to create the value and to complete the tasks we cannot complete internally. Consider the additional transaction costs of external partners. Cooperation also results in interdependency by asymmetrical information. An advantage however is that the organization obtains expertise and external resources to actually produce the high quality value. For instance, the

core business of the Swiss National Railway is to transport people not to support them with ICT services. Therefore, the railway might cooperate with an ICT service provider.

9. **Cost**: What are the costs associated with creating the value? Activities, resources, and costs of using partners have to be summarized. Distinguishing between fix and variable costs helps to estimate the recurring costs.

The business model canvas contains the described nine elements and should be elaborated in this order. Additionally it is partitioned in two sections: A revenue section which contains the elements #1 to #5, and a cost section which contains the elements #6 to #9. Figure 5 shows both sectors. The comparison of these two sectors results in a rough estimation of the viability of the developed business model and provides a basis for discussion. The business model canvas was criticised of its rather superficial guidance for defining the value proposition. Hence, Osterwalder et al. (2015) provided a more detailed approach, which is shown in Sect. 5.3.

5.3 Customer Profile and Value Proposition

A better understanding of the customer allows us to create a more appropriate and sophisticated value proposition. The two arrows in the middle of Fig. 6 indicate the essential question: Does the product or service fulfil the jobs of the customer? What function eases the customer's pains? What function increases the customers' gains?

Osterwalder et al. suggest interviews or observations to collect information about customers' jobs and their pains and gains to create a customer profile. For instance, Peter commutes every day by train from home to work. Compared to driving with the car, he can work on his computer in the train (gain), but gets annoyed by the noise in a train wagon (pain). Peter in the example, is a fictional person and represents the customer segment "working commuters".

Then, the design of a value proposition can be used to create the answer to what product or service might ease the pains and increase the gains for this customer segment. For instance, the Swiss National Railway might offer Peter a train to commute from home to his office (service) and in the train they offer him a working space with bench and table and also an electricity socket for his laptop (gain creator). Finally, they label a train wagon with "Business Wagon" where only silent working is aloud (pain killer). The match between customer profile and value proposition has to be verified by customer tests. In iterative loops customer profile and value proposition have to be adjusted till test customers approve the match.

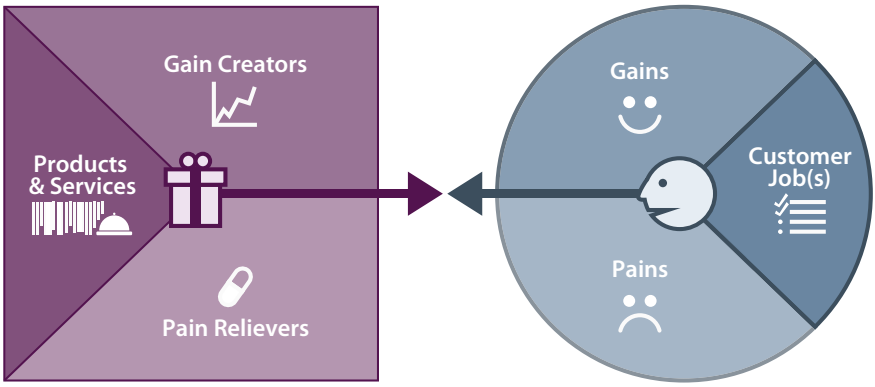

Fig. 6 Match of value proposition and customer profile (Osterwalder et al. 2015)

5.4 *Expected Results of Applying the Methods and Its Limitations*

The business model canvas forces the author to focus on the important nine elements of a business model. The business model canvas is a method that allows, within a short time, the user to gain an overview of a business model and builds a basis for discussion. The tool is also beneficial for prototyping. However, these nine elements only consider the business meso-level. To allow for a more general overview, Osterwalter and Pigneur (2010) have been working on a business macro-level model consisting of four elements: Market forces, industry forces, key trends and macro-economic forces. However, the business canvas model does allow a profound understanding of the relationship between customer and value proposition on a micro-level provided by defining the customer profile in accordance with the value proposition (Osterwalder et al. 2015).

Currently the business model canvas is predominantly used in an early phase of the business model development to develop a common understanding within the development team and to communicate ideas. It can be used as a basis for discussion to reveal misunderstanding and gaps. The business model is however less suited to analysing the internal or external dynamic consequences of a new business model. One possible way to overcome these limitations is to use system dynamics simulation to quantify the relevant elements of a business model as suggested by Groesser and Jovy (2016) and also Groesser in Chapter "Complexity Management and System Dynamics Thinking" in this book—in which the strengths of simulation methodologies when designing business models are discussed.

6 Conclusion

The maxim *survival of the fittest* seems to apply to most established companies operating in fast-changing markets prone to disruptive entry by start-ups. Companies are forced, through permanent contact and interaction with their market environment, to constantly adapt their offerings. This adaption happens not only in R&D departments but also throughout whole companies (Gassmann and Sutter 2011). To manage innovation we recommend creating an innovation portfolio which differentiates in object (process, product, service, or business model) and degree of innovation (incremental, radical, or disruptive). Interaction with, and adaption to the market environment lead to fundamentally new forms of collaboration for innovation; this is known as co-creation (Galvagno and Dalli 2014). Established enterprises fear disruptive innovations emerging from start-ups which change the whole market. Despite resources and methods like design thinking (Brown 2008) or business model canvases (Osterwalter and Pigneur 2010), companies, especially large enterprises, suffering from inhibiting factors (Assink 2006) and difficulties regulating open innovation (Chesbrough 2006b) that decelerates the speed of adjustment to the market or exploitation of new technologies. As a stop gap, while attempting to evolve into learning organisations (Senge 1996), companies are scanning the start-up market for take over opportunities or implementing separate organisational entities such as innovation centres (Lee et al. 2012).

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