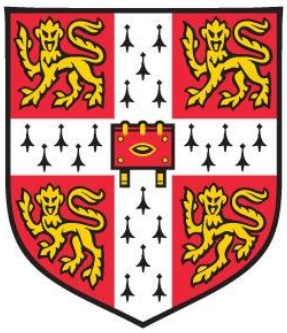
# A configuration perspective on value proposition-driven business model design



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This thesis is submitted for the degree of Doctor of Philosophy

by

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## Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for the relevant Degree Committee.

This thesis consists of 47,975 words over 176 pages, including appendices and references. It includes 16 figures and 49 tables.

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February 2020

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# Abstract

**A configuration perspective on value proposition-driven business model design**

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This research investigates how configuration theory and design-science approaches inform business model design. It was believed that these approaches might offer new insights into what are the mechanisms through which dimensions of a business model interact with and influence each other – a gap in the literature – providing a novel solution artefact (i.e. framework) for their design. The vaccine industry and the B2B e-commerce context were selected as the business model design test-bed, because they provide the necessary conditions in terms of uncertainty and volatility in supply and demand, as well as supply network, technological and infrastructural complexity.

The design-science research methodology involved conceptualising a business model artefact based on literature, and then developing and evaluating it using an in-depth case study of a vaccines manufacturer that went through a B2B e-commerce business model redesign process. The literature-derived conceptual artefact defined four business model dimensions (value creation, value delivery, value capture, customer), and it was hypothesised that these dimensions may be linked via a value proposition that could be expressed in terms of tangible, intangible, and monetary flow components. Building on the conceptual artefact, in-depth interviews with multiple respondents from the selected case study were used to test the dimensions and help define five configurational properties for each of the value proposition's flow components (volume, velocity, veracity, variety, value).

Semi-structured in-depth interviews with an additional set of respondents were then used to evaluate the business model artefact, focusing on the interrogation of the refined dimensions and the developed configurational properties, as well as their ability to express the vaccine manufacturer's overall business model. In that process, each dimension of the case study's business model was examined from a configuration perspective to identify alternative configurations of its business model, thereby demonstrating the utility of the proposed artefact. Integration and validation of the artefact's dimensions using the case study confirmed that a vaccines manufacturer's business model can be expressed in terms of the four proposed dimensions and that these dimensions can be linked via a dynamic value proposition that changes as it moves from one business model dimensions to the next. It was also found that each business model dimension possesses capabilities that affect the configuration of the value proposition's components (in terms of the five identified properties).

These findings contribute to theory by suggesting that the value proposition is not just an output of a business model, as is currently considered in the literature, but an integral mechanism of a business model through which its dimensions interact with and influence each other. These insights also address the knowledge gap related to classification of value exchanges and their interdependencies within pharmaceutical businesses through a business model perspective, and contribute to e-commerce business model literature by highlighting its reconfigurable elements.

For practitioners, the findings provide a set of properties for the (re-)configuration of the value proposition at each dimension of a business model, and as such, enable the identification of opportunities that may support improved value generation as part of the overall business model design approach. This understanding offers several avenues for future research, including exploring the relationship of the developed artefact's elements with external factors (e.g. market, regulatory), and developing business model archetypes based on the patterns of the configurations of the value proposition's properties.

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## Dedication

To my family.

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## Acknowledgements

Writing this thesis has been the most challenging and educational experience of my life to date. It has stretched me beyond anything I have ever done before, both mentally and physically. It taught me the values of dedication and perseverance, even when things get tough. I was absolutely incognizant of what I was getting myself into when I started this and was often terrified along the way. However, I am now eternally thankful for it. It made me a better person. And most importantly, it allowed me to work with people who have inspired me to carry this work to the finish line, and hopefully, beyond.

These people include, first and foremost, my supervisor, Dr Jag Srai, who I would like to thank primarily for his patience with me and my working style, and for his guidance towards a research topic that has ultimately become an area of not only my academic, but also professional interest. Additionally, I would also like to thank my colleagues at the Centre for International Manufacturing (CIM) and the wider Institute for Manufacturing (IfM) community at the University of Cambridge for their advice as and when I needed it.

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# 1 Introduction

Business model domain is an exciting area for research in both, academia and practice (Wirtz et al., 2016). This is because the relative newness of the field (vs. more established fields like business strategy), and the lack of consensus on the definitions and applications of the concept still leave a lot of room for unexplored knowledge (Teece, 2010). One such area for further exploration was identified to be how alternative academic lenses, such as configuration thinking[1] (Miller, 1996) and a design-science[2] approach (Dresch et al., 2015), could improve our understanding of business models, their underlying dimensions, and their design. As such, the main research question of this thesis was formulated as follows:

***How might configuration theory and design-science approaches inform the design of business models?***

The origins of this question and the relevant context are explained and justified in Chapters 2 and 3, and it is answered throughout Chapters 5, 6, and 7, while utilising the design-science methodology described in Chapter 4. The research conclusions are presented in Chapter 8.

# 2 Research context

## *2.1 Why business models?*

The number of research publications in the business model domain has been continuously growing over the last two decades, suggesting that it remains an area of interest for academics (see Figure 2.1.1). Inspired by that interest, the Institute for Manufacturing at the University of Cambridge organised a number of workshops, inviting both academics and practitioners, to discuss the topic of business models in more detail.

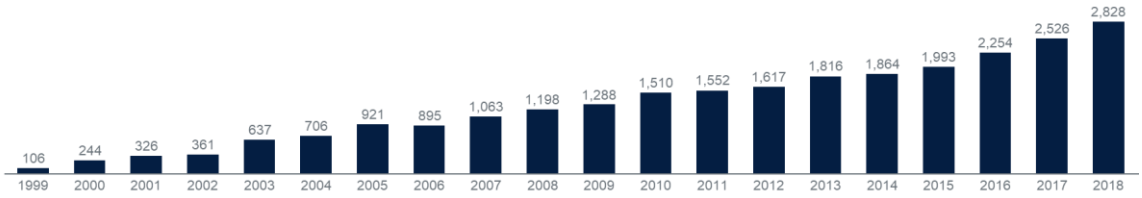


Figure 2.1.1: Number of articles and conference papers published with "business model*" in abstract/title by year [source: Scopus database]

[1] At a high level, configuration thinking refers to arrangement (i.e. configuration) of various organizational elements in a logical and structured manner (see Section 3.4.4 for details)

[2] Design-science is a research approach that focuses on developing knowledge through generalizable solutions to relevant business problems (see Section 4.2 for an introduction)

During the workshops it was established that there was still a disagreement on the definition of the concept, and that there was a need for firms to better understand their current business models through business model mapping/design frameworks. A number of participants have also suggested that business model design frameworks could help identify hidden value in firms, for example by mapping and revealing the flow of money within the business models – a process, which appeared to not be fully understood. It was also found that – with business model thinking moving from product to service (Finne et al., 2013) – there was a need to understand whether it was needed to define and design the value proposition that is offered by a business model in a new way.

Collectively, the questions raised during the series of workshops suggested that the business model domain, specifically that of business model design, remains relevant and would indeed benefit from additional academic research.

## *2.2 Choice of the industry context*

The business model workshops described in the previous section hosted academics and practitioners with expertise from a variety of industries, including those from the pharmaceutical industry, who have suggested that pharmaceutical companies could indeed benefit from taking a business model angle on the problem of "value exchange" within their organisations. This problem was chosen to be investigated in more detail by this thesis, due to the researcher's interest in the industry and the researcher's increased likelihood of getting access (i.e. to gather research data) to a pharmaceutical firm vs. firms in other industries. The relevance of the abovementioned problem was further confirmed in academic literature with Narayana et al. (2014) specifically pointing out that there was a need to understand the elements and interaction of (value) exchanges within pharmaceutical businesses, in terms of information, materials, and finances. To further narrow the research context, the problem was decided to be studied in the context of pharmaceutical firms that adopt e-commerce platforms to interact with other organisations (e.g. hospitals, distributors), as business-to-business (i.e. B2B) entities. The latter was confirmed as a relevant knowledge gap by Lin et al. (2011), who have identified the need to understand how healthcare organisations could extract more value from integrating B2B e-commerce platforms. The vaccine supply context was chosen for this research as it was believed that its discernible complexity within the already complex pharmaceutical sector –

characterised by complex "cold" supply chains, volatility of supply and demand[3], and need for timely delivery (Lemmens et al., 2016) – is arguably well-suited to be used as a foundation for extrapolating the findings of this specific research to simpler and more broad (business model) systems in the future.

## *2.3 Choice of the configuration lens*

The choice of the configuration lens was initially motivated by the fact that configuration theory is a meta-theory that can be applied across various research fields (Lim et al., 2016) and it was believed that it could help generate new insights for this research, as was done for example in the manufacturing business and supply chain domains (e.g. Srai et al., 2016; Srai and Gregory, 2008). The relevance of the configuration theory, and its potential to study business models, was further substantiated with recent emergence of application of configuration theory in other business model research, i.e. other than 'business model design' (e.g. Kulins et al., 2016 on financial performance of business models; Taran et al., 2016 on business model innovation).

## *2.4 Choice of the research methodology*

Design-science approach is increasingly being considered more suitable for developing relevant knowledge (vs. natural/social science methods), as it assumes real-life managerial problems (rather than a theoretical knowledge gap) as the research's starting point (Holmström et al., 2009; Romme, 2003; Simon, 1996; Daft and Lewin, 1990). As such, the use of a design-science methodology was deemed relevant for this thesis, as it was believed that the problem it is trying to address is indeed a real-life managerial problem. More specifically, the design-science approach was deemed fitting for its philosophical difference to traditional scientific methods, as it focuses on expanding our knowledge base by developing (generalizable) solutions (in form of artefacts) to given problems, rather than putting forward explanations of existing phenomena based on observations (Dresch et al., 2015). Further supporting the choice of design-science is the fact that, although it is only starting to emerge as a more broadly accepted methodology within the academic environment (Dresch et al., 2015), it has already

[3] For example, flu vaccines may be rendered ineffective within a single flu season (e.g. if the flu strain mutates, or the strain has been identified incorrectly by the World Health Organisation) and new batches have to be manufactured rapidly

been adapted to develop highly-cited research outputs in the business model domain (e.g. Al-Debei, 2010; Osterwalder, 2004).

Specifics of design-science and the underlying methodology are further elaborated on in Chapter 4.

## *2.5 Thesis structure*

Based on the outputs of the "business model workshops" and an initial literature review, the above sections (2.1 to 2.4) laid the foundation for the need to address the problem of business model design in the vaccine supply and B2B e-commerce context through a configuration and design-science lens. However, the research need, as well as the underlying knowledge gaps, have to be confirmed and investigated in more detail by conducting a formal literature review of the business model domain and of its adjacent theories to inform a broader understanding of the concept. This is done in Chapter 3.

The remainder of this thesis is structured as follows:

- Chapter 4 discusses the 12 steps of the design-science research methodology and how it applies in the context of addressing the proposed research question. Appropriate approaches and tools for literature review, data collection, and analysis are also discussed and established
- Chapter 5 leverages the theoretical knowledge base established in Chapter 3 and the methodological principles from Chapter 4 to conceptualise an initial solution artefact (i.e. a framework) to address the proposed research problem/question. The Chapter also identifies the "unknowns" concerning the conceptual artefact to be explored further
- Chapter 6 is split into two parts. The first part introduces the main case study and presents initial data captured during interviews, which is used to develop the previously conceptualised solution artefact. The development stage helps address the identified "unknowns" and determine additional elements to provide a better understanding of how the solution artefact can be utilised in the context of business model design. The second part of Chapter 6 focuses on evaluating the developed artefact by conducting additional case study interviews, while utilising the artefact to capture and express the case study firm's business model in greater detail, enabling identification of business model re-configuration opportunities
- Chapter 7 discussed the key research findings in the context of the main research question and of the overall research approach

- Chapter 8 concludes this thesis by revisiting the main research question and summarising the key theoretical and practical implications, which emerged during the artefact development and evaluation stages. The Chapter also summarises the business model design solution artefact, and its limitations and potential future research avenues

# 3 Literature review and knowledge gap identification

## *3.1 Introduction*

As indicated in Chapters 1 and 2, this thesis explores the question of how configuration theory and design-science approaches might inform the design of business models (in the vaccine supply and B2B e-commerce context). This Chapter reviews the relevant literature to provide a foundational understanding of the respective domains. Resulting knowledge gaps and emerging questions are then discussed in Section 3.7.

## *3.2 Literature review boundaries*

In order to address the research question, the literature review was developed along the following key subject areas, which also acted as boundary conditions for the literature review:

- ***Business models and their theoretical components:*** existing business model concepts were reviewed to identify the core business model dimensions. Two additional theoretical domains were reviewed here in the context of business models, as they have been identified as foundational for better understanding business models. These two domains are:
    - ***Resources and capabilities,*** which were identified as key organisational elements responsible for generating value – and that is at the heart of what business models aim to do
    - ***Network thinking,*** which was deemed relevant as it is a core theory concerning itself with exchanges of value – and that is one of the key themes of the business model domain and of this research
- ***Configuration concepts:*** configuration-school literature was reviewed in order to develop a systematic perspective on how the configuration concept can be meaningfully extended to business model thinking and to the underlying dimensions of a business model in the given research context
- ***B2B e-commerce in the pharmaceutical sector:*** the state-of-the-art literature related to the pharmaceutical industry and B2B e-commerce was reviewed to identify relevant knowledge gaps and position this study appropriately in the relevant industrial context

As mentioned above, the presented subject areas also served as the boundaries of the literature review. While additional domains and sub-domains of potentially relevant literature could have been explored, a conscious choice was made to ground the literature review in the "first

principles" of business models. That is, the review focused on the core business model literature and the identified 'foundational' theories of business models (i.e. resources and capabilities and network thinking), and not on the next layers of those theories. For example, although it was acknowledged during this literature review that resources and capabilities can and need to change, as per Teece (2010), the Dynamic Capabilities domain was not investigated in detail in relation to the business model domain, as it represents a layer beyond the 'first principles' of business model theory. Focusing on these "first principles" of business models has arguably enabled to provide a more sophisticated theoretical grounding for this work.

The presented subject areas are reviewed individually in the Sections following the overview of the literature review approach in Section 3.3.

## *3.3 Approach to literature review*

The literature review protocol involved reviewing general business model literature to build a better awareness and understanding of the topic by reading through articles with +200 citations and "business model*"[4] in the title according to the Scopus research database (as shown in Table 3.3.1). This resulted in 35 articles, of which 10 were excluded due to their focus on irrelevant specific areas of either software development, entrepreneurship, banking, or NGO and social-oriented/sustainability contexts. The remaining 24 articles, and the materials and articles referenced within them, were used as a foundation to build a general understanding of the business model domain. Furthermore, to ensure that the most recent academic view on the business model research was considered, business model literature review articles that were published in 2016 or later were also reviewed. Scopus and ABI/Inform databases were searched for "business model*" AND ("literature review" OR "future") strings, to reveal 10 relevant articles. After removal of articles with specific or irrelevant contexts (e.g. electronic pedagogy, agriculture), 5 articles were reviewed.

[4] The (*) sign in the search string will include search results for any letter at the end, e.g. "business models"

Table 3.3.1: Literature review protocol

| Context | Search string / search conditions | Databases used | Number of papers found in initial search |
|---|---|---|---|
| ***General business model knowledge and literature*** | "business model*" in articles title with 200+ citations | Scopus | 200+, narrowed down to 24 after reviewing and applying exclusion criteria |
| ***Business model literature review and future research articles*** | "business model*" AND ("literature review" OR "future") in article title after 2015 | Scopus, ABI/Inform | 5 |
| ***Configuration and network concepts*** | "business model*" AND ("network*" AND ("thinking" OR "theor*" OR "actor*"); "business model*" AND "configur*" | Scopus, ABI/Inform | 35 |
| ***B2B e-commerce in the pharmaceutical sector*** | "B2B" OR "business-to-business" AND "commerce" OR "e-commerce" AND "pharma*" OR "healthcare*" | Scopus, ABI/Inform | 5 |

In addition to the general business model literature, the concept was also reviewed in conjunction with configuration and network thinking (also shown in Table 3.3.1). Sources within those articles were then used to expand the knowledge base further and to identify foundational elements of both, configuration and network theories. Finally, literature related to B2B e-commerce specifically in the pharmaceutical and/or healthcare context was also reviewed to identify relevant theoretical and practical knowledge gaps and position this research within certain boundaries. Key literature review articles also captured in the Appendix in Table 8.8.1.

## *3.4 Business models and their theoretical components*

The following Section reviews the key academic business model literature, as well as their two key theoretical components identified during the literature review process. Relevant definitions, applications, and elements are identified and presented.

### *3.4.1 Evolution of the business model concept*

Academic literature on business models is vast and has grown significantly over the last 20 years (see Figure 2.1.1). Over the last decade, the concept has become increasingly important, particularly in the fields related to innovation (e.g. Foss and Saebi, 2017; Baden-Fuller and

Haefliger, 2013; Chesbrough, 2010), sustainability (e.g. Bocken et al., 2014), and strategy (e.g. Spieth et al., 2016; Casadesus-Masanell and Ricart, 2010, Teece, 2010). Despite the diversity of these fields, scholars across all of them do seem to agree that business models seek to explain how an organisation creates, delivers, and captures value (Wirtz et al., 2016; Zott et al., 2011). However, beyond that, an agreement on a more consistent, operational definition of a business model appears to still be missing. To illustrate this, consider for example Teece's (2010) definition: *"a business model articulates the logic, the data and other evidence that support value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value"* (p. 179). For contrast, Zott and Amit's (2010) definition focused more specifically on the dimensions of the business model and defined the business model as *"depicting the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities"* (p. 511). As another example, Magretta (2002) proposed that business models simply *"are, at heart, stories – stories that explain how enterprises work"* (p. 87). A more detailed overview of further business model definitions, along with their dimensions that emerged as part of the literature review process, is presented in Table 3.4.1.

Table 3.4.1: Key business model literature – definitions, contexts and elements

| | Author | Definition of BM | Context | Function | Dimensions | Research contribution |
|---|---|---|---|---|---|---|
| 1. | **Afuah and Tucci (2003)** | *A business model can be conceptualised as a system that is made up of components, linkages between the components, and dynamics.* | E-commerce | - | **(1)** Customer Value **(2)** Scope **(3)** Pricing **(4)** Revenue Sources **(5)** Connected Activities **(6)** Value Configuration **(7)** Implementation **(8)** Capabilities **(9)** Sustainability | - |
| 2. | **Al-Debei and Avison (2010)** | *An abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organisation presently and in the future, as well all core products and/or services the organisation offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives.* | Information Systems | Ontological structure of business model dimensions. | **(1)** Value Proposition **(2)** Value Network **(3**) Value Architecture **(4)** Value Finance | Provided a framework to represent digital businesses based on 4 key aspects: BM dimensions, modelling principles, interaction with strategy, and functions of a business model. |

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| 3. | **Baden-Fuller and Haefliger (2013)** | *The business model is a system that solves the problem of identifying who is (or are) the customer(s), engaging with their needs, delivering satisfaction, and monetising value.* | Technology | Business model system is a model containing cause and effect relationships. | **(1)** Customer Identification **(2)** Customer Engagement **(3)** Value Delivery and Linkages **(4)** Monetization | Argued that business models mediate the link between technology and firm performance. |
| 4. | **Bocken et al. (2014)** | *The business model is defined by its three elements: value proposition, value creation and delivery, and value capture.* | Sustainability | Conceptual business model framework based on Richardson (2008). | **(1)** Value Proposition **(2)** Value Creation and Delivery **(3)** Value Capture | Developed sustainable business model archetypes. |
| 5. | **Bohnsack et al. (2014)** | [No definition offered] | Sustainability | Business model framework derived from Chesbrough and Rosenbloom (2002), Demil and Lecocq (2010), Morris et al. (2005), and Osterwalder et al. (2005). | **(1)** Value Proposition (incl. Product and Service Content, Target Segment) **(2)** Value Network (incl. Development & Production, Sales Process & After-Sales Service) **(3)** Revenue & Cost Model | Identified 4 business model archetypes and how these evolved over time in the electric vehicle industry. |

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| 6. | **Casadesus-Masanell and Ricart (2010)** | *The logic of the firm, the way it operates and how it creates value for its stakeholders.* | Airlines | A generic two-stage competitive process framework. | Business models consists of choices and consequences of these choices. | Integrated the business model concept with strategy and tactics. |
| 7. | **Chesbrough and Rosenbloom (2002)** | *The functions of a business model are to: articulate the value proposition, identify a market segment, define the structure of the value chain, estimate the cost structure and profit potential, describe the position of the firm within the value network, and formulate the competitive strategy.* | Technology | A mediating construct between technology and economic value, as textual descriptions. | **(1)** Value Proposition **(2)** Market Segment **(3)** Value Chain **(4)** Cost Structure and Profit Potential **(5)** Value Network **(6)** Competitive Strategy | Explored how Xerox rose to success by employing business models to commercialise early stage technology. |
| 8. | **DaSilva and Trkman (2014)** | *The core of a business model is defined as a combination of resources, which through transactions generate value for the company and its customers.* | Strategy | A theoretical view of the business model concept. | Not applicable. | Explored the theoretical roots of the BM concept, identifying RBV and TCE as key foundations. |

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| 9. | **Demil and Lecocq (2010)** | *The concept refers to the description of the articulation between different BM components or 'building blocks' to produce a proposition that can generate value for consumers and thus for the organisation.* | Sport Management | A conceptual framework built on resources, capabilities, organisation, and value proposition (RCOV). | **(1)** Resources and Competences **(2)** Value Propositions **(3)** Internal and External Organization **(4)** Volume & Structure of Revenues **(5)** Volume & Structure of Costs **(6)** Margin | Reconciled the static and dynamic view of existing BM approaches to develop a business model evolution analysis tool. |
| 10. | **Doganova and Eyquem-Renault (2009)** | No single definition. | Entrepreneurship | Argue that BMs have a variety of functions. | Not applicable. | Illustrated various uses of BMs, incl. as narrative devices, templates, and scale models |
| 11. | **Hedman and Kalling (2003)** | No single definition. | Information Systems | A graphical representation of a generic business model. | **(1)** Customers **(2)** Competitors **(3)** Offering **(4)** Activities and Organisation **(5)** Resources **(6)** Supply of Factor and Production Inputs **(7)** Model Dynamics Over Time | Explain the relationship between information systems and strategy using the business model concept |

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| 12. | **Kindström (2010)** | No single definition. | Service | A tabulated business model framework founded on 6 key parameters. | **(1)** Value Proposition **(2)** Revenue Mechanisms **(3)** Value Chain **(4)** Value Network **(5)** Competitive Strategy **(6)** Target Market | Highlighted the need to focus on all aspects of a business model when developing innovative service-based business models. |
| 13. | **Magretta (2002)** | *They are, at heart, stories – stories that explain how enterprises work.* | Strategy | A set of questions to address when designing a business model. | **(1**) Who are the customers? **(2)** What do they value? **(3)** What is the underlying logic that explains how to deliver value? **(4)** How does the organisation make money in this business? | Highlighted the importance of a good business model design, arguing that a BM by itself can act as a source of competitive advantage. |
| 14. | **Mahadevan (2000)** | *A business model is a unique blend of three streams that are critical to the business. These include the value stream for the business partners and the buyers, the revenue stream, and the logistical stream.* | E-commerce | A tabulated framework. | **(1)** Value Stream **(2)** Logistical Stream **(3)** Revenue Stream | Developed a framework to understand the notion of a business model in the internet context. |

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| 15. | **McGrath (2010)** | *The business model construct offers some intriguing opportunities to capture better how a given set of resources translates into something a customer is willing to pay for.* | Strategy | Discussion on the role of the business model concept. | **(1)** Unit of Business **(2)** Processes and Operational Advantages | Emphasized the importance of constantly questioning a business model to drive new approaches of locking in value. Also highlighted the need for experimentation with business models to build competitive advantage. |
| 16. | **Morris et al. (2005)** | *A business model is a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets.* | Entrepreneurship | A tabulated framework based on a set of questions. | **(1)** How do we create value? **(2)** Who do we create it for? **(3)** What is our source of competence? **(4)** How do we competitively position ourselves? **(5)** How do we make money **(6)** What are our time, scope, size ambitions? | Offered a framework to design, describe, and analyse business models for any kind of company. |

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| 17. | **Osterwalder and Pigneur (2010)** | *It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.* | Information Systems | A business model visualisation tool. | **(1)** Customer Segments **(2)** Value Proposition **(3)** Channels **(4)** Customer Relationships **(5)** Revenue Streams **(6)** Key Resources **(7)** Key Activities **(8)** Key Partnerships **(9)** Cost Structure | Identified a set of BM dimensions, which are utilised in a graphical form as a 'canvas' to communicate business models. |
| 18. | **Palo and Tähtinen (2013)** | *A business model can assist future business planning in a net of actors.* | Technology | A conceptual model. | Not applicable. | Identified the phases of business model evolution in a networked environment as development, introduction, and commercialisation. |
| 19. | **Richardson (2008)** | *The business model can be seen as the conceptual and architectural implementation of a business strategy and as the foundation for the implementation of business processes.* | Strategy | A business model framework based on 3 dimensions. | **(1**) Value Proposition **(2)** Value Creation and Delivery System **(3)** Value Capture | Linked the role of a business model framework to strategy as a tool to logically picture how all the firm's activities form strategy. |

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| 20. | **Schafer et al. (2005)** | *A representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network.* | Strategy | A conceptual framework based on components derived from the literature. | **(1)** Strategic Choices **(2)** Value Network **(3)** Value Creation **(4)** Value Capture | Classified the components of a business model. |
| 21. | **Storbacka et al. (2012)** | *We define business models as constellations of interrelated design elements, outlining the design principles, resources and capabilities (i.e. design layers) related to markets, offerings, operations and organization (i.e. design dimensions).* | Co-creation | Constructs relating to designing business models for value co-creation. | **(1)** Design Principles **(2)** Resources **(3)** Capabilities | Argued that a firm needs to focus on both, inter-firm and intra-firm configurational fit of business model elements. |
| 22. | **Tallman (2014)** | No single definition. | International Business | Graphical representation of business model components and their linkages. | **(1)** Value Creation **(2)** Value Delivery **(3)** Value Capture **(4)** Value Allocation | Offered a framework for a business model in the international business context. |
| 23. | **Timmers (1998)** | *An architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues.* | E-commerce | A text-based tool. | **(1)** Architecture **(2)** Benefits for Business Actors **(3)** Sources of Revenue | Classified e-commerce into 11 business models. |

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|---|---|---|---|---|---|---|
| 24. | **Teece (2010)** | *A business model describes the design or architecture of the value creation, delivery and capture mechanisms employed.* | Innovation | Business model as a link between strategy, innovation management, and economic theory, as a text-based tool. | Not applicable. | Argued the importance of business model design, which alone can act a source of competitive advantage. |
| 25. | **Tongur and Engwall (2014)** | *The activities connecting the firm's technological core to the fulfilment of its customers' needs.* | Technology | A framework based on Schafer et al. (2005), Chesbrough and Rosenbloom (2002), Al-Debei and Avison (2010). | **(1)** Value Proposition **(2)** Value Creation **(3)** Value Capture | Explored the dynamics between technology and business model shifts in the automotive industry. |
| 26. | **Weill and Vitale (2001)** | *A description of the roles and relationships among a firm's consumers, customers, allies, and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants.* | E-Commerce | E-Business Model Visualisation Tool | **(1)** Participants **(2)** Relationships **(3)** Flows | Offered 8 business model archetypes for E-Commerce. |
| 27. | **Zott and Amit (2010)** | *The business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.* | E-commerce | An activity system design framework, as a text-based tool. | **(1)** Content **(2)** Structure **(3)** Governance of Transactions | Argued that a BM is a system of interdependent activities based on two parameters: design elements and design themes. |

The diversity of business model definitions could be explained by the fact that – at least from the academic perspective – the concept of business models is still in its infancy and does not have its "own" domain (Foss and Saebi, 2017). Teece (2010) pointed out that business models – as a term – has only started attracting attention of academia in the last decade or so, and only emerged with the growth of the Internet in the last twenty years. That growth forced firms to discover new ways of doing business (i.e. to discover "new business models") under radically new rules compared to the traditional goods and services industries (Fleury and Fleury, 2014). This rationale is supported by the fact that a lot of the early business model research came from the information systems (IS) domain (e.g. Hedman and Kalling, 2003; Mahadevan, 2000; Timmers, 1998).

The business model concept appears to suffer not only from a diverse set of definitions, but also from a fragmented view on how the business model concept can be used (Cosenz and Noto, 2017). For example, Doganova and Eyquem-Renault (2009) proposed three use cases for business models, namely as (a) narrative devices (i.e. for communication with the public), (b) templates (i.e. examples which support imitation or comparison), and (c) scale models (i.e. models to develop new businesses by gradually bringing them into existence). Alternatively, in a critical review of key business model literature, Massa et al. (2017) suggested that business models can be interpreted in three different ways: (1) as attributes of real firms, (2) as cognitive/linguistic schemas, or (3) as formal conceptual representations of how organisations function. The first interpretation relates to how real firms do business, in terms of its activities, resources, capabilities, etc. in order to identify business model archetypes (e.g. subscription, freemium, pay-as-you-go, razor-and-blade). The second interpretation relates to how "the way firms do business" is understood by relevant stakeholders (e.g. managers) and how it is communicated to external audiences (e.g. investors). The third interpretation is related to how the first and second interpretations could be represented using formal conceptualisations [e.g. symbolic, mathematical, or graphical depictions, for example as done by the Business Model Canvas (Osterwalder and Pigneur, 2010)]. This suggests that use-cases for the business model concept remain many-fold.

### *3.4.2 Business model dimensions*

Similar to the definitions of the business model, the literature review process has shown that their underlying dimensions are also interpreted and captured differently by scholars. As illustrated in Table 3.4.1, the average number of dimensions through which business models are described is five (based on the articles listed in the table). This ranges from just three in

Tongur and Engwall (2014), Bocken et al. (2014), and Mahadevan (2000), incl. Value Streams, Revenue Streams, and Logistical Streams in the former, and Value Proposition, Value Creation, and Value Capture in the other two, and up to nine in Osterwalder et al. (2005), incl. Value Proposition, Client Relationships, Client Segments, Distribution Channels, Partner Network, Key Activities, Key Resources, Cost Structure, and Revenue Flows. As such, some business model depictions attempt to capture more or less dimensions of the value creation, delivery and capture process (i.e. dimensions in terms of which business models tend to be defined), and may extend beyond the traditional business model domain. To illustrate this, consider the definitions of Osterwalder's Business Model Canvas dimensions (see Table 3.4.2), which seem to be purely "business model" focused.

Table 3.4.2: Definition of business model elements according to Osterwalder et al. (2005)

| **BM dimensions** | **Description** |
|---|---|
| ***Value proposition*** | Gives an overall view of a company's bundle of products and services |
| ***Client segments*** | Describes the segments of customers a company wants to offer value to |
| ***Distribution channels*** | Describes the various means of the company to get in touch with its customers |
| ***Client relationships*** | Explains the kind of links a company establishes between itself and its different customer segments |
| ***Key activities*** | Describes the arrangement of value generating activities |
| ***Key resources*** | Outlines the resources necessary to execute the company's business model |
| ***Partner network*** | Portrays the network of cooperative agreements with other companies necessary to efficiently offer and commercialise value |
| ***Cost structure*** | Sums up the monetary consequences of the means employed in the business model |
| ***Revenue flows*** | Describes the way a company makes money through a variety of revenue flows |

For comparison, Chesbrough and Rosenbloom's (2002) technology business model elements (Table 3.4.3), have a "competitive strategy" element, that clearly reaches into the strategy domain.

Table 3.4.3: Definitions of business model elements according to Chesbrough and Rosenbloom (2002)

| BM elements | Functions |
|---|---|
| ***Value proposition*** | To articulate the value created for users by the offering based on the technology |
| ***Market segment*** | To identify the users to whom the technology is useful and for what purpose, and specify the revenue generation mechanism(s) for the firm |
| ***Value chain*** | To define the structure of the value chain within the firm required to create and distribute the offering, and determine the complementary assets needed to support the firm's position in this chain |
| ***Cost structure and profit potential*** | To estimate the cost structure and profit potential of producing the offering, given the value proposition and value chain structure chosen |
| ***Value network*** | To describe the position of the firm within the value network linking suppliers and customers, including identification of potential complementors and competitors |
| ***Competitive strategy*** | To formulate the competitive strategy by which the innovating firm will gain and hold advantage over rivals |

### *3.4.3 Business model resources and capabilities*

The business model literature review process has shown that a business model, through its individual dimensions, implicitly or explicitly provides the internal competencies that underlie a firm's competitive advantage (Morris et al., 2005). Another established concept in the management literature that lies at the heart of competitive advantage is the resource-based view (RBV) of the firm (Barney, 1991). The RBV theory views the firm as a bundle of resources and capabilities from which it derives its competitive advantage (Hart, 1995). Resources and capabilities are also key to generating value (flows) (DaSilva and Trkman, 2014). As such, the

resources and capabilities concepts were deemed relevant to be reviewed to provide a broader understanding of what the business model concept could potentially entail. This is done below.

RBV is a key theoretical concept in the modern management literature (Eisenhardt and Martin, 2000; Wernerfelt, 1984). RBV suggests that valuable, costly-to-copy firm resources are the primary drivers of sustainable competitive advantage (Hart, 1995). As mentioned earlier, RBV also constitutes an important part of the business model theory. This is because a business model, at its very basic level, is built on resources owned by the organisation (DaSilva and Trkman, 2014; Storbacka et al., 2012), with some scholars arguing that these resources do not actually need to be possessed by the organisation – it just needs to have the capability to access them (e.g. Afuah and Tucci, 2003).

Håkansson (2015) introduced 5 kinds of resources, including:

- ***Technology*** (incl. patents and licenses)
- ***Input goods***
- ***Personnel***
- ***Marketing***
- ***Financial capital***

Similarly, Grant (1991) categorised resources as:

- ***Financial***
- ***Physical***
- ***Human***
- ***Technical***
- ***Reputational***
- ***Organisational***

Barney (1991) defined resources as:

- ***Tangible*** (e.g. equipment, location)
- ***Intangible*** (e.g. IP)
- ***Human*** (e.g. staff)
- ***Relational*** (e.g. relationships to suppliers and partners)

Helfat and Peteraf (2003) extended the concept beyond "resources" of a stakeholder to also incorporate its capabilities. A resource thus refers to an asset or an input (tangible or intangible)

for value creation that a stakeholder owns, controls, or has access to within its network. Capability on the other hand refers to the ability of a stakeholder to perform certain tasks (that are often non-transferable and stakeholder-specific), which utilise the aforementioned resources for the purpose of creating value (e.g. by combining the resources in a certain way). Furthermore, in order for a stakeholder to sustain a competitive advantage, its resources and capabilities must ideally be diverse and not perfectly mobile, as well as valuable, rare, inimitable, and non-substitutable (VRIN) (see Barney, 1991). It is also important to note that both, resources and capabilities, are dynamic concepts and change over time, requiring (or enabling) existing companies (and their business models) to be re-configured (Teece, 2010).

Technology (such as an e-commerce platform) and the ability to utilise it effectively is also a resource and a capability, respectively (Håkansson, 2015; Chesbrough, 2007a). Christensen (1997) defined technology quite broadly as the processes an organisation utilises to transform labour, capital, materials and information into products and services of greater value. Other authors, such as Arthur (2009), considered even business organisations and monetary systems to be technologies that "fulfil a human purpose". Ford and Saren (2001) took a more pragmatic view and defined technology in terms of two types (p.383-384):

- ***Product Technology:*** *the knowledge of the physical properties and characteristics of materials and the ability to incorporate these into the design of products or services, which could be of value to another beneficiary*
- ***Process Technology:*** *the knowledge of ways of producing products or services and the ability to produce these so that they have value to others*

In their work, Ford and Saren also offered a third type of technology called "Marketing Technology", which is defined as "*the knowledge of ways of bringing these product and process technologies to a particular application and the ability to carry this out. This involves the skills of market analysis, branding, packaging, pricing, communications and logistics"* (p.384). Furthermore, in the context of using technology (as a capability), Ford (2002) suggested that although some technologies are important on their own, a combination of product and process technologies is key to successfully building a competitive advantage within a market.

The resource-based view (RBV) is a critical part of the business model concept, since, as mentioned earlier, a business model encompasses competitive advantage (Porter, 1985), which is derived from the resources (and capabilities) it has access to (Morris et al., 2005). DaSilva

and Trkman (2014) have articulated the importance of the resources in their own definition of the business model, as follows: *"the core of a business model is defined as a combination of resources which through transactions generate value for the company and its customers"* (p.383).

The literature review has further shown that resources and capabilities within the business model context, just like the business model definitions themselves, have been viewed differently by scholars. Doz and Kosonen (2010) proposed meta-level business model capabilities, incl. (1) strategic sensitivity, (2) leadership unity, and (3) resource flexibility, which are defined as follows (p.371):

- *the sharpness of perception of, and the intensity of awareness and attention to, strategic developments*
- *the ability of the top team to make bold, fast decisions, without being bogged down in top-level 'win-lose' politics*
- *the internal capability to reconfigure capabilities and redeploy resources rapidly*

Similarly, Batistella et al. (2017) offered three macro business model capabilities:

- ***Strategy innovation:*** referring to the sharpness of perceiving and implementing new strategic developments through pro-active and continuous search product and service innovation
- ***Resource capitalisation:*** involving capabilities that rapidly redeploy resources reflecting the needs of new business opportunities, and finally,
- ***Networking:*** capabilities that help establish networks around the organisation to drive win-win scenarios with the network's stakeholder (e.g. knowledge sharing).

On the other end of the spectrum, Storbacka (2011) avoided meta/macro levels and developed more specific capabilities. In fact, the author proposed a list of 64 capabilities and practices relevant to effective business models, which were developed along four business model phases (i.e. developing, creating demand, selling, and delivering) and across three groups of cross-functionality (i.e. commercialisation, industrialisation, platform). These are shown in the Appendix in Table 8.8.2. For details, see Storbacka (2011, p.704).

### *3.4.4 Business models: a network perspective to understand value flows*

Network literature was deemed relevant to be reviewed, as network thinking is one of the key theories concerning itself with exchanges and co-creation of value (Gulati et al., 2000; Jarillo,

1988) – which is one of the key themes of this research. As such, the principles of network thinking and relevant literature are reviewed below.

Firms nowadays do not compete as single entities, but rather as parts of interconnected networks of actors, such as suppliers, partners, and customers (Håkansson et al., 2009; Mills et al., 2004; Möller and Halinen, 1999; Harland, 1996). A networked environment gives companies access to complementary information (Hansen, 1999), to capabilities (Gnyawali and Madhavan, 2001), and to markets and technologies (Afuah and Tucci, 2003). The emergence of such networks can be partially (similarly to the growth of the business model concept) attributed to the development of novel information technologies (IT), which allowed for better access to (and utilisation of) resources and capabilities, and consequently broke the transaction-cost barriers among individual firms that existed earlier (Möller and Wilson, 1995). Following this trend, network theories have become more popular, and can now be found in many major disciplines, such as strategic management (e.g. Gulati et al., 2000) and operations management (e.g. Rudberg and Olhager, 2003).

As with business models, technology (as a resource) plays a key role in networks, since initially, among other things, technology itself was responsible for the emergence of networked structures (Möller and Wilson, 1995; Lundgren, 1995). However, technological development still, and increasingly so, affects existing (and also emerging) networks, as new technologies and processes are constantly being rolled out by one or more network actors. Consider an entrepreneur who may force the emergence of new networks by looking to develop a technology or process and to gain access to markets or other capabilities. This way, specific features of the technology/process (i.e. of the resource) can affect the network's structure in terms of the actors and their roles. In such cases, Håkansson and Snehota (1995) argued that the role of a network is to support the originator of the technology with the necessary capabilities, for example to distribute or manufacture the product, as developing a technology on its own will most likely not be enough to derive value from it. In the business model context, this could be thought of as having the ability to create value using a novel technology, but not the ability to deliver it to the customer without the help of the relevant business model/network nodes (Teece, 2010).

Networks can provide firms with access to information, resources, capabilities, and customers, as well as help firms reduce risk by sharing it among the network actors (Gulati et al., 2000). In simple terms, a network emerges when a stakeholder is able to outsource some part of its activities to a second stakeholder (e.g. supplier), and therefore reduce its transaction costs. In

more recent studies, this concept was extended to "value co-creation" in networks, where actors integrate resources to create value together, rather than purely outsourcing activities to each other (Storbacka et al., 2012). In similar terms, network structures can be thought of as markets, where firms exist in order to handle transaction costs (see Transaction Cost Economics, Williamson, 1981). In that context, low transaction costs, which were enabled through modern information technologies or other technology/processes, reduced the barriers for firms to operate as networks (by not making them internalise their activities). What differentiates a network from a market-like relationship, is the higher degree of will and opportunities for value co-creation among firms (Jarillo, 1988).

Network thinking has evolved from traditional strategy research view of firms as autonomous entities, who seek sustainable competitive advantage (Corsaro et al., 2012). But, today, it is generally acknowledged that firms are better viewed as nodes of a network connected through resources, flows, and other complex relationships, allowing them to derive profits not only from their own assets, but also from the structure of the network, which they belong to (Gulati et al., 2000). It must be noted that numerous network theories and views addressing the above elements have been proposed in the past, for example: value networks, which can be defined as *"a dynamic network of actors working together to generate customer value and net-work value by means of a specific […] offering, in which tangible and intangible value is exchanged between the actors involved"* (De Reuver, 2009, p.12). Similarly, Allee (2009; 2000) defines value networks as *"any purposeful group of people or organisations creating social and economic good through complex dynamic exchanges of tangible and intangible value"* (p.3). However, in contrast to De Reuver's view, Allee's focus is on those actors who create value, but ignores those who enable value creation through exchange. Virtual enterprises (VE) have also been often discussed by authors as types of networked organisations, particularly in the manufacturing domain (see Browne and Zhang, 1999) where suppliers, manufacturers, assembler, distributers, and customers *"come together to share skills or resources and capabilities to better respond to business opportunities, and whose cooperation is supported by computer networks"* (Camarinha-Matos and Afsarmanesh, 2005, p.440). VE focuses on short-term objectives, which are delivered through collaboration of actors within the VE. Extended enterprises (EE) on the other hand focus on long-term view of collaboration between organisations within a network (Browne and Zhang, 1999), albeit through a dominant enterprise or "coordinator" within an EE, which extends its boundaries to all or some of its suppliers (Camarinha-Matos et al., 2009), rather than viewed as equal partners. Based on these

considerations Camarinha-Matos and Afsarmanesh (2005) suggested a new paradigm called collaborative networks (CNs), which are *"constituted by a variety of entities (e.g., organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their: operating environment, culture, social capital, and goals. Nevertheless, these entities collaborate to better achieve common or compatible goals, and whose interactions are supported by computer network"* (p.439). CNs are formed by network actors who share the belief that together they can achieve goals that would not be possible or would have a higher cost if attempted by them individually. CNs appear to be similar to the ecosystem perspective, which has increasingly attracted attention in recent years (e.g. Iansiti and Levien, 2004). Building on his own seminal work from 1993, Moore (1996) described ecosystems as an economic community supported by a foundation of interacting organizations and individuals called organisms (implying parallels to biological ecosystems), which constitute the business world. Moore's view of ecosystems goes beyond the core supply chain and even EE, and includes other stakeholders, like the government, industrial associations, and universities. Consequently, the ecosystem view has been criticised for the difficulty of defining its boundaries (Iansiti and Levien, 2004). However, another similar view – the industrial network perspective – developed by Håkansson and Johanson (1992), pragmatically considers networks by looking at its actors, as well as the resources and capabilities they possess, the relationships they have, and the activities that they perform to collectively deliver value.

An overview of the identified network perspectives is presented in Table 3.4.4.

Table 3.4.4: Network views in academic literature

| Network view | Literature | Description | Limitations |
|---|---|---|---|
| **Industrial network theory** | *Håkansson and Johanson (1992); Sandström and Osborne (2011)* | Views networks as markets consisting of actors, who are mutually interdependent | Considers not only firms as actors, but also individuals (e.g. customers) and organisations |
| **Value network** | *Allee (2000); Schafer et al. (2005); De Reuver and Haaker (2009); Pynnönen et al. (2008)* | Any purposeful group of people / organisations creating social / economic good through complex dynamic exchanges of tangible and intangible value | Generally looks at actors of a network who create value, but ignores those who *enable* it |
| **Collaborative network** | *Camarinha-Matos and Afsarmanesh (2005); Romero and Molina (2011)* | A variety of entities, that are largely autonomous, geographically distributed, and heterogeneous in terms of operating environment, culture, social capital, and goals, but collaborate to better achieve common or compatible goals | Predominantly focuses on providers, while ignoring other actors, such as customers |
| **Virtual enterprise (VE)** | *Davidow and Malone (1992)* | A temporary collaboration of firms, which get together to share resources and capabilities in order to better address business opportunities. Supported by IT | Focuses on businesses connected 'virtually' (i.e. using IT), while physical connections receive less attention |
| **Extended enterprise (EE)** | *Browne et al. (1995)* | Similar to VE, but EE views a network from a dominant firm perspective, which 'extends' its boundaries to its suppliers | Lacks the sense of mutual collaboration, as the network is viewed through a dominant actor |
| **Ecosystems** | *Moore (1993); Iansiti and Levien (2004); Tian et al. (2008)* | Business ecosystems are formed by loosely connected networks of entities, which interact with each other in complex ways | The boundaries of business ecosystems are too loosely defined to integrate into a BM view |
| **Strategic network theory** | *Gulati et al. (2000); Zaheer and Bell (2005)* | Strategic networks are composed of inter-organisational relationships that are enduring and of strategic significance | May lock actors into unproductive relationships, or preclude from partnering with other viable firms |

The common element across the reviewed network types and definitions is that they all imply an aspect of connection or relationship among its stakeholders or nodes (see Table 3.4.4). For example, as *"loosely connected entities"* (ecosystem view), *"inter-organisational relationships"* (strategic network view), *"mutually interdependent actors"* (industrial network view), or "*group of people or organisations linked through complex exchanges of tangible and intangible value"* (value network view). A combination of these views was arguably very well captured by Gulati et al. (2000) almost two decades ago, who proposed that firms are better viewed as nodes of a network connected through resources, flows, and other complex relationships, allowing them to derive profits not only from their own assets, but also from the structure of the network that they belong to.

Håkansson and Johanson (1992) specified that the flows among the actors in the various types of networks can be of two types:

- ***Tangible*** (e.g. material, product, platform), or
- ***Intangible*** (e.g. information, knowledge, service)

These exchange (or flows) types among actors or nodes are typically supplemented by a third type in the literature – the financial (or monetary) flow (e.g. Mentzer et al., 2001).

In terms of a more detailed view of value flows – this appears to be missing in the academic management literature. That is, no studies have been found that attempt to understand how these value flows can be analysed and optimised when they are flowing from one node to another within a business/value network. A potential approach was found in Information Systems research, where scholars have proposed that *intangible* data flows move between the nodes of a *digital* network and are expressed and configured in terms of four characteristics: (1) volume, (2) velocity, (3) variety, and (4) veracity (e.g. Grover et al., 2018; Jagadish, 2015; Ferrando-Llopis et al., 2013), and are referred to as follows:

- ***Volume:*** amount of data to be processes and analysed
- ***Velocity:*** the speed at which the data is transferred (or created)
- ***Variety:*** the different types of data formats and sources (e.g. structured, semi- and un-structured data)
- ***Veracity:*** the quality or certainty/reliability of data to be processed

Building on a review of relevant literature, Demchenko et al. (2013) have proposed to also include "value" as an additional characteristic of data flows, which *"is defined by the added-value that the collected data can bring to the intended […] analysis"* (p.50).

The literature review has also shown that, unlike the relationships (among nodes) within networks, the relationships and flows among the business model dimensions, have not been well documented and/or understood. For example, Foss and Saebi (2017), who have reviewed recent business model literature and established that business models can be viewed as a bundle of (value creating and capturing) activities that are linked with each other, have concluded their paper by stating that *"how interdependencies [of activities] within the business model look like"* remains unknown, and is one of the key future research directions (p.10). Wirtz et al. (2016), following an extensive literature review and an expert survey, have also called for more research on the interactions between the individual business model dimensions. Similarly, Zott et al. (2011) have conducted a broad literature review on business models and have specifically mentioned that *"none of the [literature] analyses the relationship between any business model component[s]"* (p.1028).

Only one theoretically-grounded, but broad, approach to meaningfully relating the dimensions of a business model to each other was discovered during the literature review process. By linking the resource-based view (RBV) (Barney, 1991) and the transaction cost economics (TCE) (Williamson, 1981) theories, DaSilva and Trkman (2014) have proposed that business models represent bundles of resources, which through efficient transactions, generate value for its customers. The authors thereby implied that there is, at the very least, a transactional relationship between the "value creating" dimensions and the "customer" dimension of the business model.

## *3.5 Business models and configuration thinking*

A configuration lens was deemed relevant to explore the business model design problem, as discussed in Section 2.3. A review of the concept is offered below to provide a better understanding of the configuration thinking, and how it links to the business model domain.

Configuration concepts have been initially developed in the strategic management (Miller, 1996; Chandler, 1962) and organizational literature (Mintzberg, 1979) to describe various organizational elements and their arrangement (i.e. their configuration) in a logical and structured manner. For example, in network literature, it was found that configuration "profiles" of supply networks (e.g. network integrator, mass customisation, integrated service provider, etc.) could be expressed through various dimensions, such as structure, relationships, and processes (Srai and Gregory, 2008). Similarly, in the business model context, business model frameworks (e.g. Osterwalder and Pigneur's (2010) Business Model Canvas) are seen

as tools for describing configurations of business models of firms (e.g. as long-tail business model or multi-sided platforms business models) through their various elements, such as key resources, key activities, and customer relationships (Zott and Amitt, 2007). As such, configuration theory can be viewed as a meta-theory that can be applied across various research fields, as long as it is grounded in the specifics of the research context (Lim et al., 2016).

The application of the configuration theory in the business model domain is however limited. Kulins et al. (2016) recently took a configuration theory-driven approach to business model design based on Amit and Zott's (2001) NICE-framework, which connects four elements: (1) novelty, (2) lock-in, (3) complementarities, and (4) efficiency as value drivers for business model design. Novelty refers to new ways of organising transaction flows between stakeholders. Lock-in leverages the imposition of switching costs on the participants of the business model. Complementarities describe synergies between product-service offerings within the business model. And finally, efficiency relates to the minimisation of transaction costs among all stakeholders of the business model. By analysing business models, where (a) efficiency-novelty, (b) novelty-lock-in, or (c) efficiency-complementarities-lock-in configurations were in place, Kulins and colleagues were able to identify which business model configurations were likely to drive positive performance in an organisation (while suggesting that the elements of the NICE framework cannot explain what drives negative performance). Baden-Fuller and Mangematin (2013) have proposed that business model configurations can be expressed in terms of the number of customers, customer proposition, monetisation, and value chain and linkages (i.e. governance, typically concerning the firm internally). Taran et al. (2016) recently reviewed existing business model literature to identify and develop a list of 71 (!) possible configurations expressed in terms of five elements: (1) value proposition (i.e. what the company offers), (2) value segment (i.e. to whom is the company offering it), (3) value configuration (i.e. how the company develops and distributes this offering cost effectively), (4) value network (i.e. who collaborates with the company in order to develop, distribute, and sell the offering), and (5) value capture (i.e. how much and in what way does the company generate revenues). Similarly, Osterwalder and Pigneur (2010) have developed 5 business model archetypes based on their well-established Business Model Canvas that incorporates 9 elements: (1) customer segments, (2) value proposition, (3) channels, (4) customer relationships, (5) revenue streams, (6) key resources, (7) key activities, (8) key partnerships, and (9) cost structure. Using similar language, Gassmann et al. (2014) have

developed 55 patterns along four dimensions: (1) value proposition (what?), (2) value chain (how?), (3) profit mechanism (why?), and (4) target customer (who?).

## *3.6 B2B e-commerce in the pharmaceutical sector*

### *3.6.1 Business models and e-commerce*

The reduction in costs associated with the growing availability of information and communication technology (ICT) stimulated its wide-spread adoption among organisations both, private and public. Consequently, this technology opened up new ways for organisations to create and deliver value to their customers (Mason and Spring, 2011). In parallel, these (often internet-enabled) technologies or platforms, such as e-commerce, became responsible for driving the interest in value creation and delivery research – that is in *business model research* (Hedman and Kalling, 2003). Zott et al. (2011) have emphasised the ICT heritage of business model research by reviewing 49 conceptual business model studies to find that a quarter of them were related to e-commerce (e.g. Afuah and Tucci, 2003; Applegate, 2000; Mahadevan, 2000). More recently, Vendrell-Herrero et al. (2018), following a review of several "digital business models" articles, have re-emphasised the point that ICT- or *digitally-enabled* technologies play a critical role in enhancing the process of value creation, delivery, and capture of an existing value proposition – that is in the process of enhancing the business model. For example, (digitally-enabled) e-commerce business models allow organisations to reach more customers, embed themselves into more value chains, and collect more and better data about their customers (Kiu and Lee, 2016). However, Vendrell-Herrero and colleagues have concluded that a better understanding of mechanisms and capabilities that explain the "enhancement" process is still missing in the literature.

### *3.6.2 Business-to-Business (B2B) e-commerce in the healthcare sector*

E-commerce is an internet-enabled marketplace for trading goods and services (e.g. Amazon, e-bay), and is a particularly well-established model (and research topic) in a business-to-consumer (B2C) environment, where transactions are taking place between organisations and individuals (Kiu and Lee, 2016). However, the realisation of benefits from e-commerce platforms in the business-to-business (B2B) environment, where transactions take place between two (or more) organisations, is less well understood (Ghobakhloo et al., 2014), particularly in the healthcare industry (Bhakoo and Sohal, 2008), where adoption of digital technologies, such as e-commerce, has historically lagged behind other industries (Wickramsinghe et al., 2005). Although the benefits of implementing a B2B e-commerce

platform in a healthcare organisation have been previously recognised, and include (Ammenwerth and de Keizer, 2007):

- Improved accessibility to relevant products and services for healthcare providers
- Improved workflow efficiency and sharing of information
- Improved inventory and order management (e.g. reduction in order errors)
- Creation of health information databases

…how to realise the abovementioned benefits in a healthcare organisation with the help of a B2B e-commerce platform remains under-researched (Chiasson et al., 2007), despite the significant growth of B2B e-commerce adoption in recent years. Few studies appear to have attempted to address this knowledge gap, and if they did, then the authors have focused on identifying success factors for B2B e-commerce implementation in healthcare organisations rather than on how the benefits can be realised once the platform is already in place. For example, Lin et al. (2010) have conducted 29 case studies in healthcare organisations to identify B2B e-commerce implementation constraints, incl.: organisational (e.g. appreciation of an e-commerce platform as a strategic business opportunity), industry (e.g. standardised protocols), supply chain (e.g. interoperability issues), knowledge and resources (e.g. failure to retain knowledge), and human resources (e.g. user motivation). Similarly, Thatcher and Foster (2003) have suggested that (1) organisational readiness, (2) enterprise culture, (3) marketing strategy, (4) internal factors, (5) information technology, and (6) governmental support, are the key factors in B2B e-commerce adoption.

### *3.6.3 Further challenges in the healthcare industry*

Finding a way to extract benefits from B2B e-commerce platforms is not the only challenge in the healthcare industry. For example, Ding (2018) has highlighted that control and management of the entire life cycle of pharmaceutical goods throughout the supply chain (i.e. what happens to drugs once they leave the factory) is still not sufficiently well understood. This ties into Narayana's et al. (2014) call for a better understanding of not only the reverse logistics (i.e. product returns/waste management), but also of the overall elements of (business) value exchange within the pharmaceutical supply chain. On top of that, Settanni et al. (2017) have argued that current interpretations of pharmaceutical supply chains focus more on production and therefore fail to provide a more customer- or patient-centric research perspective.

## *3.7 Emerging questions and gaps in the literature*

Scholars appear to agree that a business model seeks to explain the logic of how an organisation creates, delivers, and captures value for a customer (Wirtz et al., 2016; Zott et al., 2011). However, at a deeper level, the literature review process has shown that there remains a wide range of definitions and interpretations of the business model concept among scholars. This does not only apply to how the business model concept is holistically defined or how it is used (e.g. as a communication device to explain how the company makes money, or as a business template that can be copied by others), but it also applies to what underlying dimensions the concept is based on and how these dimensions are understood. For example, one of the most frequently mentioned dimensions in the literature (see Table 3.4.1) is the "value proposition" dimension. This dimension has been defined in various ways, including *"what the firm will deliver to its customers and why they will be willing to pay for it"* (Richardson, 2008, p.138), or as a *"company's bundle of products and services that are valuable to the target customer"* (Osterwalder, 2004, p.43). Yet, despite the "value proposition's" significant presence across the existing business model definitions, it does not appear to have been examined in more detail (e.g. how exactly it relates to the other business model dimensions?). Furthermore, a value proposition also does not seem to be an explicit part of the widely acknowledged business model understanding mentioned above (i.e. that it seeks to explain an organisation creates, deliver, and captures value for a customer, but does not specifically mention the value proposition). Additionally, when it comes to other dimensions, having reviewed those shown in Table 3.4.1, the question emerges whether a business model also includes the "value network" dimension, the "market segment" dimension, or the "value proposition" dimension, or all of them? And how many dimensions does the concept account for in total? Is it three, or nine, or more? With this academic reality in mind, this research proposes to follow Massa et al. (2017)'s proposition to instead of driving the research towards a unified perspective on what a business model could be and what dimensions it could contain, to simply and explicitly define an interpretation that is applicable and relevant to the given research context. This approach also reflects the philosophy of the design-science (see Section 2.4 and Chapter 4 for details), which involves focusing on developing solutions to the actual (identified) problem at hand, which can address the problem in a way that is better than any existing solutions, rather than grounding the work in a specific literature gap (Dresch et al., 2015). Embracing this logic allows to move past the issue of developing a holistic definition of the business model concept, and to move onto exploring the concept's underlying elements in more detail instead, in a way

that is relevant to this research. As such, a key sub-question for this research emerges to be as follows:

- ***What are the dimensions of a business model (from a design-science perspective)?***

Beyond identifying the dimensions, it appeared that there was a need to understand how these dimensions interact with each other. The literature review in Section 3.4.4 offered some potentially relevant insights into how to achieve that understanding by explaining how nodes of a value network or a business network may be represented and related to each other (i.e. through tangible product, intangible information, and financial monetary flows). However, this knowledge has not yet been effectively transferred to the business model domain. More specifically, based on the calls of multiple business model scholars (e.g. Foss and Saebi, 2017; Wirtz et al., 2016; Zott et al., 2011), it has been noted that the relationships and interdependencies among the dimensions of a business model are not clearly understood and/or documented in the literature and therefore represent a significant knowledge gap. Although a number of authors suggest that there is a need to research the relationships among the business model dimensions, none of them actually suggest a specific way forward, potentially due to the fact that there are no generally accepted dimensions of a business model in the literature in the first place. As such, following the sub-question defined above, another sub-question needs to emerge, which could be defined as follows:

- ***What is the mechanism through which the business model dimensions interact with each other?***

Reviewing literature related to configuration thinking in Section 3.5 also confirmed the relevance of adopting a configuration perspective to explore the main research question. This is because, in addressing configurations of business models, scholars have so far mostly focused on identifying and developing long lists of possible business model configurations, or "patterns", that are expressed through certain sets of business model dimensions. For example, Taran et al. (2016) and Gassmann et al. (2014) have both proposed 50+ configurations, which are based on 5 and 4 different business model elements, respectively. Similarly, Kulins et al. (2016) have suggested that business model configurations can be expressed through 4 elements, which are again different to Taran's et al. (2016) and Gassman's et al. (2014) work. In light of these examples, this research suggests that there is a need to stop attempting to add more business model configurations to business model literature. Although, this exercise is unquestionably useful for practitioners (i.e. business managers), who can leverage the established configurations as business model "profiles" that they can replicate, it arguably adds

less value to the theoretical domain of business models since new configurations will keep emerging and evolving dynamically over time anyways (Demil and Lecocq, 2010). As such, the challenge arguably becomes to revisit the dimensions upon which the business model configurations are based on, since, as the literature review has shown, these configurations appear to be based on "high-level" dimensions, such as "value chain" or "value network", which miss to point out specifically how these dimensions can be configured. This appears to be a major knowledge gap in the literature. Therefore, this research argues that there is a need to identify the sub-elements or properties of a business model's dimensions that can be configured in an explicit way. Accomplishing this could offer academics (and practitioners) a way to systematically tweak and (re-)configure business models in a more nuanced, yet cohesive way.

The literature review has also confirmed the relevance of exploring the main research question in the B2B e-commerce context of the pharmaceutical industry. It was found that although adoption of e-commerce has been well documented at the business-to-consumer (B2C) level (in terms of how it offered opportunities for organisations to create and deliver value to customers in new ways, and as such, create new business models) there was less research on adoption and specifically "benefit realisation" from e-commerce platforms at the business-to-business (B2B) level. This was particularly evident when reviewing B2B e-commerce literature in the healthcare sector, where the benefits of adopting an e-commerce platform could create important societal impacts, e.g. improved accessibility to healthcare products for healthcare providers, better health-related databases, etc. (Ammenwerth and de Keizer, 2007). Therefore, it is surprising that, although success factors and constraints of implementing B2B e-commerce platforms in healthcare organisations have been studied (Lin et al., 2010), no research went into how these benefits could be realised more effectively, for example once an e-commerce platform, or other digital technology, is already in place (Vendrell-Herrero et al., 2018; Ghobakhloo et al., 2014). This creates a knowledge gap that a business model perspective, which is already strongly embedded in the e-commerce domain, could arguably support in addressing; for example, by providing a way to configure e-commerce-driven business models in a particular way so as to enhance the process of value creation, delivery, and capture.

Finally, the literature review has shown that there are a number of other challenges that a business model and configuration perspective (as discussed in Section 3.5) could potentially help with in the healthcare/pharmaceutical sector, such as understanding the specific elements of value exchange within pharmaceutical businesses, and how to structure them, in terms of

information, material, and financial (value) flows (Narayana et al., 2014). The business model perspective specifically could aid in providing a more customer-centric research perspective in the pharmaceutical sector, as opposed to a production-centric view – which is an established challenge in the literature (Settanni et al., 2017).

## *3.8 Key research questions and chapter summary*

This Chapter focused on reviewing the key literature domains relevant to this research, including business models, configuration thinking, and B2B e-commerce in the pharmaceutical sector. Reviewing these domains resulted in identifying and/or confirming relevant knowledge gaps within each of those domains. Following that, the overall research questions for this work can be summarised as follows:

Main research question

***How might configuration theory and design-science approaches inform the design of business models?***

Sub-questions

- ***What are the dimensions of a business model (from a design-science perspective)?***
- ***What is the mechanism through which the business model dimensions interact with each other?***

These questions will be addressed in the following Chapters.

# 4 Research methodology

## *4.1 Introduction*

This Chapter introduces and discusses the design-science paradigm and research approach selected for this thesis as previously briefly discussed in Section 2.4. The underlying research activities are summarised in Figure 4.4.1 at the end of the Chapter.

## *4.2 Philosophical standpoint*

In designing a research, it is important to first establish an ontological and an epistemological perspective, which provide a distinctive philosophical view on how one perceives the world and how the knowledge emerging from the research is formed (Easton, 1995). In management research, the two key ontological positions are considered to be realism and relativism, each of which is commonly associated with either a positivist epistemological perspective or with social constructionism, respectively (Easterby-Smith et al., 2012). Positivists assume that there is a single, objective reality and it can be measured independently of the researcher and the employed instrument. Social constructivists on the other hand assume that there are many truths and knowledge is shaped subjectively, through social interactions. However, irrespective of the way knowledge is formed through the aforementioned perspectives, they attempt to do so by describing a phenomenon (i.e. trying to provide an explanation/understanding of it) (Van Aken, 2004). Yet, just providing descriptions or explanations of existing phenomena is being increasingly criticised for failing to be practically relevant in management research since an explanation of how things are is often insufficient, because simply understanding a problem may not be enough to solve it (Dresch et al., 2015; Romme, 2003; Simon, 1996; Daft and Lewin, 1990). Similarly, focusing on explanations may preclude researchers from generating knowledge about artificial things or systems that do not yet exist (Van Aken, 2004). To address this challenge, it has recently been argued that design-science should be considered as an additional (third) research paradigm in the management domain, which can create knowledge through an iterative and prescriptive (rather than descriptive) perspective (Dresch et al., 2015; Holmström et al., 2009; Baskerville et al., 2009; Hevner et al., 2004; Simon, 1996; March and Smith, 1995). It does so by focusing on prescribing possible solutions (in the form of artefacts) to problems identified in practice, rather than putting forward explanations of existing phenomena based on observations (Romme, 2003; Simon, 1996; Daft and Lewin, 1990). In that process, the knowledge grounded in design-science emerges in a unique way compared to the other paradigms, as the (ontological and epistemological) world views of the researcher

may shift throughout the research process in order to arrive at a suitable solution to a problem (Vaishnavi and Kuechler, 2015). Building on Dresch et al. (2015), Vaishnavi and Kuechler (2015), and Van Aken (2004), Table 4.2.1 compares and contrasts the three research paradigms.

Table 4.2.1: Comparison of key research paradigms in management research

| **Research paradigm** | **Positivist** | **Social constructionism** | **Design science** |
|---|---|---|---|
| ***Ontology*** | Single reality, single truth (realism) | Multiple realities, many truths (relativism) | Multiple, contextually situated alternative world views |
| ***Epistemology*** | Knowledge is objective; researcher is detached from what is being observed | Knowledge is subjective; researcher is part of what is being observed | Knowledge emerges through making, with iteration revealing meaning |
| ***Approach*** | Explanatory / descriptive | | Prescriptive |
| ***Focus*** | Problem-focused | | Solution-focused |
| ***Output*** | Observation (e.g. a model, explanation) | | Suggestion (e.g. a design proposition) |

Although there is still some ongoing debate on the validity of design-science being a standalone research paradigm (e.g. Niehaves, 2007; Iivari, 2007), this research adopts the standpoint that it indeed can be considered as one, and in doing so, follows other successful examples of design-science-driven research in the business model domain (e.g. Al-Debei, 2010; Osterwalder, 2004). Furthermore, the choice of design-science is justified as this research aims to prescribe a solution to the problem of business model design (as will be discussed in Section 4.3.4) through iterative solution development based on a case study (see Section 4.3.7.1), rather than to provide an explanation of how business model design works through either observation or social interaction.

## *4.3 Overview of the design-science-driven research methodology*

This work adopts Dresch et al. (2015)'s 12-step design-science approach as shown in Table 4.3.1, which highlights the iterative, solution-oriented nature of research grounded in design-science.

Table 4.3.1: A 12-step design-science research method based on Dresch et al. (2015)

| Feedback | Step | Description | Outputs |
|---|---|---|---|
|  | 1. | ***Identification of the problem*** | Formalised research question |
| | 2. | ***Awareness of the problem*** | Formalisation of the aspects of the problem: understanding of the outer environment; literature review |
| | 3. | ***Literature review*** | |
| | 4. | ***Identification of the artefacts and configuration of classes of problems*** | Identified artefacts (constructs, models, methods, instantiations); structured and configured classes of problems; explicitly satisfactory solutions |
| | 5. | ***Proposition of artefacts to solve a specific problem*** | Formalised proposals of artefacts |
| | 6. | ***Design of the selected artefact*** | Design indicating the techniques and tools for artefact conceptualisation and evaluation; detailed information on the artefact's requirements |
| | 7. | ***Conceptualisation of the artefact*** | Construction of the artefact in a real-world problem-solution context; artefact in its functional state |
| | 8. | ***Evaluation of the artefact*** | Application of the artefact in a real-world environment; evaluated artefact |
| | 9. | ***Clarification of learning achieved*** | Formalised learning |
| | 10. | ***Conclusions*** | Results of the research; main decisions made; limitations of the research |
| | 11. | ***Generalisation for a class of problems*** | Generalisation of the construction and application heuristics for a class of problems |
| | 12. | ***Communications of the results*** | Publication in journals, trade magazines, seminars, conferences, thesis |

### *4.3.1 Identification of the problem*

In design-science, the problem to be examined must arise from the researcher's interest in (a) a novel or interesting piece of information, (b) an answer to an important question, or (c) a solution to a practical (class) of problem(s) (Van Aken et al., 2012; Alturki et al., 2011; Baskerville et al., 2009). The problem must also be *relevant* (March and Storey, 2008) and be supported by a justification of why it should be studied (Booth et al., 2008), culminating in a clearly defined research question.

Having identified the problem and justified its relevance throughout Chapters 2 and 3, the research question was formalised as:

- ***How might configuration theory and design-science approaches inform the design of business models?***

In order to address the proposed question in more depth, additional sub-questions were formulated as:

- *What are the dimensions of a business model (from a design-science perspective)?*
- *What is the mechanism through which the business model dimensions interact with each other?*

### *4.3.2 Awareness of the problem*

Prior to starting to solve the problem in design-science, it has to be well-understood. This involves considering the context of the problem and its causes, as well as its boundaries (Simon, 1996). The process of understanding the problem in this research was guided by a simplified thinking process derived from the Theory of Constraints (TOC) (Goldratt, 1994) – if you want to achieve X in situation Y, then perform action Z, as suggested by van Aken (2004), or in other words *'if it is necessary to achieve X (a goal or problem to be solved) in situation Y (outer environment, context), then you should use Z (the artefact and its requirements)'* (Dresch et al., 2015, p.111). Following the TOC thinking process, these variables were defined as:

- **X – Goal/problem to be solved:** to design or (re-)configure a business model (and its underlying dimensions) informed by theoretically established and relevant concepts
- **Y – Outer environment/context:** the problem is to be solved in the context of B2B e-commerce platform adoption in the pharmaceutical industry (specifically in the vaccine supply context), where the focus of analysis is on the focal firm and the direct interaction with its core customer
- **Z – Artefact:** a framework (or a "solution artefact") that consists of clearly defined (business model) dimensions and semantics (i.e. their functionalities, interrelationships and interactions) that also meets the requirements of the problem it is aiming to solve (see Table 4.3.2)

Having informed the X component of the thinking process by the proposed research question and defined the Y component by placing the problem into the vaccine supply B2B e-commerce context with specific boundaries, it was also necessary to identify the key theoretical elements relevant to finding the solution to the problem. This was partially achieved in Chapter 2 through

conversations with academics and practitioners and then expanded on in the literature review stage in Chapter 3, where the emerging knowledge gaps were also presented.

The problem awareness stage also requires outlining the solution artefact's (i.e. framework's) performance criteria, which it has to meet, to ensure the research output's quality. These criteria were developed based on Platts (1993)'s Feasibility-Usability-Utility framework, Tracy (2010)'s Eight Big-Tent Criteria, and Martinez and Albores (2003)'s qualitative operations management evaluation criteria. The first input was deemed relevant, as it was previously applied in management and configuration research (e.g. Srai, 2007). The second input offered qualitative research criteria for non-domain-specific research; and the third input was deemed relevant as their criteria were developed with management research in mind and were based on key literature from respectable authors like Voss et al. (2002), Morse et al. (2002), Easterby-Smith and Araujo. (1999), Meredith (1998), and Yin (2009). The evaluation criteria were also informed by Hevner and Chatterjee (2010) and Hevner et al. (2004) in order to ensure the relevance of the criteria to design-science research. The performance criteria for this research are shown in Table 4.3.2.

Table 4.3.2: Artefact performance criteria

| **Performance criteria** | **Description** |
|---|---|
| ***Practically relevant*** | The output is relevant to practice/to current trends in the industry |
| ***Theory-driven*** | The output is developed based on established theories to enhance its rigour |
| ***Non-trivial*** | The output avoids obviousness; however this does not imply that it should be complicated |
| ***Clearly defined*** | Every dimension and variable, as well as the boundaries of the output are clearly defined, and their relationships to other dimensions or variables in the output are explained. This will improve the ability to clearly communicate the output to others |
| ***Valid*** | The output is developed using a set of logical steps, while implementing established research methods |
| ***Credible*** | The output is supported by data from a practice environment (e.g. a case study) |
| ***Valuable*** | The output is considered valuable if its generalisable and thus applicable in various contexts |
| ***Contributes to knowledge*** | The output addresses a gap in the existing literature and creates new knowledge |
| ***Offers a practical solution*** | The output offers a functional tool/framework to find new solutions or improve existing systems in the business world |

### *4.3.3 Literature review*

The objective of this stage of design-science is to determine the theoretical concepts relevant to solving the identified problem, to establish and confirm a suitable context, and to evidence artefacts and classes of problems that potentially address a problem similar to the one to be solved by this research (as well to identify and verify the theoretical knowledge gaps). This has been done in Chapter 3, with the approach to literature review described in Section 3.3.

### *4.3.4 Identification of the artefacts and configuration of classes of problems*

As part of the literature review, potential problem-solution artefacts were identified, which served as a foundation for the development of the artefact and the definition of the class of problems that the research contributes to (Baskerville et al., 2009). The reviewed artefacts were grouped into the 4 classifications of design-science research output (van Aken, 2011; March and Smith, 1995), as shown in Table 4.3.3 (these artefacts were not necessarily developed using design-science-research, but they were classified as such by the author of this work based on the understanding of their purpose).

Table 4.3.3: Outputs of Design-Science and examples of business model artefacts

| Artefact | Description | Examples | Details |
|---|---|---|---|
| **Constructs** | Language of concepts (i.e. constructs) with which to characterise problems within a domain and specify their solutions | Baden-Fuller and Haefliger (2013) | This paper developed a business model typology with four dimensions: customer identification, customer engagement, value delivery, and monetization |
| | | Zott and Amitt (2010) | The authors conceptualised a firm's business model as a system of interdependent activities, where the key elements are: content, structure and governance |
| | | Al-Debei (2010) | The proposed business model ontology incorporates four design dimensions: (1) value proposition; (2) value architecture; (3) value network; (4) value finance |
| | | Richardson (2008) | This paper proposed a business model framework that includes the value proposition, the value creation system, and value capture |
| | | Osterwalder (2004) | The author identified a set of nine business model dimensions, which are utilised in a graphical form as a 'canvas' to communicate business models |
| | | Hedman and Kalling (2003) | This paper offered an outline for a conceptual business model, and proposed that it should include customers and competitors, the offering, activities and organisation, resources and factor market interactions |

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| | | | |
|---|---|---|---|
| **Models** | A set of propositions or statements expressing relationships among constructs. However, the main concern of a model is its utility. It does not necessarily need to be accurate with respect to the details of reality as long as it captures the overall structure of reality, thus ensuring its utility | Baden-Fuller and Haefliger (2013) | The paper depicted the business model system as a model containing cause and effect relationships and shows that business models mediate the link between technology and firm performance |
| | | Casadesus-Masanell and Ricart (2010) | The authors presented a conceptual framework to separate and relate the concepts of strategy and business model |
| | | Al-Debei (2010) | Al-Debei developed an ontological framework based on business model thinking for designing innovative mobile data services |
| **Methods** | A set of steps to perform a task, which are based on the underlying constructs and a representation model. Can be captured graphically. Method artefacts can be tied to models, because the steps of the method can use parts of the model as the inputs that comprise them (March and Smith, 1995) | Teece (2010) | Teece defined a specific set of steps involved in business model design, which focused creating value for customers, enticing payments, and converting payments to profits. He also put forward steps to achieve sustainable business models (that competitors cannot copy) |
| **Instantiations** | Operationalisation of constructs, models, and methods (i.e. realisation of an artefact in its environment). Primarily seeks to demonstrate the feasibility and effectiveness of the artefacts | Al-Debei (2010) | The author formalised the conceptual business model ontology through a web mark-up language, opening it up for use in different existing and future contexts/applications |
| | | Osterwalder (2004) | Osterwalder operationalised the developed business model ontology by creating a visual representation of the ontology and applying to a real-world business setting |

In terms of defining the class of problems that the solution artefact in this research is aiming to solve, Dresch et al. (2015)'s logic was applied. The authors suggested that a class of problems can be established and structured, once a problem is recognised, understood, and potential artefacts that seek to find solutions to the problem are identified. This was achieved as part of this design-science process so far, and as such the core class of problems was defined as follows:

***"Business model design (in the vaccine supply and B2B e-commerce context)"***

The defined class of problems also reflects the main research question of this thesis.

### *4.3.5 Proposition of artefacts to solve a specific problem*

Building on the artefacts identified in Table 4.3.3, artefacts specifically related to business model *design* were considered to inform the design and conceptualisation of the artefact that addresses the problem in this research. For this purpose, artefacts developed by Richardson (2008) and Osterwalder (2004) were reviewed and their dimensions (e.g. value creation, value proposition) were considered as a foundation for defining a business model artefact in this work. This is discussed in more detail in Chapter 5. Richardson (2008)'s work was selected for its ability to clearly, but comprehensively outline the key dimensions of a business model (i.e. value creation, delivery, and capture). The relevance of these dimensions was confirmed during literature review (e.g. Wirtz et al, 2016; Teece, 2010). Osterwalder (2004)'s work was selected for its prominence among practitioners (thereby reflecting the importance of practical inputs for design-science).

### *4.3.6 Design (conceptualisation) of the selected artefact*

At this stage of the design-science process, an initial iteration of the solution artefact is conceptualised based on the theoretical concepts identified during the literature review process. This includes leveraging the knowledge from the artefacts developed by other researchers (as mentioned in the previous Section) as well as from relevant adjacent theories, such as those discussed in Section 3.4.

### *4.3.7 Development of the artefact*

#### *4.3.7.1 The case study approach*

Developing the conceptualised artefact using inputs from beyond academic literature is the next step of the design-science methodology. This was chosen to be done using the case study

approach (e.g. Eisenhardt, 1989), in line with many other design-science-based works, which have leveraged the case study method for developing and evaluating their artefacts qualitatively (Peffers et al., 2007). Case study research is widely accepted as a methodology in business research (Voss et al., 2002). It is typically used to investigate "how" and/or "why" research questions (Yin, 2009) for the purpose of theory generation, theory testing, and/or theory elaboration using inductive, deductive, and abductive logic, respectively (Ketokivi and Choi, 2014), and as such was deemed suitable for this work, which aims to answer those questions. However, despite the method's prominence in academic research, only recently did Costa et al. (2016) propose a structured method of applying the case study research method *specifically in design-science research*. In doing so, the authors have also argued that a single case study can be used during the construction of the artefacts (i.e. as ex-ante development), as well as to evaluate artefacts once they have been developed (i.e. as ex-post evaluation), thereby allowing to add more depth to the case by providing details from within the same context. Building on the recommendations for conducting case study research from Voss et al. (2015), Ketokivi and Choi (2014), and Barratt et al. (2011), Costa et al. (2016) have proposed 11 components of case study research (CSR) design, which this research adopted for the purpose of investigating the proposed research question. This approach is summarised in Table 4.3.4.

Table 4.3.4: CSR design as part of the design-science method applied in this research

| CSR component | Details |
|---|---|
| ***Knowledge of theoretical context*** | Business model literature and theoretical concepts identified as part of the design-science methodology prior to engaging in CSR (as described in Sections 3.4 and 3.5) |
| ***Knowledge of empirical context*** | Practical issues related to business model design identified as part of workshops and interviews with practitioners prior to engaging in CSR (as described in Sections 2.1 and 2.2) |
| ***Sampling*** | A case study that meets the research objectives: a case study that involves the development of a B2B e-commerce-driven business model within the vaccine supply industry, which provides in-depth insights to support both, ex-ante development and ex-post evaluation of the artefact (more details on the case to follow in this Section) |
| ***Unit of analysis*** | The analysis is limited to the focal firm and its direct interaction with its core customer (as per business model dimensions), potentially including a 3PL (3rd party logistics provider) within the boundaries of the analysis (e.g. where the focal firm does not deliver its value proposition to the customer itself) – this view focuses the inquiry to data that can be reasonably accessed, while acknowledging practical limitations of access and time |
| ***Informants*** | Due to the high-level business nature of research problem, senior stakeholders need to be involved in interviews to provide relevant input |
| ***Data sources*** | Iterative semi-structured interviews with relevant and diverse senior management personnel throughout the case organisation; (confidential) offline and online documents of the case organisation; additional academic and practice literature where appropriate |
| ***Data analysis*** | Qualitative cross-referencing and keyword grouping of data collected during interviews, including the data from the data gathering instrument (Table 4.3.10) and from handwritten interview notes |
| ***Research logic*** | Design-science-driven abductive research logic that allows for generation of new ideas and is not limited to finding a definite explanation, but rather suggests one (or few) that help researcher better orient in a given environment and disregard some possibilities |
| ***Construct validity*** | Iterative review of intermediate concepts of the artefact with relevant interviewees and triangulation of different inputs from various interviewees (within the case organisation) |
| ***External validity*** | External validity of the artefact is provided to the extent that it can be generalised as a solution to a specific class of problems (in line with the design-science methodology) that lies within the B2B e-commerce business model design in the vaccine supply context |
| ***Reliability*** | Documented application of design science and case study research methodologies (i.e. this research) |

In order to build an in-depth understanding of the problem and derive detailed insights for the purpose of developing and evaluating the artefact, a *single-case* study approach was utilised.

A single case study is often criticised by the more traditional camp of scholars for a lack of scientific rigour, as well as for its inability to provide sufficient evidence to make robust generalisations (e.g. Miles and Huberman, 1994; Eisenhardt, 1989). However, more recently, researchers in another camp have argued that single case studies can just as well be used to provide generalisation, as long as they meet the study objectives (Easterby-Smith et al., 2012; Siggelkow, 2007; Stake, 1995). This is because in reality, even the minimum of eight cases to justify generalising a theory, as suggested by for example Eisenhardt (1989), cannot be statistically significant to achieve generalisation (Dubois and Gadde, 2002). As such, single case studies can be just as good to provide generalisation (Easton, 2003). This observation is particularly relevant for *exploratory* research, such as the one in this thesis, which does not aim to fully justify a theory, but rather establish the existence of a phenomenon not recognised previously (which as will be shown later is that a value proposition can be viewed as a combination of dynamic value flows), for which a single well-constructed case study is sufficient, as argued for example by Eisenhardt and Graebner (2007), Kelliher (2005), Remenyi et al. (1998) and Van Maanen (1988). Stuart el al. (2002) also support the belief that successful case research can be done with as a little as one case in certain contexts and environments.

To highlight the power of single case studies, Siggelkow (2007) adapted Ramachandran (1998)'s scenario for consideration: a person brings a pig into an apartment, and its owner says that it can talk. The reaction of other people in the apartment is to say *'Really? Show us!'*. The owner snaps her fingers and the pig starts talking. The other people say *'Wow! You should write a paper about this!'*. The owner writes up a case and sends it to a journal, but the reviewers say *'That's interesting, but that is just one pig. Show us a few more, and we might believe you'*. It could be argued that would be an inappropriate response, as that single case was a very powerful example. In business model research context, which although might be considered less exciting or unique than encountering a talking pig, single case studies *have* been successfully used to generate high-quality and widely-cited outputs – some examples are captured in Table 4.3.5.

Table 4.3.5: Examples of highly-cited research on business models with single case studies

| Reference | # of citations (Google Scholar/Scopus, as of Oct 2018) | Details |
|---|---|---|
| **Chesbrough and Rosenbloom (2002)** *The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies* | 4725/1370 | The paper proposed a definition and a set of elements of a business model and applied that understanding to explore how the Xerox Corporation arose by employing effective business models to successfully commercialise early-stage technology |
| **Osterwalder (2004)** *The business model ontology - a proposition in a design science approach* | 2801/N.A. | A vast range of works explored and based their research on the theoretical business model canvas framework developed in this thesis using a single case study of the Montreux Jazz Festival |
| **Demil and Lecocq (2010)** *Business model evolution: in search of dynamic consistency* | 1267/392 | This paper developed and tested a business model evolution framework based on a single case study of the Arsenal football club, whose resources and capabilities continuously changed |
| **Sosna et al. (2010)** *Business model innovation through trial-and-error learning: the Naturhouse case* | 799/263 | The framework in this paper considered how external factors can affect business model creation, development and replication over time. It also showcased how trial-and-error learning can be leveraged to innovate business models based on a single case study of a dietary products firm |
| **Doganova and Eyquem-Renault (2009)** *What do business models do? Innovation devices in technology entrepreneurship* | 659/N.A. | This paper investigated the various roles of business models as devices in the innovation process of a single firm's data processing business |

#### *4.3.7.2 Case study sampling*

Selecting (or "sampling") the case study organisation is a critical step in ensuring quality of the case research (as mentioned in Table 4.3.4). The case has to be selected from an appropriate population in order to avoid (as much as possible) extraneous variations (Eisenhardt, 1989). This research aims to find a solution to the problem of *"business model design in the vaccine supply and B2B e-commerce context"*. As such, it was critical to select a case that would accurately reflect the "research needs" of the given problem and context. The following criteria for case selection were considered, which roughly reflect relevance, maturity, and accessibility:

- **Criteria 1:** the case organisation has to be primarily operating in the vaccine supply industry (that is being in the business of manufacturing and/or marketing vaccines)
- **Criteria 2:** the case organisation has to interact with other businesses or organisations (i.e. B2B), rather than directly with the consumers of their products (i.e. B2C). This would typically apply to organisations manufacturing or marketing prescription-medicines or medicines where a doctor's supervision is required, as opposed to products that are sold OTC[5], i.e. directly to consumers
- **Criteria 3:** the case organisation has to be large and mature enough, displaying experience in the industry in order to collect meaningful inputs; and also interact with a variety of customers to allow to identify their differences (i.e. interact with other large organisations, such as distributors, as well as smaller players, such as clinics or individual doctors)
- **Criteria 4:** the case organisation has to have an e-commerce platform in place, which is at the centre of its "business model" and is used to interact with its customers
- **Criteria 5:** the case organisation has to be accessible, meaning that the researcher can access senior stakeholders within the organisation to get sufficient insights regarding the organisation's business model and capabilities

Having selected the case study organisation, another key feature of the proposed case study research design was to allow for both, (a) artefact development (i.e. ex-ante) from its conceptual state, and (b) also allowing the case to be used for ex-post evaluation. Selecting a single case also allowed to collect inputs from within the same context (thereby also enhancing

[5] Over-the-counter products that can be sold directly to consumers without a prescription, e.g. some pain medications (e.g. paracetamol), digestive health, or allergy products

the rigour of the output) (Costa et al., 2016). For ex-ante development, a specific protocol was created to be followed during the research process to ensure consistency when interviewing the stakeholders. This is shown in Table 4.3.7. The interview protocol was used with a number of senior stakeholders within the case study organisation (see Table 4.3.6). NDAs were signed and the outputs were anonymised to respect the organisation's confidentiality policy. The primary form of data collection within these interviews was with hand-written notes.

Table 4.3.6: Stakeholders interviewed during the artefact development stage

| Team | Role / title | Method | Topics covered | Duration |
|---|---|---|---|---|
| ***Business/ commercial*** | Global e-commerce platform integration project associate leader/head of commercial (Asia-pacific region) | Skype interview (w/ screen sharing and video) | Role of the business model in the organisation; how a business model is (re-) designed; dimensions of a business model (in e-commerce context) | 2 x 2h = **4 hours** |
| ***Commercial*** | Commercial operations (Asia-pacific) | | The impact of e-commerce capability on the business model and the overall value proposition | 1 x 3h = **3 hours** |
| ***Commercial*** | Commercial operations (EMEA region) | | | 1 x 2h = **2 hours** |
| ***Operations*** | Vice-president operations (Asia-pacific region) | | Impact of e-commerce on the business model and its dimensions; review of components of the value proposition following the introduction of the e-commerce capability (i.e. tangible, intangible, monetary value flows) | 1 x 3h = **3 hours** |
| | | | **Total hours of interviewing:** | **12 hours** |

Table 4.3.7: Ex-ante interview protocol - questions and dimensions of data to discuss with interviewees to develop the artefact further

***INTRODUCTION AND CONTEXT***

- Introduction and context of the research (purpose, research questions, goals), including the following questions for a general understanding:
    - How is the concept of a "business model" understood in your organisation and your industry?
    - How do you capture it, and what dimensions do you include? Which dimensions do you start with?
    - What is the value proposition offered by your organisation?
    - How do you (re-)design a business model in your organisation?

***ARTEFACT EXPLORATION AND DEVELOPMENT***

- Introduction of the conceptual artefact (as shown in Figure 5.2.5. Explanation of the business model dimensions of the artefact derived from literature (i.e. value creation, delivery, capture, and customer dimensions, and the flowing value proposition), and the following questions:
    - How would you *express your business model using the four dimensions* of the proposed artefact?
    - How would you *express the value proposition* being offered by your organisation *in terms of the three value flow types/components* (i.e. tangible, intangible, monetary)?

***CONCLUSION***

- Wrap up and next steps (e.g. follow up with the interviewees with summarised outputs of the interviews)

### *4.3.8 Evaluation of the artefact*

The evaluation process in design-science aims to make sure that the research problem can be solved in a *satisfactory* manner using a functional artefact. That is, the idea is to not necessarily to provide an optimal solution, but to develop one that is better than the existing one, which is in line with the design-science methodology (Dresch et al., 2015). At the same time, the performance criteria outlined in Table 4.3.2 have to be met.

In order to meet the evaluation criteria, this step continued to leverage the same case study organisation used for ex-ante development also for *ex-post* evaluation, as discussed in Section 4.3.7. At this stage, new stakeholders were interviewed (see Table 4.3.8). This allowed to evaluate the artefact from a new perspective, but from within the same context and same organisation, thereby enhancing the artefacts validity through triangulation of new inputs (Costa et al., 2016; Easterby-Smith et al., 2012). The ex-post interview protocol is shown in Table 4.3.9. Twice amount of time was spent interviewing the employees of the case study firm vs. the development stage to provide an in-depth perspective.

During the evaluation interviews a "formal" data gathering instrument was used to capture relevant data in a structured way (shown in Table 4.3.10). The instrument was developed based on the "developed artefact" by including all the key dimensions of the business model and the properties of the underlying value proposition. Full data captured by the instrument is shown in Section 6.3.5

Table 4.3.8: Stakeholders interviewed during the artefact evaluation stage

| Team | Role / title | Method | Topics covered | Duration |
|---|---|---|---|---|
| ***Business/ commercial*** | Global e-commerce platform integration project leader | Skype interview (w/ screen sharing) and video | • Rationale for integrating the e-commerce capability; expected impacts on the business model of the organisation (in terms of the market opportunities, types of customers, and possible extensions to the main value proposition).<br>• Review of the business model along the dimensions of the artefact<br>• Review of the value proposition in terms of properties | 1 x 3h = **3 hours** |
| ***Business/ commercial*** | Head of commercial (Americas region) | | | 2 x 2h = **4 hours** |
| ***Business/ commercial*** | Head of commercial (EMEA region) | | | 1 x 2h = **2 hours** |
| ***Operations*** | Vice-president operations (Americas region) | | | 2 x 2h = **4 hours** |
| ***Commercial*** | Commercial operations (Americas region) | | | 2 x 2h = **4 hours** |
| ***Business/ operations*** | Senior vice-president commercial operations (Global) | | | 2 x 2h = **4 hours** |
| ***Operations*** | Vice-president operations (EMEA region) | | | 1 x 2h = **2 hours** |
| | | | **Total hours of interviewing:** | **23 hours** |

Table 4.3.9: Ex-post interview protocol - questions and dimensions of data to discuss with interviewees to evaluate the developed artefact

***INTRODUCTION AND CONTEXT***

- Introduction and context of the research (purpose, research questions, goals) and of the work done so far (including explanation of the developed artefact and its dimensions), as well as asking the following questions for a general understanding:
    - How is the concept of a "business model" understood in your organisation and your industry?
    - How do you capture it, and what dimensions do you include? Which dimensions do you start with?
    - What is the value proposition offered by your organisation?
    - How do you (re-)design a business model in your organisation?

***ARTEFACT EVALUATION***

- Step-by-step review of the developed artefact based on the data gathering instrument shown in Table 4.3.10, including explanation of the business model dimensions of the developed artefact, as well as the following questions:
    - Thinking of configuration of each of the constituting flow types/components of the value proposition, *how would you express the value proposition* that is leaving the value creation/delivery/customer/capture dimension, *in terms of volume, velocity, veracity, variety, and value?* Do these configurations meet/fit the requirements of receiving business model dimension?
    - What are the key input-process-output *capabilities* you (need to) have to support the properties required of the various flow type at different dimensions of the business model?

***CONCLUSION***

- Wrap up and next steps (including asking the interviewees to identify opportunities for business model re-configuration based on the collected data)

Table 4.3.10: Data gathering instrument

| *Business model dimensions* | | **Value creation dimension** | | | **Value delivery dimension** | | | **Customer dimension** | | | **Value capture dimension** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Capabilities* | | Input | Process | Output | Input | Process | Output | Input | Process | Output | Input | Process | Output |
| **VP component** | **Property** | | | | | | | | | | | | |
| **Tangible** | Volume | | | | | | | | | | | | |
| | Velocity | | | | | | | | | | | | |
| | Variety | | | | | | | | | | | | |
| | Veracity | | | | | | | | | | | | |
| | Value | | | | | | | | | | | | |
| **Tangible's monetary flow** | Volume | | | | | | | | | | | | |
| | Velocity | | | | | | | | | | | | |
| | Variety | | | | | | | | | | | | |
| | Veracity | | | | | | | | | | | | |
| **Intangible** | Volume | | | | | | | | | | | | |
| | Velocity | | | | | | | | | | | | |
| | Variety | | | | | | | | | | | | |
| | Veracity | | | | | | | | | | | | |
| | Value | | | | | | | | | | | | |
| **Intangible's monetary flow** | Volume | | | | | | | | | | | | |
| | Velocity | | | | | | | | | | | | |
| | Variety | | | | | | | | | | | | |
| | Veracity | | | | | | | | | | | | |

### *4.3.9 Clarification of learning achieved*

The purpose of this step of design-science is to ensure that the work can be used as a reference for future research by re-iterating the factors that contributed to its success (Dresch et al., 2015). As such, these factors were captured as part of Chapters 5 and 6. This for example included the successful generation of insights through semi-structured interviews following the protocols proposed in Sections 4.3.7 and 4.3.8 to discover ideas that were not initially expected, e.g. the need to include separate monetary flow dimensions of a value proposition for both, tangible and intangible flows, rather than including a single, combined monetary flow (as will be discussed in Section 6.2.5).

In terms of the design-science output the artefact is expected to represent a mix of a conceptual *model and method* artefacts. The model is a simplified representation of reality documented through a formal notation or language, and a method represents conceptual, yet actionable instructions for performing a task (Peffers et al., 2007). In terms of contribution to design-science knowledge, the final artefact is expected to be an improved design proposition to an existing problem (i.e. the problem of B2B e-commerce business model design in the vaccine supply context).

### *4.3.10 Research conclusions*

The results of the research, informed by all the previous stages of the research, were communicated in Chapter 8. These included (a) the key findings, as well as (b) the limitations of this work.

### *4.3.11 Generalisation for a class of problems*

As part of Chapter 8, the outputs were also generalised to a specific class of problems, specifically to "*business model design in the vaccine supply and B2B e-commerce context"*, as defined in Section 4.3.4. This is a critical part of design-science research, since the generalization advances knowledge in design science by allowing the knowledge generated in a specific situation to be later applied in similar situations (Dresch et al., 2015). This generalisation is captured in the implications for theory and practice Sections of Chapter 8.

### *4.3.12 Communications of the results*

The results of the research are communicated through this thesis as well as conference proceedings (e.g. Kouptsov and Srai, 2019) and will be made accessible to all interested academics and practitioners.

## *4.4 Chapter summary*

This Chapter discussed the research methodology and design adopted by this work, which follows a 12-step design-science research approach developed by Dresch et al. (2015), as shown in Table 4.3.1. This included approaches to the:

- identification of the problem as *"business model design in the vaccine supply and B2B e-commerce context"* and the definition of the research question as *"How might configuration theory and design-science approaches inform the design of business models?"*
- building of awareness around the identified problem in terms of relevant theoretical concepts (including business model, configuration, and network concepts)
- literature review and identification of knowledge gaps (within the previously identified concepts) and review of existing business model design artefacts
- initial conceptualisation of the business model design artefact based on the reviewed literature (including relevant dimensions of the artefact)
- artefact's development and evaluation using a single case study (and the rationale for using a single case study approach)
- summary and communication of research outputs

The sequence of the activities in this research are summarized in Figure 4.4.1.

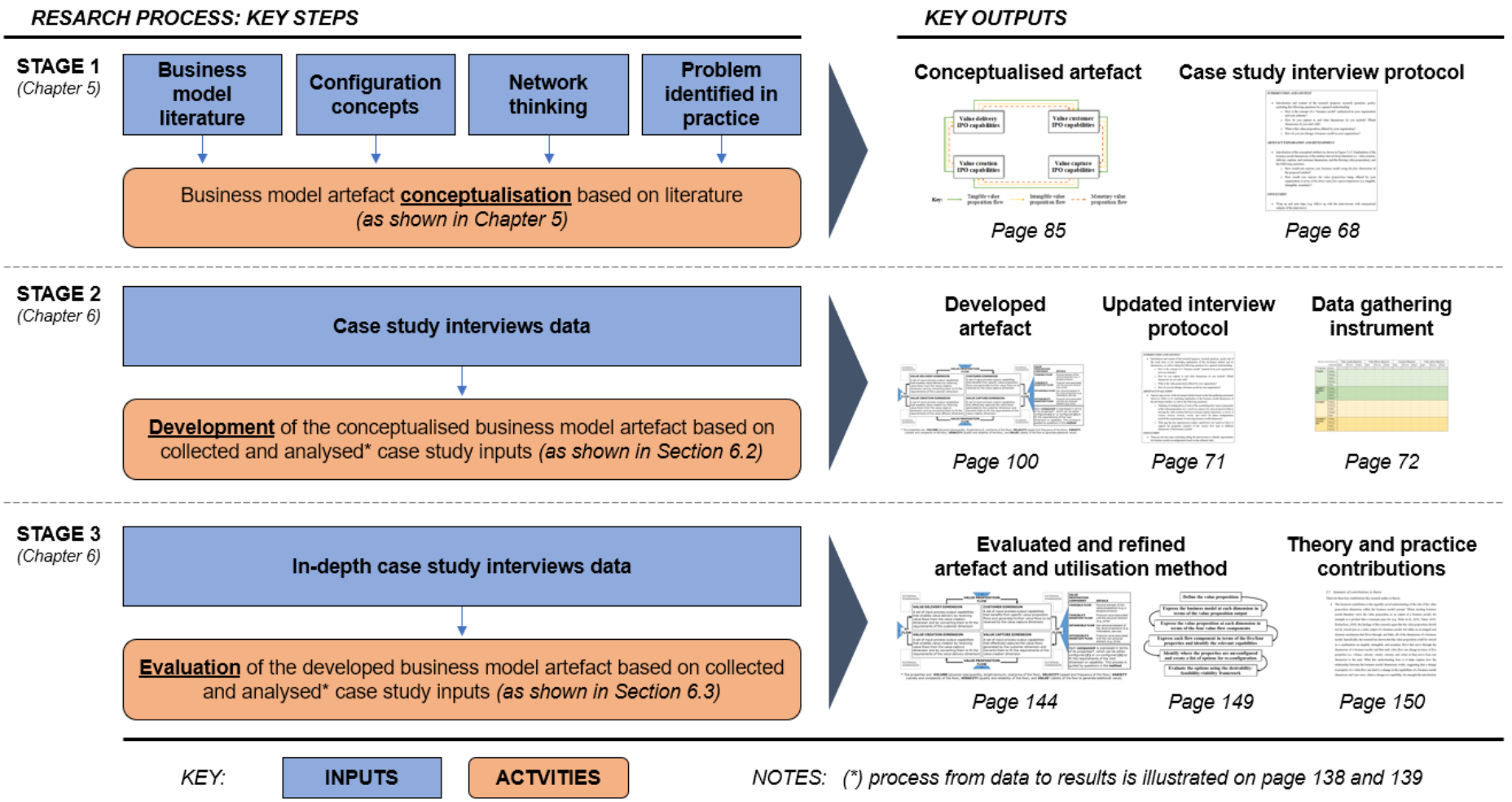


Figure 4.4.1: Summary of research activities and outputs

# 5 Solution artefact conceptualisation

## *5.1 Introduction*

This Chapter leverages the design-science-driven methodology outlined in Chapter 4 in order to address the main research question: "*How might configuration theory and design-science approaches inform the design of business models?"*. To do so, a first version of a solution artefact (i.e. a framework) is conceptualised in this Chapter. The artefact is derived from concepts in the existing literature that were reviewed in Chapter 3.

Chapter 3 has demonstrated that there remains a wide variety of business model definitions in the academic literature, and which dimensions comprise a business model also remains unclear. As such, the conceptualisation stage begins with the first sub-question identified in Section 3.7, which asks *"what are the dimensions of a business model (from a design-science perspective)?"* This Section attempts to, at least partially, answer this question in a way that is relevant for this specific research, while also addressing the second sub-question: *"what is the mechanism through which the business model dimensions interact with each other?"*

## *5.2 Artefact conceptualisation (based on literature)*

### *5.2.1 Business model design artefact definition and dimensions*

Despite the existing diversity of business model interpretations, scholars do appear to agree that a business model seeks to explain how an organisation creates and delivers value for customers, and how it then captures that value (Wirtz et al., 2016; Zott et al., 2011). Following this thinking, and in line with Teece (2010), Richardson (2008), and Osterwalder et al., (2005), this research proposes that a business model can be expressed through five key dimensions:

- **(1) *Value creation*** dimension
- **(2) *Value delivery*** dimension
- **(3) *Value capture*** dimension
- **(4) *Customer*** dimension (which creates a purpose for the value creation, delivery, and capture activities, i.e. someone who the value is generated for), and
- **(5) *Value proposition*** dimension (which expresses what the value *is* that is being generated for the customer)

With these dimensions in mind, the working definition of a business model for this research could be expressed as follows:

***A business model represents the logic behind creating, delivering, and capturing value through a specific value proposition being offered by an organisation to a customer***

This definition takes into account the contemporary knowledge from the literature, such as value creation, value delivery, and value capture dimensions being core parts of a business model (e.g. Wirtz et al., 2016, Teece, 2010), and extends it further to create a holistic and integrated view of a business model by creating a purpose for the value creation/delivery/capture dimensions in serving a specific customer. To support the rationale for these dimensions, they are mapped onto literature in Table 5.2.1.

Table 5.2.1: Business model dimensions mapped onto literature

| **BM elements** | ***Taran et al. (2016)*** | ***Demil and Lecocq (2010)*** | ***Richardson (2008)*** | ***Morris et al. (2005)*** | ***Osterwalder et al. (2005)*** | **Chesbrough and Rosenbloom (2002)** |
|---|---|---|---|---|---|---|
| ***(5) Value proposition*** | A company's offering of products and services that customers are willing to pay for. It identifies values that a company brings to its customers that are able to satisfy its customers' needs | What a company delivers to customers, in the form of products and services. Encompasses how and to whom the offer will be marketed | What the firm will deliver to its customers, why they will be willing to pay for it, and the firm's basic approach to competitive advantage | How the value proposition looks like and who it is created for | Company's bundle of products and services that are valuable to the target customer | Value created for users by the offering based on the technology |
| ***(1) Value creation*** | Key activities (e.g. production, service delivery, logistics) and distribution channels needed to create and deliver the value proposition to the selected customer in a cost-effective manner | Ability & knowledge to develop, improve, recombine, or change the value proposition. Includes the organisation's activities and the relations it establishes with other organisations to combine and exploit its resources | How the firm will create and deliver the value proposition to its customers and the source of its competitive advantage | The sources of competence to create and deliver the value proposition | Partnerships, capabilities and resources and their configuration to create value | The value chain within the firm required to create and distribute the offering, and determine the complementary assets needed to support the firm's position in this chain |
| ***(2) Value delivery*** | | | | | Distribution channels to customers, and relationships to customers | |

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| **Business model elements** | ***Taran et al. (2016)*** | ***Demil and Lecocq (2010)*** | ***Richardson (2008)*** | ***Morris et al. (2005)*** | ***Osterwalder et al. (2005)*** | **Chesbrough and Rosenbloom (2002)** |
|---|---|---|---|---|---|---|
| ***(4) Value customer*** | The customer segment a company aims to serve | Included in value proposition definition | The intended customer or target market | Included in value proposition | Describes the segments of custom-ers a company wants to offer value to | The users to whom the technology is useful and for what purpose |
| ***(3) Value capture*** | Describes how the customers pay for the delivered products / services offered | N/A | How the firm generates revenue and profit | How is the value proposition priced, how much is sold, and what are the margins and revenue streams | The cost structure (i.e. all the money in the business) and revenue model (i.e. how a firm makes money through revenue flows) | N/A |

### *5.2.2 Business model design artefact dimensions as nodes of a network*

Having established the key dimensions of the conceptual solution artefact, and in order to start answering the second sub-question, this research proposes that these dimensions could be viewed as nodes of a value network (see Section 3.4.4). That is, the dimensions could be viewed as a network of nodes, which collectively generate value for a particular stakeholder through exchanges of tangible and intangible value (e.g. Gulati et al., 2000; Allee, 2000). This approach may indeed be helpful in addressing the knowledge gap related to the understanding of the relationships between the dimensions of a business model discussed in Section 3.7.

By borrowing the visualisation from Browne and Zhang (1999), which represents an extended enterprise – a form of a value network, as discussed in Section 3.4.4 – the artefact's dimensions could be shown in a similar way, where the flows between the dimensions are represented by a flowing value proposition. This is shown in in Figure 5.2.1 and Figure 5.2.2, respectively.

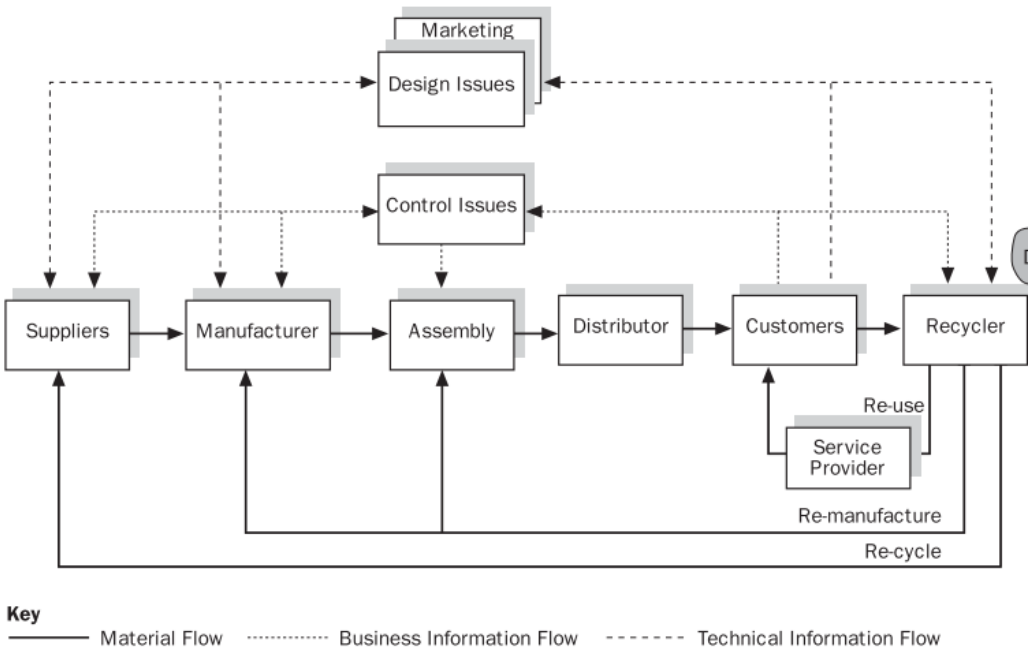



Figure 5.2.1: Visual representation of an 'extended enterprise'-like value network (Browne and Zhang, 1999)

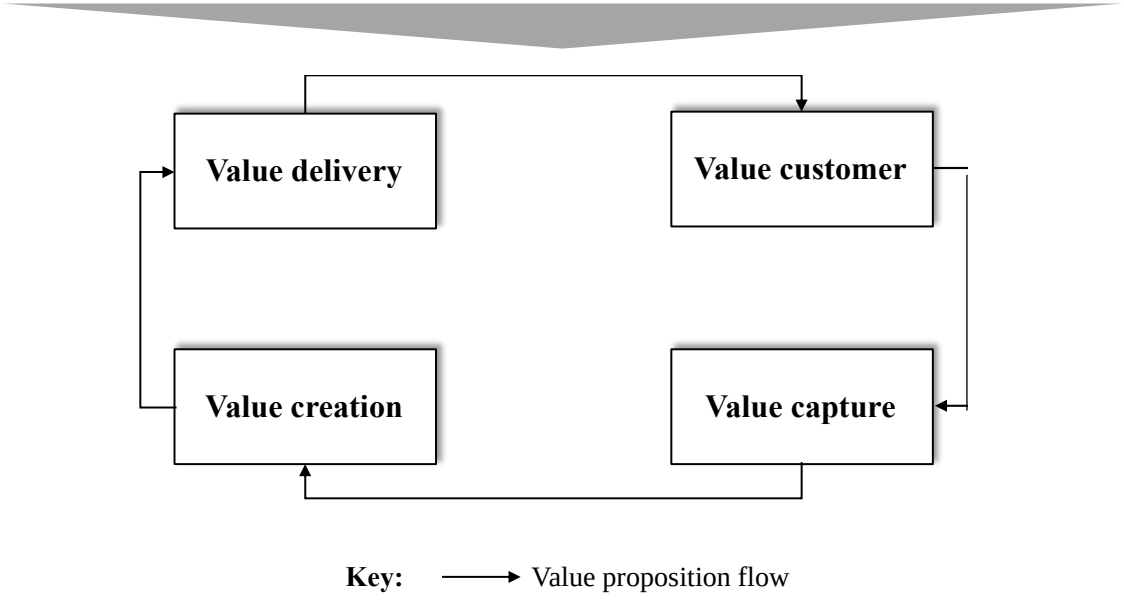



Figure 5.2.2: A proposed visualisation of conceptual artefact as a collection of (network) nodes, which are linked through value proposition flows

### *5.2.3 Value proposition as a flow between the dimensions of the artefact*

As demonstrated in Table 5.2.1, a value proposition is typically represented in the literature as a product or a service that will be delivered to the customer to meet their needs, for which the customer will provide a value in return (which is typically in monetary form) (e.g. Richardson, 2008, Osterwalder et al., 2005). However, the view proposed in Figure 5.2.2 suggests that value proposition is more than a static unit of value that is simply delivered to the customer once. Rather, it should be viewed as a flowing dimension that changes as it moves from one dimension to the next. This argument – that the value proposition changes – is supported by the logic that each dimension within the conceptual solution artefact will have different requirements, which the value proposition will need to meet, and therefore, will have to change as it moves from one dimension to the next.

The "flow" view is also a reflection of the underlying network thinking, which was discussed in Section 3.4.4. It suggests that actors, or nodes, within a network are linked through various value exchanges or "flows" (e.g. Gulati et al., 2000; Allee, 2000). As such these value (proposition) flows could be arguably viewed as a linking mechanism between the artefact's core dimensions. However, in order to provide a more granular and meaningful view of such a "value proposition flow", it needs to be broken down further. Inspired by the different flows shown in Figure 5.2.1 and the network thinking literature discussed in Section 3.4.4, a value proposition flow could be viewed as a combination of tangible, intangible, and monetary flows. To academically support this split, the three flow types/components are mapped to literature in Table 5.2.2.

Table 5.2.2: Value flow types according to literature

| **Key literature** | **Tangible flow component** | **Intangible flow component** | **Monetary flow component** |
|---|---|---|---|
| ***Shafer et al. (2005)*** | Products | Services and information | Cash |
| ***Mentzer et al. (2001)*** | Products | Services and information | Finances |
| ***Browne and Zhang (1999)*** | Materials | Business and technical information | N/A |
| ***Håkansson and Johanson (1992)*** | Material, product | Information, knowledge, service | N/A |

With these value proposition flow components in mind, Figure 5.2.2 can be updated to include three flows, as opposed to just one. This is illustrated in Figure 5.2.3.

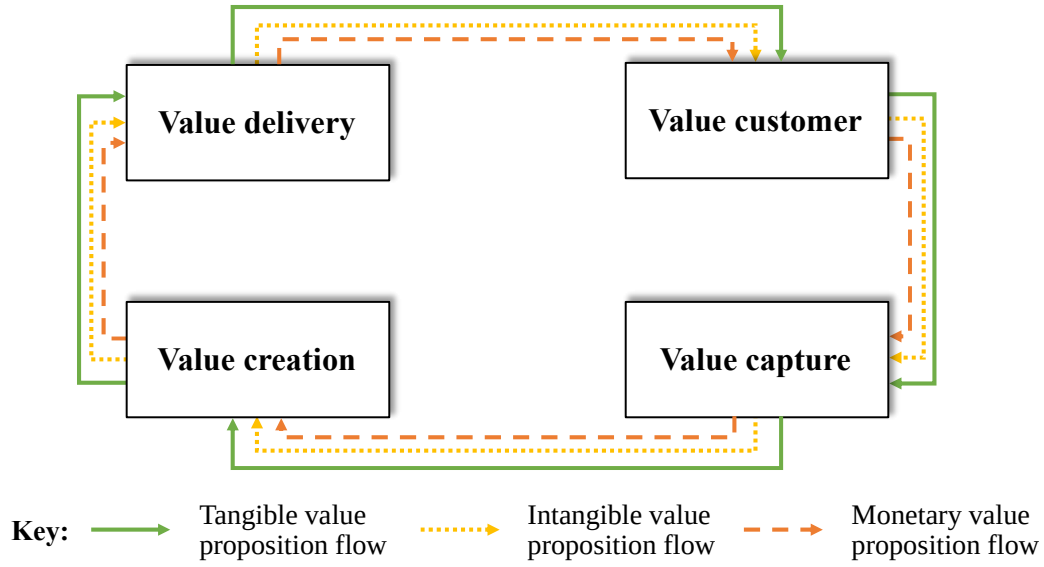



Figure 5.2.3: A proposed visualisation of the artefact as a collection of dimensions, which are linked through three value proposition flow components

### *5.2.4 Capabilities of the business model dimensions*

Continuing to build on the existing business model and network literature, this Section proposes a way to introduce a *capabilities aspect* into the artefact developed so far (as shown in Figure 5.2.3). As discussed in Sections 3.4.3 and 3.4.4, capabilities (and resources) are a critical part of both value-generating networks, *and* business models. This is because networks leverage skills and resources found among its nodes to meet the needs of their stakeholders (e.g. Camarinha-Matos and Afsarmanesh, 2005). Similarly, business models leverage and combine resources in a specific way so as to generate value for a customer (DaSilva and Trkman, 2014). However, as highlighted in Section 3.4.3, existing approaches to integrating a capabilities aspect into a business model artefact (i.e. a framework) have so far arguably resulted in less feasible outcomes. They either only established meta-level capabilities that do not explicitly correlate to specific business model dimensions (e.g. Batistella et al., 2017), or defined overly-long lists of capabilities that are too specific and arguably un-pragmatic for effective business model design and/or management (e.g. Storbacka, 2011).

In order to avoid either of these pitfalls, this research proposes an alternative approach. As can be seen from Figure 5.2.3, the value proposition flows could be moving from one dimension of the conceptual artefact to the next. These dimensions arguably possess capabilities that alter the value proposition flows at each dimension so as to make them suit the requirements of the next dimension. Given the "*flowing"* nature of the value proposition components, this research proposes to view them from an established manufacturing/supply chain perspective, in which goods (i.e. value propositions) are created by processing inputs into specific outputs (e.g. Troutt

et al., 2001). A similar view has also been previously used in information systems research and captured as the input-process-output (or IPO) perspective (Chan and Ngai, 2011). This simple approach is illustrated in Figure 5.2.4.


Figure 5.2.4: Visualisation of an input-process-output (IPO) perspective

An IPO perspective in the business model artefact context arguably allows to account for all possible capabilities that might be required to drive the value proposition flows from one dimension to the next by effectively grouping them into only three categories, as follows:

(1) The **I**nput capabilities (i.e. the capabilities required to receive the incoming value proposition flows)

(2) The **P**rocess capabilities (i.e. the capabilities required to process the received value proposition flows)

(3) The **O**utput capabilities (i.e. the capabilities required to release the processed value proposition flow for it to reach the next node)

The benefit of this approach is that it also allows to directly relate the specific capabilities to the dimensions of a particular business model within each of those groups. That is, it allows to highlight the capabilities that are directly responsible for affecting the value proposition as it moves through the business model dimensions. This is a direct contrast to meta-level capabilities, which do not have an explicit relation to a specific dimension of a business model. The introduction of an IPO capabilities perspective therefore extends the currently proposed artefact visualisation shown in Figure 5.2.3 to the one illustrated in Figure 5.2.5.

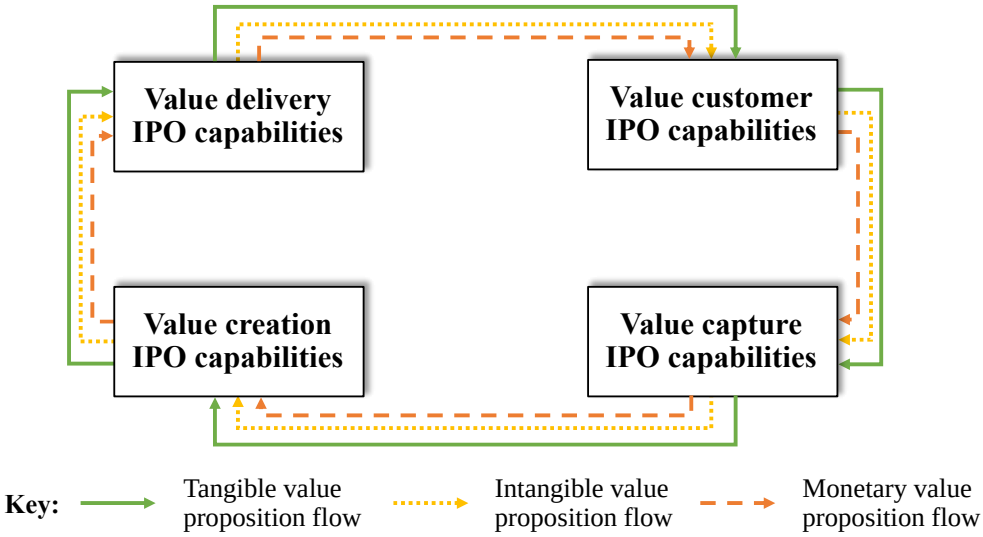



Figure 5.2.5: A proposed visualisation of the conceptualised artefact as a collection of dimensions, which are linked through three value proposition flow components. Each dimension possesses input-process-output (IPO) capabilities to drive the flow of the value proposition

Building on the view proposed so far, as captured in Figure 5.2.5, all dimensions of the conceptual artefact can be preliminary defined as shown in Table 5.2.3.

Table 5.2.3: Preliminary definitions of key business model dimensions

| **Artefact dimension** | **Definition/role** |
|---|---|
| ***Value creation dimension*** | A set of (IPO) capabilities that enables value creation by receiving value flows from the value capture dimension and by converting them to fit the requirements of the value delivery dimension |
| ***Value delivery dimension*** | A set of (IPO) capabilities that enables value delivery by receiving value flows from the value creation dimension and by converting them to fit the requirements of the customer dimension |
| ***Customer dimension*** | A set of (IPO) capabilities that benefits from specific value proposition flows and generates further value flows to be received by the value capture dimension |
| ***Value capture dimension*** | A set of IPO capabilities that effectively captures the value flows generated by the customer dimension and converts them to fit the requirements of the value creation dimension |
| ***Value proposition dimension*** | A dynamic combination (i.e. one that continuously changes) of tangible, intangible, and monetary value flows that move in a loop from one dimension of the artefact to the next |

The proposed artefact and its dimensions, and how they could collectively express a business model, could arguably be understood better, if illustrated using an example. This is shown in Figure 5.2.6 based on an example of a heavy-equipment manufacturer, which manufactures mining excavators with built-in equipment usage sensors. The example does not exhaustively explain each element (i.e. all IPO capabilities or all flow components) of the illustrative firm, but attempts to offer an easy-to-follow way to understand what the conceptual artefact is aiming to achieve.

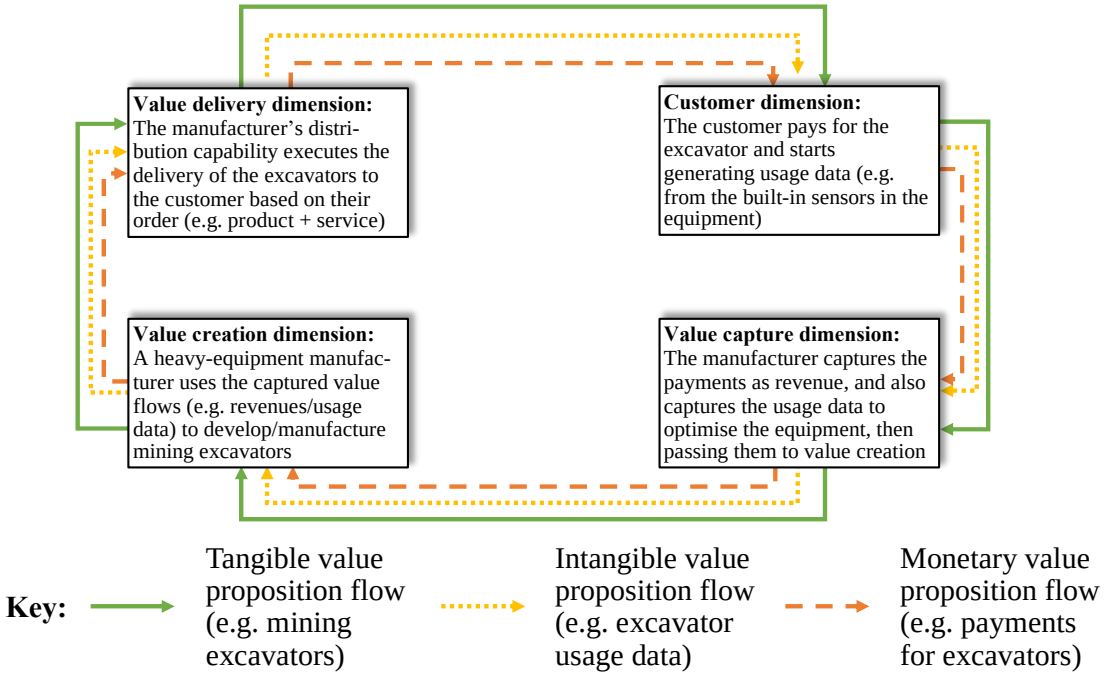



Figure 5.2.6: Illustrative example of the conceptual artefact, capturing a business model of a heavy-equipment manufacturer

## *5.3 Conceptual artefact's "unknowns"*

The conceptual artefact created in Section 5.2 emerged as a feasible framework for expressing a business model in a logical way. It also potentially offers a more value-proposition- and customer-centric perspective than for example some of the more established artefacts that exist in the literature (e.g. Osterwalder's Business Model Canvas). Nevertheless, despite providing a foundation for answering the research sub-questions identified earlier, there are still a number of "unknowns" surrounding the conceptual artefact in its current form. These could be captured as follows:

*(i)* *How does the solution artefact help explain the aspects of value (proposition) flows and their interrelationship with the business model dimensions?*

*(ii) How can a business model be configured while accounting for the interaction among its dimensions (using the solution artefact)?*

*(iii) What is the method for utilizing the solution artefact in a practical context?*

These unknowns are not considered to be additional sub-questions for this research, but rather aspects to explore in the development and evaluation stages of the artefact, which is done in Chapter 6.

## *5.4 Chapter Summary*

This Chapter applied the design-science-driven methodology outlined in Chapter 4 to develop a conceptual, first version of the artefact based on academic literature. This included:

- Leveraging established concepts from the literature to identify the key dimensions of the business model and proposing to view them as nodes of a value-generating network. These dimensions include the (1) value creation dimension, the (2) value delivery dimension, the (3) customer dimension, and the (4) value capture dimension
- Proposing a mechanism to link these dimensions together using a *flowing* (5) value proposition, which can be broken down into (a) tangible, (b) intangible, and (c) monetary value flows/components
- Suggesting an approach to include a capabilities aspect within the artefact by proposing that each dimension possesses capabilities that are responsible for input, process, and output of value (proposition) flows; and suggesting that the capabilities are responsible for changing the value proposition's tangible, intangible, and monetary flows as the move from one business model dimension to the next
- Illustrating the conceptual artefact's ability to express a business model based on an example of a heavy-equipment manufacturer
- Identifying "unknowns" surrounding the conceptual artefact to be explored in the next stages of the research

# 6 Solution artefact development and evaluation

## *6.1 Introduction*

The first part of this Chapter takes the conceptualised artefact created in the previous Chapter, and develops it further using a case study from the vaccine supply industry, while addressing the "unknowns" identified in Section 5.3. The second part of the Chapter evaluates the developed artefact based on data captured during interviews with additional employees from within the same case study firm. The benefit of this approach is that it enriches the artefact with inputs that come from the same context, but from *other* perspectives, providing a rich base for informing and validating the artefact (Costa et al., 2016).

## *6.2 Artefact development*

### *6.2.1 Ex-ante development of the artefact using a case study from vaccine manufacturing*

In line with the case study approach outlined in Section 4.3.7, this Section focuses on developing the first version of the conceptual artefact (see Figure 5.2.5) a step further, through *ex-ante development*. That is, the artefact is reviewed and discussed with employees of the selected case study firm through semi-structured interviews (for the list of the interviewees see Table 4.3.6) and then enhanced based on the inputs collected during those interviews (see Table 4.3.7 for the interview protocol). However, before moving onto the development stage, it was critical to select an appropriate case study first. This was done by following a set of sampling criteria, which are discussed in Section 4.3.7.2. The selected case study is presented in the next Section.

### *6.2.2 Overview of the case study organisation*

As discussed in Section 4.3.4, the objective of this research was to establish a solution to the problem of *"business model design in vaccine supply and B2B e-commerce context"*. To solve for this problem, a case study was selected based on a range of criteria, including relevance, maturity, and accessibility (see Section 4.3.7.2 for the description of the criteria). The case selected for the purpose of this research was able to meet all of those criteria (see Table 6.2.1), representing a case that is suitable for illuminating a solution to the identified problem. The case organisation is described on the next page.

**The FluCo Case Study**

The case study organisation selected for this research was the second largest influenza (i.e. flu) vaccine manufacturer in the world, which at the time of the researcher's interaction with the organisation, was going through the process of introducing an e-commerce platform for its US business. The firm was established as a result of a merger of assets from two other pharmaceutical firms, and will be called FluCo in this thesis (for confidentiality reasons as agreed in a Non-Disclosure Agreement signed by the researcher and the case study firm). FluCo now runs global operations in more than 20 countries with manufacturing plants in the US, UK, and Australia, and employs 1,900+ people. The introduction of an e-commerce platform for its US business, intended to help the organisation reach more of its customers, such as pharma distributors, hospitals, or healthcare professionals (i.e. doctors) in clinics.

For context, following initial discussions with FluCo's employees, the firm's value proposition could be expressed as follows:

***Wholesale-volumes manufacturing of a range of high-quality influenza (i.e. flu) vaccines, which are delivered in a timely manner ahead of local flu seasons to distributors, hospitals, local clinics and doctors, to help protect people from flu***

Table 6.2.1: Sampling criteria for case study selection

| Sampling criteria | Comments |
|---|---|
| ***1 – Vaccine supply industry*** | FluCo meets this criterion by being in the business of flu vaccines manufacturing and marketing |
| ***2 – Business to business (B2B) operations*** | FluCo meets this criterion as it does not directly deal with consumers. Their vaccines reach consumers via distributors, hospitals, small clinics, and doctors |
| ***3 – Large/mature*** | FluCo meets this criterion by being the second-largest flu vaccine manufacturer in the world, and as such it is considered being a top player in the industry, whose senior employees can provide relevant insights for the case study |
| ***4 – E-commerce platform*** | FluCo met this criterion, because introduction of an e-commerce platform was part of the firm's recent post-merger integration strategy, which meant that relevant stakeholders could provide recent insights on its successes and challenges |
| ***5 - Access*** | FluCo also met the criteria of accessibility, as the researcher was able to gain direct access to 11 senior stakeholders within the organisation from relevant areas (incl. commercial, operations, and e-commerce platform leads) to collect inputs |

### *6.2.3 Using the conceptual artefact to express FluCo's business model*

Having selected an appropriate case study, the next step of the artefact development process was to express FluCo's business model using the proposed conceptual artefact. To do so, four senior employees (see Table 4.3.6) were interviewed across the business/commercial and operations departments of the firm based on a semi-structured interview protocol (Table 4.3.7). Their inputs were collated and cross-referenced for similarities (e.g. in terms of meaning and/or expressions). The collated version of the inputs was then sent again to the interviewees for verification, after which it was sent back to the researcher with additional comments and then amended accordingly. The resulting expression of the business model using the conceptual artefact is presented below.

Firstly, a high-level expression of FluCo's business model was defined through the four core dimensions of the artefact: value creation dimension, value delivery dimension, customer dimension, and value capture dimension. This is shown in Table 6.2.2.

Table 6.2.2: FluCo as mapped onto the four dimensions of the business model

| **Value creation dimension** | **Value delivery dimension** | **Customer dimension** | **Value capture dimension** |
|---|---|---|---|
| FluCo leverages its revenues and the outputs of its research and development (R&D) capability, in conjunction with inputs from the World Health Organisation (in terms of which flu strains to produce), to manufacture high quantities of two flu vaccine types | FluCo uses a third-party logistics (3PL) partner and their infrastructure to store and deliver ordered vaccines to their customers on time; FluCo's "marketing and sales" capability ensures vaccines meet the customers' needs (e.g. in terms of quantity ordered) | FluCo's customers pay for, use (if doctors), or distribute downstream (if distributors) the vaccines; the customer returns unused vaccines back to FluCo | FluCo captures the payments made for the vaccines through its e-commerce platform; works with its 3PL provider to collect unused vaccines |

Secondly, an initial understanding of FluCo's value proposition was developed in terms of its tangible, intangible, and monetary flow components *as outputs* of each business model dimension, as shown in Table 6.2.2. As before, the data was cross-referenced from the four interviewees and a collated version of the aforementioned flow components was developed. It was then sent back to each interviewee for verification. A final version of the flow components is shown in Table 6.2.3.

Table 6.2.3: FluCo's value proposition expressed in terms of its tangible, intangible, and monetary flows as an output of each business model dimension

| | **Value creation dimension** | **Value delivery dimension** | **Customer dimension** | **Value capture dimension** |
|---|---|---|---|---|
| ***Tangible*** | A range of flu vaccines (e.g. quadrivalent vaccines, trivalent vaccines) | Flu vaccines that meet the customers' requirements (i.e. in terms of the vaccine type) | Vaccines that have not been used by the customer, or those that expired | N/A, since returned vaccines cannot currently be recycled |
| ***Intangible*** | After creation, FluCo remains responsible for disposal of all vaccines that remain un-used or expire (this is provided as a service) | After creation, FluCo remains responsible for disposal of all vaccines that remain un-used or expire (this is provided as a service) | Customer generates demand by placing orders for more vaccines (this is generated as intangible information for FluCo) for the next flu season | The order data is securely forwarded to the value creation dimension |
| ***Monetary*** | A specific price associated with each vaccine type / per unit (based on R&D, manufacturing costs, etc.) | A price that meets the specific customer's requirements (e.g. based on bulk purchase discounts), but not exceeding the pre-set (regulatory) price | Full-, part-, or invoice- (typically 1 month) payments for their specific vaccines ordered | Payments as revenues, which are converted and reinvested into R&D and manufacturing (or paid out as dividends) |

The initial expression of FluCo's business model based on the four dimensions shown in Table 6.2.2 and FluCo's value proposition shown in Table 6.2.3, demonstrates that the artefact is indeed capable of feasibly expressing a firm's business model.

Interestingly, expressing FluCo's business model using the artefact has shown that the value proposition (and its tangible, intangible, and monetary components) change as they move from one business model dimension to the next. However, to understand how exactly the value proposition changes arguably requires developing a more detailed view of its components. Doing so would also help address the conceptual artefact's "unknowns" (i) and (ii), which were identified at the end of Section 5.3. These "unknowns" relate to the detailed aspects of the value flows, and the potential configuration of the business model. As such, further analysis of the collected inputs of both, the artefact's four dimensions and the value proposition flow

components, were conducted in order to develop additional detail. This is presented and discussed in the next Section.

### *6.2.4 Developing a detailed view of the value proposition flows/components*

As a starting point, to better understand the proposed value flows of the value proposition (incl. tangible, intangible, and monetary components) as captured in the previous Section based on FluCo's case study, it was initially assumed that such "flows" possess certain properties, similar to those that other physical flows would possess (for example how water flowing through a pipe would have volume and speed properties).

Through qualitative analysis of FluCo's business model – based on the data captured so far – it was found that such properties could be identified in the descriptions of the elements below, where the potential properties are highlighted in bold:

- In the value proposition, as captured in Section 6.2.2, where it is defined as follows: *"**Wholesale-volumes (1)** manufacturing of a **range (2)** of **high-quality (3)** influenza (i.e. flu) vaccines, which are delivered in a **timely (4)** manner ahead of local flu seasons to distributors, hospitals, local clinics and doctors, to **help protect (5)** people from flu."*
- In the dimensions of the business model, as captured in Table 6.2.2, where for example the output of the value creation dimension includes *"…to manufacture **high quantities (6)** of **two** flu vaccine **types (7)**."* Or, the output of the value delivery dimension, which includes *"…deliver ordered vaccines to their customers **on time (8)**"* and *"…vaccines **meet** the customers' **needs (9)**."* Or, the customer dimension output, which includes *"returns **unused vaccines (10)** back to FluCo."*
- In the tangible, intangible, and monetary value proposition components flows, as captured in Table 6.2.3, where for example the tangible value creation dimension output is *"A **range (11)** of flu vaccines…"*; or the output of the tangible customer dimension is expressed as *"Vaccines that have **not been used (12)** by the customer, or those that **expired (13)**."*. Similarly, such properties could also be defined for the intangible and monetary outputs of the customer dimension, such as *"…placing **orders for more vaccines (14)** […] for the **next flu season (15)**"* and *"**full-, part-, or invoice- […] payments (16)** for their specific vaccines ordered"*. Intangible outputs of the value creation dimension would include the following description: *"…**responsible for disposal of all vaccines (16)** that remain un-used or expire"* and the following for the monetary output: *"…**specific price (17)** associated with each vaccine type / per unit."* Value capture dimension's intangible output is expressed as follows *"The order data*

*is **securely (18)** forwarded…"*. And finally, the value delivery dimension's monetary output is expressed as follows: *"…meets the **specific customer's requirements (19)**."*

Having identified examples of properties shown above suggests that such properties could indeed exist in the context of the proposed business model artefact. However, it was found that such properties could not be effectively grouped and classified within the artefact, simply because "properties", as a concept, have not been previously considered a part of value proposition flows in the business model literature. To solve for that, inspiration was taken from information systems research – a domain closely linked to the business model literature in its heritage, as discussed in Section 3.4. Specifically, as shown in Section 3.4.4, it was found that flows of data between the nodes of a digital network could be expressed in terms of five characteristics (i.e. 5Vs): (1) volume, (2) velocity, (3) variety, (4) veracity, and (5) value. It is argued here that these characteristics – or *properties* – could also be used in the context of the proposed artefact to express the properties of the value flow components. These properties have been mapped to academic literature, as shown in Table 6.2.4.

Table 6.2.4: Properties of (digital) data flows mapped onto key literature

| | **Volume** | **Velocity** | **Variety** | **Veracity** | **Value** |
|---|---|---|---|---|---|
| ***Grover et al. (2018)*** | Magnitude of data | Speed of data generation | Diversity of formats of data | Quality / reliability of data | N/A |
| ***Jagadish (2015)*** | Amounts of data being generated | Data generation frequency | Distinct and unstructured formats | The quality of the data and its proven real-world application | N/A |
| ***Ferrando-Llopis et al. (2013)*** | Amount of data to be processed and analysed | The speed at which data is created, processed and analysed | Different types of data and data sources | Certainty of data | N/A |
| ***Demchenko et al. (2013)*** | Features as size, scale, amount of data | Speed of data generation | Complexity of data | Data consistency (or certainty), reliability; and trustworthiness | Added-value that the collected data can bring to the intended process or activity |

This research argues that the properties shown in Table 6.2.4 could be equally translated to the proposed business model artefact and applied outside of the pure information systems context. Specifically, not only intangible, but physical and monetary value flows could also be described using the above properties, and provide a systematic way to analyse (and potentially re-configure) the flows as they move from one dimension of the business model to the next.

For the purpose of the artefact being developed here, by building on the definitions from Table 6.2.4 and cross-referencing them with Table 5.2.2, the properties could be mapped onto the three value proposition flow components as shown in Table 6.2.5. However, whereas the properties of the monetary flows clearly relate to the financial aspects of the value proposition (e.g. cost/price), the distinction between the properties of the tangible and intangible flows is more nuanced and will need to be investigated in more detail. For now, these properties simply describe either the physical (i.e. tangible) elements of the value proposition, or the data service/knowledge (i.e. intangible) elements.

Table 6.2.5: Properties of tangible, intangible, and monetary value proposition flows / components in the business model artefact context

| | **Tangible flow (physical)** | **Intangible flow (information/service/ knowledge)** | **Monetary flow (money/payments)** |
|---|---|---|---|
| ***Volume*** | Physical size/quantity of the flow | Length/amount of flow | Cost/price of the flow |
| ***Velocity*** | Speed and frequency of flow | Speed and frequency of flow | Speed and frequency of flows |
| ***Variety*** | Variety and complexity of the flow | Composition of the flow | Currency of the flow |
| ***Veracity*** | Quality and reliability of the flow | Quality and reliability of the flow | Reliability of payment |
| ***Value*** | Ability of the flow to generate additional value | Ability of the flow to generate additional value | Ability of the flow to create additional monetary flows |

Going back to the qualitative analysis that was done at the beginning of Section 6.2.4, the identified properties could also be mapped onto the 5Vs from Table 6.2.4, as shown in Table 6.2.6.

Table 6.2.6: Various value proposition flow properties as captured using the FluCo case study; mapped to the 5V properties

| | **Tangible flow (physical)** | **Intangible flow (information/service/ knowledge)** | **Monetary flow (money/payments)** |
|---|---|---|---|
| ***Volume*** | ***Wholesale-volumes (1); high quantities (6)*** | *placing* ***orders for more vaccines (14);*** *responsible for disposal of* ***all vaccines (16)*** | ***specific price (17)*** |
| ***Velocity*** | ***timely (4); on time (8)*** | ***next flu season (15)*** | - |
| ***Variety*** | ***range (2); two*** *flu vaccine* ***types (7); range (11)*** *of flu vaccines* | - | ***full-, part-, or invoice-[…] payments (16)*** |
| ***Veracity*** | ***high-quality (3); meet*** *the customers'* ***needs (9); unused vaccines (10); not been used (12); expired (13)*** | ***securely (18)*** | ***specific customer's requirements (19)*** |
| ***Value*** | ***help protect (5)*** | ***responsible*** *for disposal of all vaccines (16)* | - |

Table 6.2.6 shows that it is indeed possible to group the various value flow properties identified using the artefact along the 5Vs (i.e. volume, velocity, variety, veracity, value); and although FluCo's identified value flows do not map across *all* of the properties, the initial results suggest that the 5V approach could still potentially be used to effectively define the properties of the tangible, intangible, and monetary components of a value proposition flow.

The ability to define the properties of the tangible, intangible, and monetary value flows also potentially opens up a way to (re-)configure the overall value proposition, and by extension, a way to (re-)configure (and as such, arguably improve) the overall business model of an organisation in a highly granular way. This view is similar to Srai and Gregory (2008), who proposed that *re-configurability* of a supply network (which among other things accounts for tangible and intangible flows within it), can be expressed as *"the ability to rearrange key elements of the supply network, as an alternative permutation from the current state, to enable improvements in the supply or development […] of the product or service […]"* (p.394). With that in mind, the (re-)configuration process of a business model could be expressed as:

***The act of changing the properties of the value proposition to an alternative permutation to the current configuration, to systematically identify areas for potential improvement of the overall business model***

### *6.2.5 Additional artefact development points*

In addition to defining value flow properties, capturing interview data from the FluCo employees and expressing the flows as artefact outputs allowed to identify a number of additional development points for the artefact. These are discussed below.

Firstly, after engaging with the interviewees it became clear quite quickly that the proposed version of the artefact (as shown in Figure 5.2.5) did not have a specific starting point from which one could start reviewing the business model. As such, upon presentation of the artefact, the interviewees would "instinctively" start working through it by first defining the high-level value proposition (as in Section 6.2.2) and then expressing it in more detail (i.e. in terms of the tangible, intangible, and monetary components), beginning at the value creation dimension and then moving on to the next dimension of the business model (e.g. as shown in Table 6.2.2 and Table 6.2.3). Although this approach was not wrong, it highlighted that the proposed artefact did not have a specific *method* of application/utilisation associated with it. However, developing a method – that is developing conceptual, yet actionable instructions for performing a task (Peffers et al., 2007) – is one of the key outputs of design-science-driven research (as discussed in Chapter 4).

Secondly, despite being significantly influenced by network literature (see Section 3.4.4), the proposed business model artefact maintains a firm-focal view. As such, it does not account for external players that provide relevant inputs into the various dimensions of the business model. This drawback became evident during the initial interviews. As an example, through the discussions with the interviewees, it was noticed that FluCo's value creation dimension may use its capabilities to source relevant inputs from outside stakeholders (e.g. raw materials from suppliers, financing from banks) to create tangible outputs. Similarly, the value capture dimension may use its capabilities to distribute a share of the monetary flows captured from the customer to outside stakeholders (e.g. loan providers, shareholders). Although describing those relationships in detail falls outside of the scope of this research, they still need to be acknowledged in the artefact to, at the very least, provoke the user of the artefact to consider the role of the external stakeholders when reviewing business model through the artefact's configuration lens.

Thirdly, the interviews further highlighted that having just one monetary flow component of a value proposition did not seem appropriate. That is, because it could be argued that both, a tangible flow and an intangible flow could exist on their own, yet a monetary flow could not. This is supported by the observation that within the case study a monetary flow was always

accompanied by at least a tangible or an intangible value flow, or by both (even if they were not necessarily taking place at the same time), suggesting that there potentially needs to be two monetary flows within one value proposition, one paired up with each of the two other flows: (1) a tangible monetary flow and (2) an intangible monetary flow. This thinking also solves the issue encountered during the case study, where a single monetary flow needed to account for both, the tangible and intangible flows, thereby reducing clarity in what the given monetary flow actually accounts for (i.e. for the tangible or the intangible value flow?). For example, where the value delivery component of FluCo's business model output (tangible) vaccines for the customer, while simultaneously offering the (intangible) service of collecting unused or expired vaccines – it would have been more practical to assign a separate monetary flow to each of the two flows/components.

Finally, while mapping the properties of FluCo's value flows onto the 5Vs, as shown in Table 6.2.6, it appeared that *value* property of the *monetary* flow could not be adequately expressed and captured, arguably because it was irrelevant in the monetary context, as monetary flows are intrinsically "valuable". Furthermore, having identified the 5V properties of the value flows, it was argued that they could provide a foundation for (re-)configuring the flows and therefore would require a relevant approach. Specifically, it would be helpful to not only understand how to configure the flows (i.e. in terms of the different properties), but to also simply help identify whether they are configured at all or not, suggesting that there might be a binary view of the configuration of the value proposition flows properties. That is, there could be a view where the properties of the value proposition flows can only be in two states, either *configured* or *not-configured*. A view like that would allow to quickly spot opportunities for improvement of the overall business model by revealing simple configuration fit gaps (i.e. properties that are "not-configured" to fit the requirements of the next dimension). This logic is similar to the network configuration approach discussed in Section 3.5, which suggests that each of the network elements must be arranged in a logical and complementary manner in order to establish effective and efficient systems.

### *6.2.6 Implementation of artefact development points based on FluCo case study*

This Section builds on the development points identified in Sections 6.2.4 and 6.2.5 to "develop" the next version of the business model artefact. These development points can be summarised as follows:

1. Addition of five properties to describe the individual tangible, intangible, and monetary components of the value flows, which include volume, velocity, variety, veracity, and

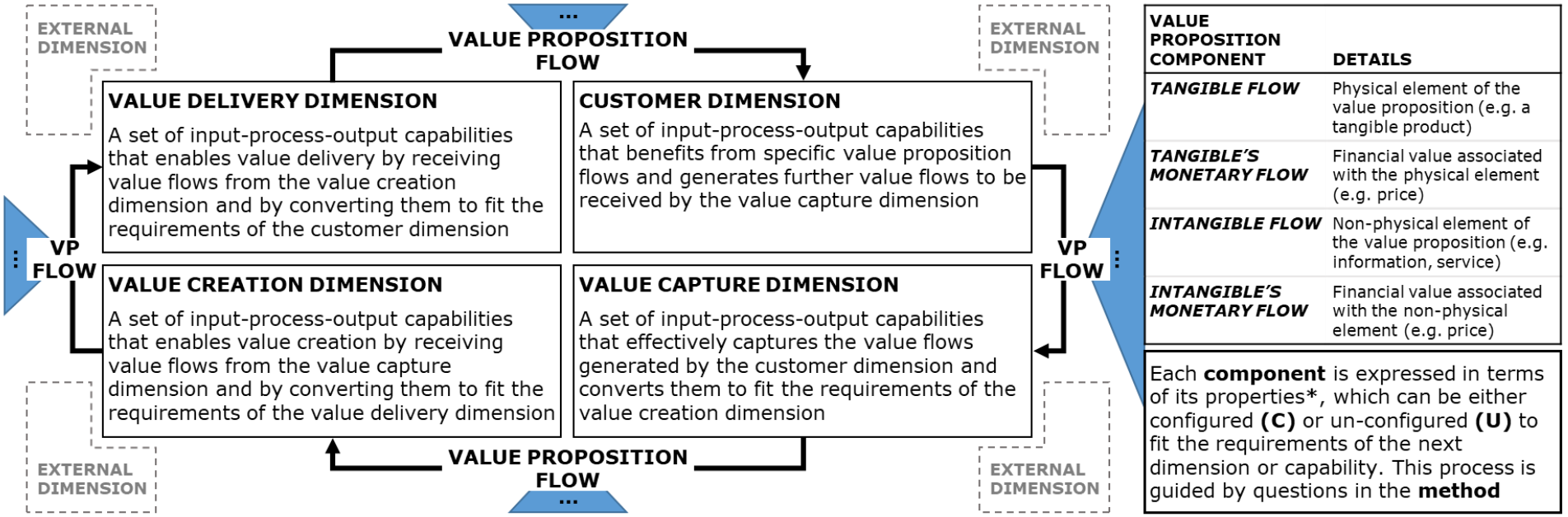
value, where the latter is only used to describe the tangible and intangible components, and not the monetary components, as they are seen as intrinsically "valuable". A more detailed description of the properties and how they relate to the tangible, intangible and monetary components is expressed in Table 6.2.5

2. Addition of external dimensions (as "nodes") to account for external input providers or output beneficiaries at the various business model dimensions. This could include for example, raw materials provided to the value creation dimension, external delivery infrastructure provided at the value delivery dimension, external value propositions that the customer benefits from when using the business model's core value proposition (e.g. plug-ins for the e-commerce platform that are created by external developers to enhance your value proposition), or shareholders receiving outputs (e.g. dividend payments) from the value capture dimension
3. Separation of the monetary flow component of the value proposition into two, where each monetary component is associated with a tangible and an intangible component, respectively
4. Addition of a view that value flows must be configured appropriately in order to fit the requirements of each business model dimension. If the flows do not meet the requirements of the dimensions (i.e. of their capabilities), then the value flows are considered "un-configured", arguably leading to suboptimal operation of the business model. As such, the tangible, intangible, and the respective monetary flows, can reach the dimensions of a business model in either of the two states:
   (i) A **configured state**, which suggests that a flow can be received and processed by the dimension's capabilities in its current state, without the need for re-configuration of the flow. For example, consider the velocity property of a tangible value flow, which describes the speed and frequency of the physical flow aspects of the value proposition. A configured velocity property of a value flow would essentially mean that the flow reaches a dimension at a speed and frequency that is valuable/suitable for the dimension and it can receive and process the flow using its existing capabilities (to then also generate an output)
   (ii) An **un-configured state**, which suggests that the flow cannot be received and processed by the dimension's capabilities in its current state, and needs to be re-configured. Therefore, for a not-configured velocity property of a value flow it would mean that the flow reaches the dimension at a speed and frequency that is

not valuable/suitable for the node as it would not be able to process the flow (e.g. if it is too fast)

5. Finally, the addition of an artefact "method" to support the application of the artefact in a practical context. This is discussed in more detail in Section 6.2.7.

Taking these artefact development points into account, and building on the first version of the artefact shown in Figure 5.2.5, the updated version of the artefact can be visually expressed as shown in Figure 6.2.1. The artefact visualises the business model elements as a collection of four dimensions, which are linked through a value proposition flow that consists of four components: the tangible flow, the intangible flow, and their respective associated monetary flows. These value proposition flows change as they flow through the capabilities of each dimension of the business model in terms of their properties (i.e. volume, velocity, variety, veracity, and value), and these flows can also either be configured (C) or un-configured (U). This means that the flows are either appropriately configured to fit the requirements of the next dimension, or not, arguably determining optimal operation of a business model. Additionally, the artefact visualises the external dimensions that may feed into and receive value flows from each of the business model's four dimensions.




* The properties are: **VOLUME** (physical size/quantity, length/amount, cost/price of the flow), **VELOCITY** (speed and frequency of the flow), **VARIETY** (variety and complexity of the flow), **VERACITY** (quality and reliability of the flow), and **VALUE**[1] (ability of the flow to generate additional value)

Figure 6.2.1: Visualisation of the developed business model design artefact (Note 1: value property does not apply to monetary flows)

### *6.2.7 Artefact (utilisation) method development*

As mentioned in the previous Section, in order to effectively utilise the developed artefact in a practical context, it is necessary to establish an appropriate artefact *method*. In design-science terms, this means developing a set of conceptual, but actionable instructions for performing a task based on a specific *model* (Peffers et al., 2007) – the model being the developed business model artefact shown in Figure 6.2.1. This Section proposes such a method, which is developed based on the original interview protocol (see Table 4.3.7), the flow of the interactions with the interviewees from FluCo when discussing the proposed artefact and analysing FluCo's business model, and the addition of the identified development points to the artefact (e.g. the properties of the value flows). In that sense, method development was based on the dimensions of the artefact, with the value proposition dimension acting as a starting point of the six proposed steps. These steps are described below:

**(1)** Define the value proposition in terms of its value creation, delivery and capture activities, as well as who it is intended for, for example as was shown in the case study box in Section 6.2.2

**(2)** Express the business model at each business model dimension in terms of the defined value proposition, starting with the value creation dimension, for example as was done in Table 6.2.2

**(3)** Express the value proposition in terms of the four value flow types/components (i.e. tangible, intangible, and their respective monetary flows) at each business model dimension, starting as an output of the value creation dimension. This would be similar to how it was done in Table 6.2.3, but with two monetary flows – one associated with each of the other two flows (i.e. tangible and intangible), instead of just one

**(4)** Break up each value flow component (i.e. tangible, intangible, etc.) and express it in terms of its five (or four for the monetary component) properties at each dimension of the business model as they flow through the input-process-output capabilities of the dimensions. This will be evaluated in Section 6.3 by utilising the data gathering instrument shown in the methodology Section (see Table 4.3.10)

**(5)** Review the information captured in the data gathering instrument and identify properties where the value proposition flows are un-configured – that is where a flow's property does not fit the requirements of the receiving capability. Next, consider options to reconfigure the flows (e.g. change the output capability to make the flow fit the dimension, change the receiving capability, or remove the flow). Questions to ask at

each dimension to whether they are configured or not would be based on the 5V properties, and would include:

a. Does the value proposition (i.e. product, service) flow in the right quantity and at the right cost/price?
b. Does the value proposition (i.e. the physical product, the service, the payment) flow at the right speed and frequency?
c. Does the value proposition (i.e. the physical product, the service, the payment) flow in the right composition/type/format?
d. Do the value proposition flows meet the quality and reliability requirements of the receiving dimension?
e. Do the tangible and intangible value proposition flows meet the value expectations of the receiving dimension?

**(6)** Having generated a number of options for potential re-configuration in the previous step, it is necessary to have a way of assessing whether these options are at all viable for implementation. In order to support this process, the established Desirability-Feasibility-Viability framework presents a helpful, yet simple device. This framework is borrowed from the design-thinking literature (e.g. Brown, 2009), and at its simplest, suggests that optimal choices are found at the intersection of three properties:

a. Desirability – that is whether there is demand or need for the given option,
b. Feasibility – that is whether the option can realistically be implemented, and
c. Viability – that is whether the option can be successfully implemented (i.e. is it worth it economically?).

With the DFV framework in mind, configuration options can be quickly and effectively tested at the business model level by assigning a "yes", "no", or a "conditional" response for each criterion, based on the inputs gathered from conversations with the interviewees (Mueller and Thoring, 2012). However, it should be noted that identifying a proper response will require a certain level of familiarity with the business and/or general business acumen by the person utilising the artefact/framework

The six steps of the proposed method can be captured more visually as shown in Figure 6.2.2.

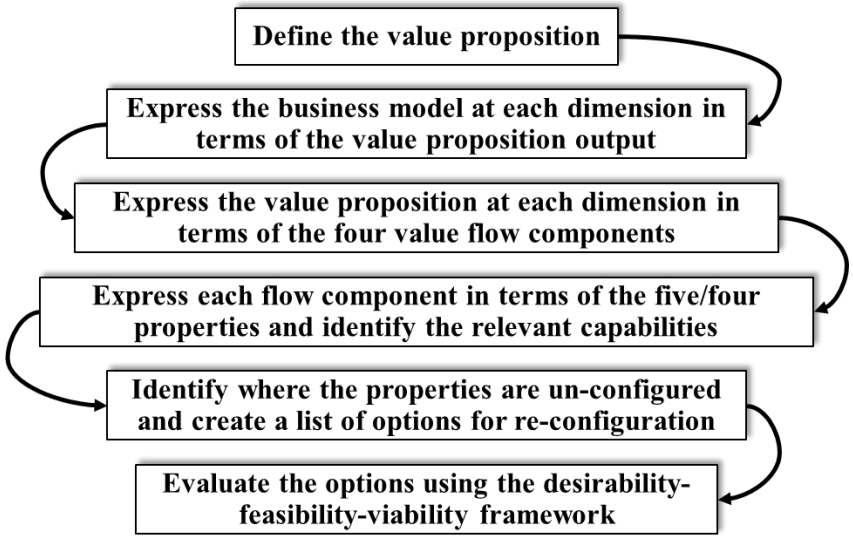



Figure 6.2.2: The business model artefact utilisation method

### *6.2.8 Artefact development summary*

Section 6.2 focused on the development of the previously conceptualised artefact (see Figure 5.2.5) by leveraging inputs from case study interviews. The development points included in the updated version of the artefact, as shown in Figure 6.2.1, are:

- Separation of the monetary flow component into two separate flows, each to become associated with the respective tangible and intangible flow (because tangible and intangible flows may have different monetary properties associated with them)
- Addition of *"external nodes"* for each of the four core business model dimensions. This is to account for outside stakeholders that provide inputs (e.g. raw materials) to the business; or who benefit from outputs of the business (e.g. dividend payments)
- Introduction of five properties for each of the value proposition flow components, including volume, velocity, variety, veracity, and value[6]. This is to enable (re-)configuration of the value proposition components, and the underlying business model. It is supplemented by a binary configuration view of the various properties of the value flows to quickly identify re-configuration opportunities
- Removal of the *"value"* property of the monetary flow, as it was found to be redundant
- Development of an artefact utilisation *method*. The method presents a set of six actionable steps to utilise artefact in order to systematically analyse a business model

[6] Value property does not apply to monetary flows

## 6.3 Data presentation and artefact evaluation

### 6.3.1 Introduction

This Section evaluates the developed business model artefact and method presented in Figure 6.2.1 and Figure 6.2.2, respectively, by conducting additional interviews with stakeholders from FluCo that have not been interviewed during the development stage (for interviewee list see Table 4.3.8). As set out in Section 6.2.7, the approach included the use of an interview protocol shown in Table 4.3.9 to discuss and capture FluCo's business model through the lens of the updated artefact (Figure 6.2.1) while utilising the data gathering instrument (shown Table 4.3.10) to capture FluCo's value proposition properties. This aided the ultimate goal of this Section, which was to test the artefact's ability to provide a *satisfactory* solution to the *"business model design in the vaccine supply and B2B e-commerce context"* (see Section 4.3.8 for details), and also to evaluate whether the artefact meets the performance criteria as defined in Table 4.3.2. The following Sections present and discuss the "ex-post" evaluation process of the artefact along the six method steps developed in Section 6.2.7, as shown in Figure 6.2.2.

### 6.3.2 Step 1: Defining the value proposition

Defining FluCo's value proposition was a relatively simple, but critical exercise. This is because this step is the cornerstone of all subsequent steps of the method, since the definition of the value proposition informs all other parts of the artefact. Helpfully, it was found that the definition proposed in Section 6.2.2 (i.e. "*Wholesale-volumes manufacturing of a range of high quality influenza (i.e. flu) vaccines, which are delivered in a timely manner ahead of local flu seasons to distributors, hospitals, local clinics and doctors, to help protect people from flu"*), ultimately resonated with each of the seven interviewees. More importantly, the definition mapped across the four business model dimensions, as it included aspects like *"manufacturing"*, which reflects the *"value creation"* dimension; the *"timely delivery"*, which reflects the *"value delivery"* dimension; the *"distributors, hospitals, local clinics and doctors"*, which reflect the *"customer"* dimension; and *"help people"*, which reflects the *"value capture"* dimension of the business model.

However, it should be noted that arriving at that definition required additional guidance from the researcher, because each interviewee had a slightly different understanding of what a *"value proposition"* was. Specifically, a number of interviewees initially said that FluCo's value proposition is simply a *"flu vaccine"*, without specifying any additional details about it. Three other interviewees went a step further to say that the value proposition is the "s*ale of flu vaccines*". Only one interviewee said from the start that FluCo's value proposition is the

*"manufacturing and delivery of flu vaccines to their customers"* and thereby being the only person to indicate the involvement of actual *activities* in the creation and delivery of the value proposition.

### 6.3.3 *Step 2: Expressing the business model at each dimension in terms of the value proposition*

Similar to the first step of the method, the interviewees involved in the artefact evaluation process were mostly in agreement with the original expression of FluCo's business model along the four proposed dimensions (i.e. in agreement with the expression developed during the development stage of the artefact, as shown in Table 6.2.2). However, to more accurately reflect the developed artefact, with the inclusion of the external "nodes" of the business model, FluCo's firm-focal business model was updated at every dimension of the artefact based on the inputs from the seven interviewees. These inputs were collated and sent back to the interviewees for further comments. The output of this resulted in FluCo's business model being expressed as shown Figure 6.3.1., demonstrating clearly distinct functions of each dimension within the business model.

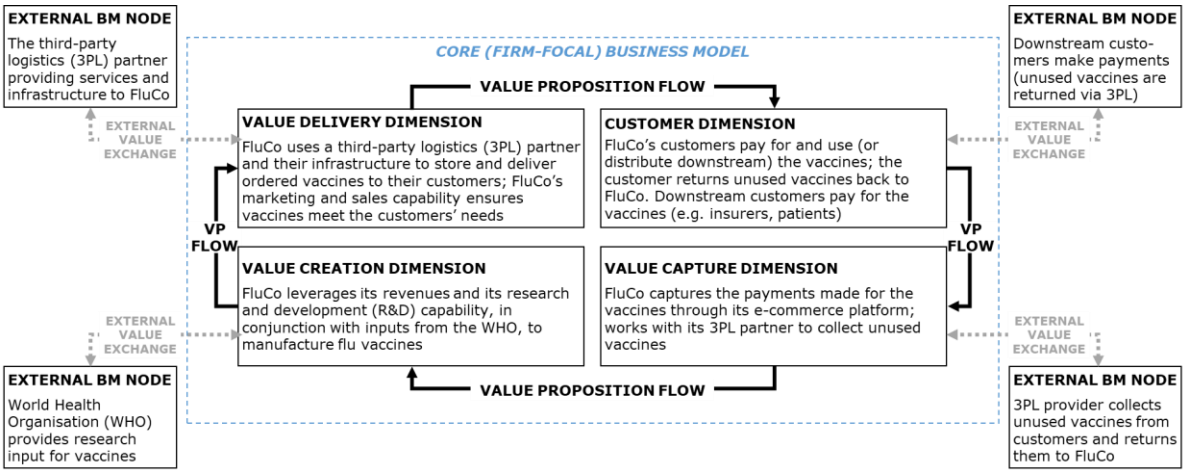



Figure 6.3.1: FluCo's business model expressed using the proposed artefact

In the process of expressing the business model as shown in Figure 6.3.1, it was found that the definition of each dimension (see Table 5.2.3) did not fully resonate with the interviewees as it was too *"high-level"* or *"too unspecific"*. As such, the definitions of each dimension within the artefact were updated and reviewed with the interviewees, and then defined such as shown in Table 6.3.1, providing a more specific view of what the four dimensions are responsible for and how they function.

Table 6.3.1: Updated business model artefact dimensions descriptions

| **Artefact dimension** | **Definition/role** |
|---|---|
| ***Value creation dimension*** | A set of input-process-output capabilities that work together to recombine the value flows received from the value capture dimension (e.g. recycled materials, usage data, money) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the value delivery dimension that then prepares them for the customer, while accounting for the requirements of the external nodes relevant to the value creation dimension (e.g. suppliers, data providers, financial services) |
| ***Value delivery dimension*** | A set of input-process-output capabilities that work together to recombine the value flows received from the value creation dimension (e.g. product, service, price) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the customer dimension, while accounting for the requirements of external nodes relevant to the value delivery dimension (e.g. physical infrastructure) |
| ***Customer dimension*** | A set of input-process-output capabilities that benefit from the value flows received from the value delivery dimension of the business model (e.g. a product/service at a particular price), as well as the flows from external nodes (e.g. additional product/service features not provided by the main business model) for which the customer then provides value flows in return (e.g. returned materials, demand/usage data, payments), to be captured by the value capture dimension |
| ***Value capture dimension*** | A set of input-process-output capabilities that work together to recombine the value flows received from the customer (e.g. returned materials, demand/usage data, payments) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the value creation dimension, while accounting for the requirements of external nodes relevant to the value capture dimension (e.g. shareholders) |

### *6.3.4 Step 3: Expressing the value proposition at each dimension in terms of the four value flow components*

Having found that FluCo's business model can be effectively expressed in terms of its dimensions (as shown in Figure 6.3.1), it was necessary to evaluate whether the artefact could also be used to express FluCo's value proposition in more detail, by breaking it down into its four components (tangible, intangible, and respective monetary flows). This was done through interviews with FluCo's stakeholders by building on the definition captured shown in Table 6.2.3. By collating the responses from the interviewees, a new version was developed, as shown in Table 6.3.2, which effectively differentiates between the value proposition's various components.

Table 6.3.2: FluCo's value proposition components expressed as outputs of each business model artefact dimension

| Value proposition component | **VALUE CREATION DIMENSION** | **VALUE DELIVERY DIMENSION** | **CUSTOMER DIMENSION** | **VALUE CAPTURE DIMENSION** |
|---|---|---|---|---|
| ***Tangible flow*** | A range of flu vaccines (e.g. quadrivalent vaccines, trivalent vaccines) | Flu vaccines that meet the customers' requirements (i.e. in terms of the vaccine type) | Expired or unused vaccines | N/A (returned vaccines cannot currently be recycled) |
| ***Tangible's monetary flow*** | A price associated with each vaccine type/per unit at 'transfer pricing' (based on R&D, manufacturing costs, etc.) | A price that meets the specific customer's requirements (e.g. based on bulk purchase discounts), but not exceeding the regulated price | A full- or part-payment for the ordered vaccines | Payments for vaccines captured as revenues, which are converted and reinvested back into value creation dimension (or paid out to external nodes as dividends) |
| ***Intangible flow*** | After creation, FluCo remains responsible for disposal of the vaccines if they remain un-used or expire (this is provided as a service) | After delivery, FluCo remains responsible for disposal of the vaccines if they remain un-used or expire (this is provided as a service) | Customer generates demand by placing orders for more vaccines (this is generated as intangible information for FluCo) | The order data is forwarded to the value creation dimension |
| ***Intangible's monetary flow*** | Cost associated with being responsible for collecting unused vaccines is included in the cost of the vaccines | Cost associated w/ remaining responsible for collecting unused vaccines is included in the cost of the vaccines passed on to the customer | Currently no monetary payments made associated with intangible value flows | Currently no payments are captured as none are generated by the customer |

### 6.3.5 *Step 4: Expressing each flow component in terms of the five/four properties and identifying the relevant IPO capabilities*

The next step of the proposed method is capturing and expressing the value proposition at a deeper level, so that not only its components, but also the properties of each component could be analysed. This is a critical step, which allows to build a more granular understanding of how the value proposition changes, as it flows from one dimension to the next. The IPO capabilities, which enable and facilitate the change of the value proposition components' properties are also captured. For this purpose, the data gathering instrument, which was created based on the first version of the artefact (as presented in Table 4.3.10 in the methodology Chapter) was used. The empty and the completed instruments are shown below in Figure 6.3.2. However, for convenience of presentation, the instrument was broken down into sixteen tables, each of which captures how a particular flow component, and its specific properties, could be expressed at each of FluCo's dimensions as they move through the input, process, and output capabilities. These tables are shown in the following pages. The relevance of the text highlighted in different (blue) font colours in each of the tables will be explained in Section 6.3.6.

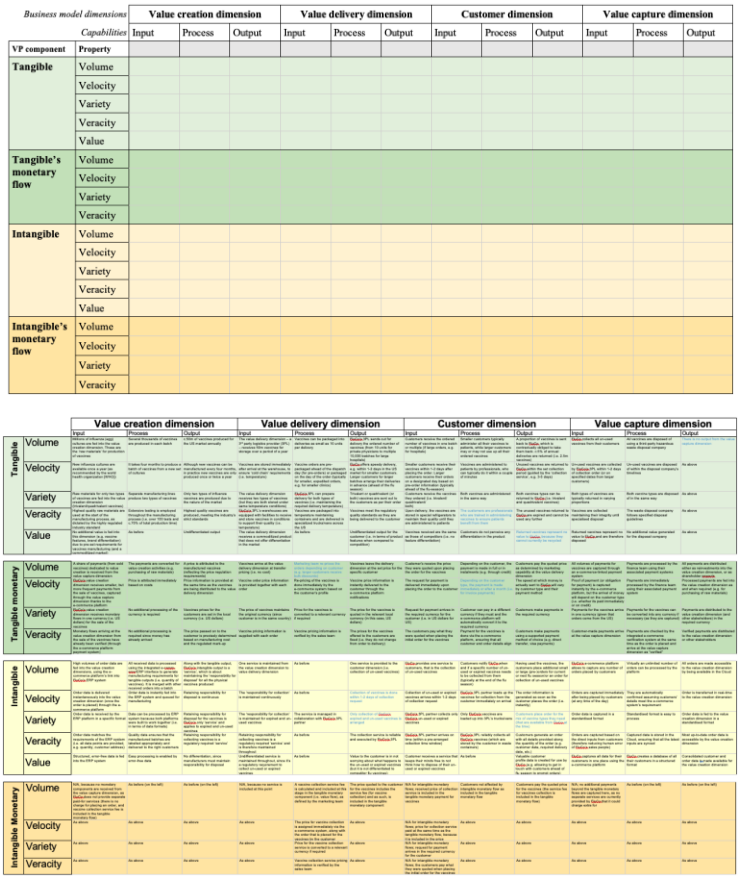


Figure 6.3.2: (a) Top – empty data gathering instrument
(b) Bottom - completed data gathering instrument

Table 6.3.3: Tangible value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | Millions of influenza (egg) cultures are fed into the value creation dimension. These are the 'raw materials' for production of vaccines | Several thousands of vaccines are produced in each batch | c.50m of vaccines produced for the US market annually |
| ***Velocity*** | New influenza cultures are available once a year (as recommended by the world health organization [WHO]) | It takes four months to produce a batch of vaccines from a new set of cultures | Although new vaccines can be manufactured every four months, in practice new vaccines are only produced once or twice a year |
| ***Variety*** | Raw materials for only two types of vaccines are fed into the value creation dimension (trivalent/quadrivalent vaccines) | Separate manufacturing lines produce two types of vaccines | Only two types of influenza vaccines are produced due to the nature of the market |
| ***Veracity*** | Highest quality raw materials are used at the start of the manufacturing process, as dictated by the highly regulated industry standard | Extensive testing is employed throughout the manufacturing process (i.e. over 100 tests and c.70% of total production time) | Highest quality vaccines are produced, meeting the industry's strict standards |
| ***Value*** | No additional value is fed into this dimension (e.g. vaccine features, brand differentiation) due to requirements for vaccines manufacturing (and a commoditized market) | As before | Undifferentiated output |
| ***IPO capabilities examples*** | R&D/innovation capability, raw materials sourcing, manufacturing/vaccine production, product labelling, quality control | | |

Table 6.3.4: Tangible's monetary value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | A share of payments dedicated to value creation is received from the value capture dimension | The payments are converted for value creation activities (e.g. purchasing of raw materials) | A price is attributed to the manufactured vaccines (reflecting the price regulation requirements) |
| ***Velocity*** | FluCo's value creation dimension receives smaller, but more frequent payments from the value capture dimension thanks to e-commerce platform | Price is attributed immediately based on costs | Price information is provided at the same time as the vaccines are being distributed to the value delivery dimension |
| ***Variety*** | FluCo's value creation dimension receives monetary flows in one currency (i.e. US dollars) | No additional processing of the currency is required | Prices for the customers are set in the local currency (i.e. US dollars) |
| ***Veracity*** | Monetary flows arriving at the value creation dimension have already been verified | No additional processing of the currency is required | The price passed on to the customer is precisely determined based on manufacturing cost and the regulated mark-up |
| ***Value*** | The combination of the above properties makes the monetary flows valuable | As before | As before |
| ***IPO capabilities examples*** | Financial sourcing capability | | |

Table 6.3.5: Intangible value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | High volumes of order data are fed into the value creation dimensions, using the e-commerce platform's link into FluCo's ERP system | All received data is processed using the integrated e-comm-erce/ERP interface to generate manufacturing requirements for tangible outputs (i.e. quantity of vaccines). It is merged with other received orders into a batch | Along with the tangible output, FluCo's intangible output is a 'service', which is about maintaining the 'responsibility for disposal' for all the physical vaccines produced |
| ***Velocity*** | Order data is delivered instantaneously into the value creation dimension (once the order is placed) through the e-commerce platform | Order data is instantly fed into the ERP system and queued for manufacturing | Retaining responsibility for disposal is continuous |
| ***Variety*** | Order data is received by the ERP platform in a specific format | Data can be processed by ERP system because both platforms were built to work together (i.e. in terms of data formats) | Retaining responsibility for disposal for the vaccines is FluCo's only 'service' and applies to expired and un-used vaccines |
| ***Veracity*** | Order data matches the requirements of the ERP system (i.e. all data points are provided, e.g. quantity, customer address) | Quality data ensures that the manufactured batches are labelled appropriately and delivered to the right customers | Retaining responsibility for collecting vaccines is a regulatory required 'service' |
| ***Value*** | Structured, error-free data is fed into the ERP system | Easy processing is enabled by error-free data | No differentiation, since manufacturers must maintain responsibility for disposal |
| ***IPO capabilities examples*** | Order data processing capability (i.e. an ERP system) | | |

Table 6.3.6: Intangible's monetary value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | N/A, because no monetary components are received from the value capture dimension. This is because FluCo does not provide separate paid-for services (there is no charge for placing an order, and vaccine collection service fee is included in the tangible monetary flow) | As before (on the left) | As before (on the left) |
| ***Velocity*** | As above | As above | As above |
| ***Variety*** | As above | As above | As above |
| ***Veracity*** | As above | As above | As above |
| ***IPO capabilities examples*** | N/A | | |

Table 6.3.7: Tangible value proposition component at FluCo's value delivery dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | The value delivery dimension – a 3rd party logistics provider (3PL) – receives 50m vaccines for storage over a period of a year | Vaccines can be packaged into deliveries as small as 10 units per delivery | FluCo's 3PL sends out for delivery the ordered number of vaccines (from 10 units for private physicians to multiple 10,000 batches for large hospitals) |
| ***Velocity*** | Vaccines are stored immediately after arrival at the warehouse, to ensure 'cold chain' requirements (i.e. temperature) | Vaccine orders are pre-packaged ahead of the dispatch day (for pre-orders) or packaged on the day of the order (typically for smaller, expedited orders, e.g. for smaller clinics) | FluCo offers speedy delivery, e.g. within 1-2 days in the US market for smaller customers. Larger customers for larger batches arrange their deliveries in advance (ahead of the flu season) |
| ***Variety*** | The value delivery dimension receives two types of vaccines (but they are both stored under same temperature conditions) | FluCo's 3PL can prepare delivery for both types of vaccines (i.e. maintaining the required delivery temperature) | Trivalent or quadrivalent (or both) vaccines are sent out to the customers as per their order |
| ***Veracity*** | FluCo's 3PL's warehouses are equipped with facilities to receive and store vaccines in conditions to support their quality (i.e. temperature) | Vaccines are packaged into temperature maintaining containers and are delivered in specialized trucks/vans across the US | Vaccines meet the regulatory quality standards as they are being delivered to the customer |
| ***Value*** | The value delivery dimension receives a commoditized product that does not offer differentiation in the market | As before | Undifferentiated output for the customer (i.e. in terms of product features when compared to competition) |
| ***IPO capabilities examples*** | Infrastructure (e.g. warehouses, delivery trucks, order tracking systems, cooling systems), customer support/aftercare | | |

Table 6.3.8: Tangible's monetary value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | Vaccines arrive at the value delivery dimension at transfer pricing (i.e. no cost) | Marketing team re-prices the orders depending on customer (e.g. larger customers receive bulk discounts) | The sales team ensures the right price is provided to the customer |
| ***Velocity*** | Price information is provided together with each order | Re-pricing is done immediately by the e-commerce system based on the customer's profile | Price information is instantly delivered to the customer through the e-commerce platform |
| ***Variety*** | The price of vaccines maintains the original currency (since customer is in the same country) | Price is converted to a relevant currency if required | The price is quoted in the relevant local currency (in this case, US dollars) |
| ***Veracity*** | Pricing information is supplied with each order | Pricing information is verified by the sales team | The prices offered to the customers are fixed (i.e. they do not change from order to delivery) |
| ***Value*** | The combination of the above properties makes the monetary flows valuable | As before | As before |
| ***IPO capabilities examples*** | Costing and pricing capability (although not as relevant for FluCo because prices are regulated) | | |

Table 6.3.9: Intangible value proposition component at FluCo's value delivery dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | One service is maintained from the value creation dimension to value delivery dimension | As before | One service is provided to the customer dimension (i.e. collection of un-used vaccines) |
| ***Velocity*** | The 'responsibility for collection' is maintained continuously | As before | Collection of vaccines is done within 1-2 days of collection request[7] |
| ***Variety*** | The 'responsibility for collection' is maintained for expired and un-used vaccines | The service is managed in collaboration with FluCo's 3PL partner | Only collection of FluCo's expired and un-used vaccines is arranged[7] |
| ***Veracity*** | Retaining responsibility for collecting vaccines is a regulatory required 'service' and is therefore maintained throughout | As before | The collection service is reliable and executed by FluCo's 3PL |
| ***Value*** | Undifferentiated service is maintained throughout, since it's a regulatory requirement to collect un-used or expired vaccines | As before | Value to the customer is in not worrying about what happens to the un-used or expired vaccines (but it is not differentiated to competitor flu vaccines) |
| ***IPO capabilities examples*** | Order tracking system, customer care team and service delivery capabilities | | |

[7] Relevance of blue font discussed in Section 6.3.6

Table 6.3.10: Intangible's monetary value proposition component at FluCo's value delivery dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | N/A, because no service is included at this point | A vaccine collection service fee is calculated and included at this stage in the tangible monetary component (i.e. value flow), as defined by FluCo's marketing team | The price (and other properties) quoted to the customer for the vaccines includes the service fee (for vaccine collection) and as such, is included in the tangible monetary component |
| ***Velocity*** | As above | The price for vaccine collection is assigned immediately via the e-commerce system, along with the order that is placed for the vaccines by the customer | As above |
| ***Variety*** | As above | Price for the vaccine collection service is converted to a relevant currency if required | As above |
| ***Veracity*** | As above | Vaccine collection service pricing information is verified by the sales team | As above |
| ***IPO capabilities examples*** | N/A | | |

Table 6.3.11: Tangible value proposition component at FluCo's customer dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | Customers receive the ordered number of vaccines in one batch or multiple (if large orders, e.g. for hospitals) | Smaller customers typically administer all their vaccines to patients, while larger customers may or may not use up all their ordered vaccines | A proportion of vaccines is sent back to FluCo, which is contractually obliged to take them back. c.5% of annual deliveries are returned (i.e. 2.5m vaccines) |
| ***Velocity*** | Smaller customers receive their vaccines within 1-2 days after placing the order. Larger customers receive their orders on a designated day based on pre-order information (typically ahead of the flu-season) | Vaccines are administered to patients by professionals, who can typically do it within a couple of minutes | Unused vaccines are returned to FluCo within the set collection period (guided by the 'collection service', e.g. 3-5 days) |
| ***Variety*** | Customers receive the vaccines they ordered (i.e. trivalent/ quadrivalent/ both) | Both vaccines are administered in the same way | Both vaccines types can be returned to FluCo (i.e. trivalent and quadrivalent vaccines) |
| ***Veracity*** | Upon delivery, the vaccines are stored in special refrigerators to maintain their quality until they are administered to patients | The customers are professionals who are trained in administering vaccines to ensure patients benefit from them[8] | The unused vaccines returned to FluCo are expired and cannot be used any further |
| ***Value*** | Vaccines received are the same as those of competitors (i.e. no feature differentiation) | Customers do not perceive any differentiation in the product | Returned vaccines represent no value to FluCo, because they cannot currently be recycled[8] |
| ***IPO capabilities examples*** | Capability to store the vaccines in the right conditions | | |

[8] Relevance of blue font discussed in Section 6.3.6

Table 6.3.12: Tangible's monetary value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | Customer's receive the price they were quoted upon placing the order | Depending on the customer, the payment is made via immediate transfer, credit card (mostly small clinics), or invoice (larger customers) | Customers pay the quoted price as determined by marketing capability at the value delivery dimension |
| ***Velocity*** | The request for payment is delivered immediately upon placing the order to the customer | Depending on the customer type, the payment is made immediately or after a month (i.e. for invoice payments)[9] | The speed at which money is actually sent to FluCo will vary by customer type |
| ***Variety*** | Request for payment arrives in the required currency for the customer (i.e. in US dollars for US) | Customer can pay in a different currency if they must, but e-commerce platform will automatically convert it to the required currency | Customers make payments in the required currency |
| ***Veracity*** | The customers pay what they were quoted when placing the initial order | Payment is done via the e-commerce platform, ensuring that all customer and order details align | Customers make payments using a supported payment method of choice (e.g. direct transfer, visa payments) |
| ***Value*** | The combination of the above properties makes the monetary flows valuable | As before | As before |
| ***IPO capabilities examples*** | Resources to pay | | |

[9] Relevance of blue font discussed in Section 6.3.6

Table 6.3.13: Intangible value proposition component at FluCo's customer dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | FluCo provides one service to customers, that is the collection of un-used vaccines | Customers notify FluCo when and if a specific number of un-used or expired vaccines needs to be collected from them (typically at the end of the flu season) | Having used the vaccines, the customers place additional small or large (pre-)orders for current or next flu season/or an order for collection of un-used vaccines |
| ***Velocity*** | Collection of un-used or expired vaccines arrives within 1-2 days of collection request | FluCo's 3PL partner loads up the vaccines for collection from the customer immediately on arrival | The order information is generated as soon as the customer places the order (i.e. instantly) |
| ***Variety*** | FluCo's 3PL partner collects only FluCo's un-used or expired vaccines | Only FluCo's vaccines are loaded up into 3PL's trucks/vans | Customers place order for the mix of vaccine types they need (that are available from FluCo at the time)[10] |
| ***Veracity*** | FluCo's 3PL partner arrives on time (within a pre-arranged collection time window) | FluCo's 3PL reliably collects all FluCo's vaccines (which are stored by the customer in waste containers) | Customers generate an order with all details provided along the quantity of the order (e.g. customer data, required delivery date, etc.) |
| ***Value*** | Customer receives a service that keeps their minds free to not think how to dispose of their un-used or expired vaccines | As before | Valuable customer profile data is created for use by FluCo (e.g. allowing to get in touch with customers ahead of flu season to prompt orders) |
| ***IPO capabilities examples*** | Knowledge how to use/administer the product (if customer is a physician); Awareness of the service offerings and the ability to use it (e.g. access to the e-commerce ordering platform) | | |

[10] Relevance of blue font discussed in Section 6.3.6

Table 6.3.14: Intangible's monetary value proposition component at FluCo's customer dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | N/A for intangible monetary flows; received price for collection service is included in the tangible monetary payment for vaccines | Properties of the intangible value flow not relevant for the customer dimensions as they are included in the tangible monetary flow | Customers pay the quoted price for the vaccines (the service fee volume, along with all other properties, for vaccines collection is included in the tangible monetary flow) |
| ***Velocity*** | N/A for intangible monetary flows; price for collection service paid at the same time as the tangible monetary flow, because it is included in the price | As above | As above |
| ***Variety*** | N/A for intangible monetary flows; request for payment arrives in the required currency for the customer | As above | As above |
| ***Veracity*** | N/A for intangible monetary flows; the customers pay what they were quoted when placing the initial order for the vaccines | As above | As above |
| ***IPO capabilities examples*** | N/A | | |

Table 6.3.15: Tangible value proposition component at FluCo's value capture dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | FluCo collects all un-used vaccines from their customers | All vaccines are disposed of using a third-party hazardous waste disposal company | There is no output from the value capture dimension[11] |
| ***Velocity*** | Un-used vaccines are collected by FluCo's 3PL within 1-2 days of collection order (or on specified dates from larger customers) | Un-used vaccines are disposed of within the disposal company's timelines | As above |
| ***Variety*** | Both types of vaccines are typically returned in varying proportions | Both vaccine types are disposed of in the same way | As above |
| ***Veracity*** | Vaccines are collected maintaining their integrity until specialised disposal | The waste disposal company follows specified disposal guidelines | As above |
| ***Value*** | Returned vaccines represent no value to FluCo and are therefore disposed | No additional value generated for the disposal company | As above |
| ***IPO capabilities examples*** | Infrastructure (e.g. collection trucks, storage for returned vaccines until disposal) | | |

[11] Relevance of blue font discussed in Section 6.3.6

Table 6.3.16: Tangible's monetary value proposition component at FluCo's value creation dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | All volumes of payments are captured through an e-commerce-linked payment system | Payments are processed by the finance team | All payments are distributed either as reinvestments into the value creation dimension, or as shareholder pay-outs |
| ***Velocity*** | Proof of payment (or obligation for payment) is captured instantly by the e-commerce platform, but the arrival of money will depend on the customer type (i.e. whether its paid immediately or on credit) | Payments are immediately processed by the finance team | Processed payments are fed into the value creation dimension as required (e.g. for purchasing of raw materials) |
| ***Variety*** | Payments arrive in one currency (given that orders come from the US) | Payments can be converted into any currency if necessary (as they are captured) | Payments are distributed to the value creation dimension (and other stakeholders) in the required currency |
| ***Veracity*** | Customer-made payments arrive at the value capture dimension | Payments are checked by the integrated e-commerce verification system at the same time as the order is placed and arrive at the value capture dimension as 'verified' | Verified payments are distributed to the value creation dimension or other stakeholders |
| ***Value*** | The combination of the above collectively makes the monetary flows more valuable | As before | As before |
| ***IPO capabilities examples*** | Payment capture capability (e.g. a relevant payment system), order capture capability (e.g. an e-commerce platform), allocation capability (i.e. for payments, order information, etc. to other dimensions) | | |

Table 6.3.17: Intangible value proposition component at FluCo's value capture dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | FluCo's e-commerce platform allows to capture any number of orders placed by customers | Virtually an unlimited number of orders can be processed by the platform | All orders are made accessible to the value creation dimension by being available in the Cloud |
| ***Velocity*** | Orders are captured immediately after being placed by customers (at any time of the day) | They are automatically confirmed assuming customers' details meet the e-commerce system's requirement | Order is transferred in real-time to the value creation dimension |
| ***Variety*** | Order data is captured in a standardised format | Standardised format is easy to process | Order data is fed to the value creation dimension in a standardised format |
| ***Veracity*** | Orders are captured based on the direct inputs from customers (therefore reducing human error of FluCo's sales people) | Captured data is stored in the Cloud, ensuring that all the latest inputs are synced | Most up-to-date order data is accessible by the value creation dimension |
| ***Value*** | FluCo captures all data for their customers in one place using the e-commerce platform | FluCo creates a database of all their customers in a structured format | Consolidated customer and order data is made available for the value creation dimension |
| ***IPO capabilities examples*** | Order data capture platform and relevant infrastructure (i.e. an e-commerce platform) | | |

Table 6.3.18: Intangible's monetary value proposition component at FluCo's value capture dimension from an input-process-output perspective

| | **Input** | **Process** | **Output** |
|---|---|---|---|
| ***Volume*** | N/A; no additional payments beyond the tangible monetary flows are captured here, as no separate services are currently provided by FluCo that it could charge extra for | As before (on the left) | As before (on the left) |
| ***Velocity*** | As above | As above | As above |
| ***Variety*** | As above | As above | As above |
| ***Veracity*** | As above | As above | As above |
| ***IPO capabilities examples*** | N/A | | |

It should be noted that throughout Step 4, several FluCo interviewees mentioned that rather than identifying each individual capability that could potentially be relevant to enabling a value flow at a particular business model dimension, the proposed *"IPO approach"* was preferred. This was because it allowed to *"think of capabilities more holistically"*, or *"think of and capture capabilities that are genuinely required"*, rather that listing all possible capabilities – and as such reflecting the design-science philosophy of creating a *"practical solution"* (see Section 4.3.1). In fact, the outcomes of the interviews in this case study also suggested that Step 4 of the proposed method was very detailed – perhaps too detailed – specifically for practitioners who might be using it for the purpose of business model (re-)design, implying that it is too complex. However, several interviewees also suggested that it is the complexity that the proposed artefact and methods offer that might genuinely lead to new insights by forcing one to think more carefully through the business model in question.

### *6.3.6 Step 5: Identifying where the properties are un-configured and creating a list of options for re-configuration*

The fifth step of the method involves reviewing the inputs collected during the interviews with FluCo's stakeholders. The inputs were captured in tables throughout Section 6.3.5, and were then used to identify re-configuration opportunities of the value proposition's properties. (Identifying re-configuration opportunities refers to those properties, such as velocity, that could be improved from a business model perspective). However, given the time constraints of each interview, inputs from only five (out of seven) of the interviewees were gathered to help identify those re-configuration opportunities. Their answers were cross-referenced for patterns and those re-configuration opportunities that were mentioned by at least two of the interviewees were highlighted (in blue font) in the tables throughout Section 6.3.5. In doing so, seven re-configuration opportunities were identified. (To support the identification of the re-configuration opportunities, questions (a) to (e) from Step 5 in Section 6.2.7 were used). These identified opportunities are further summarised below:

- **First set of re-configuration opportunities 1 (see Table 6.3.9)**

  **Identified by 4 out of 5 interviewees:**

  While reviewing the configurations of the different intangible flows at the *value delivery dimension*, it was found that the velocity and variety of the offered *"vaccine collection"* service was not configured. Specifically, the interviewees have found that there may be room for reducing the speed of collection of un-used/expired vaccines from their customers, as current collection within 1-2 days is not legally required, but

may be more expensive to arrange than for example collection within a 10-day period. As such, the velocity opportunity may improve the *"monetary"* configuration of the vaccine collection service by allowing to charge customers extra for faster collection (if they require one). Variety of the collection service was also seen as an opportunity, in a sense that one could collect not only their own vaccines, but also other medical waste products for an extra charge

- **Second set of re-configuration opportunities (see Table 6.3.11)**

  **Identified by 5 out of 5 interviewees:**

  While reviewing the configurations of the different tangible flows at the *customer dimension*, a number of re-configuration opportunities were uncovered by the interviewees. Firstly, the veracity (or quality) of processing (i.e. use of) the vaccines by customers[12] could potentially be improved by supplementing the vaccines with higher quality educational materials (e.g. how to administer the vaccine properly). Secondly, the returned vaccines do not offer any value to the value capture dimension of FluCo's business model, as the dimension cannot currently process or recycle them in any way (i.e. they are simply disposed), which also prevents the value capture dimension from generating a tangible output, such as recycled parts (see Table 6.3.15)

- **Third re-configuration opportunity (see Table 6.3.13)**

  **Identified by 3 out of 5 interviewees:**

  While reviewing the configurations of the different intangible flows at the *customer dimension*, it was found that the variety property of the customer's output could be improved. Specifically, three interviewees noted that when customers place orders for their vaccines through their e-commerce platform, they currently can only order FluCo's products. However, extending the range of products to, for example, including relevant third-party accessories required for administering vaccines could be a way to generate more business (i.e. to produce higher *volumes* of monetary flows)

- **Fourth re-configuration opportunity (see Table 6.3.12)**

  **Identified by 4 out of 5 interviewees:**

  While reviewing the configurations of the different monetary flows at the *customer dimension*, it was found that the velocity of the monetary processing is currently not

[12] Applies to doctors/nurses, not distributors or clinics

favourably configured, because payments by smaller clinics, which do not have credit accounts with FluCo, need to be made *immediately*. This could potentially be preventing FluCo from doing business with a number of smaller clients that would otherwise buy vaccines on credit

Following the generation of the four sets of re-configuration opportunities (or "options"), it was noted by a number of interviews that had it not been for the systematic approach of the artefact and its method, identifying those opportunities with a *"naked eye"* would have been much more challenging. Having identified a set of re-configuration options, the next step of the method was to evaluate them.

### *6.3.7 Step 6: Evaluating the options using the desirability-feasibility-viability framework*

Having generated a number of options for potential re-configuration of FluCo's business model using the business model artefact, it was then time to evaluate the options for possible implementation using the sixth step of the method involving the Desirability-Feasibility-Viability framework [see point (6) of the method in Section 6.2.7 for details]. Based on the conversations with the FluCo interviewees, the identified options are captured and evaluated in Table 6.3.19.

Table 6.3.19: Desirability-Feasibility-Viability evaluation of the re-configuration options identified during the artefact evaluation process with FluCo's interviewees

| Set | Opportunity | Criteria | Rationale | Passed? |
|---|---|---|---|---|
| **1a** | Reduce the standard speed of collection of vaccines to reduce costs | Desirability | There appears to be no rush among consumers to get rid of their expired or un-used vaccines (or at least, a couple of extra days of storing them does not seem to make a difference) | ***Yes*** |
| | | Feasibility | There is no barrier to implementing a slower collection service, as it would only entail cooperation with the 3PL to reconfigure the service (and renegotiation of the fees) | ***Yes*** |
| | | Viability | It is not clear how much costs FluCo would save by reducing their speed of collection at this point, and further analysis would be required | ***Conditional*** |
| **1b** | Offer premium, faster collection service of un-used vaccines for an extra charge | Desirability | It would need to be tested whether customers are prepared to pay for quicker collection. However, this would only work if FluCo's vaccines had a competitive differentiation over other products. Otherwise, customers would switch to competitive products, who offer speedier collection at no extra charge | ***Conditional*** |
| | | Feasibility | Implementing an extra charge would be easy to do by offering the option to 'buy' speedier or 'express' collection via the new e-commerce platform | ***Yes*** |
| | | Viability | Given FluCo's strong relationship with their 3PL provider, it would be possible to negotiate a good price for the express collection; implementing the functionality in the e-commerce platform would not cost anything | ***Yes*** |

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| Set | Opportunity | Criteria | Rationale | Passed? |
|---|---|---|---|---|
| **1c** | Collect other 'waste' from customers for an extra charge | Desirability | It would need to be tested whether customers could consolidate their used vaccines with any other medical waste in way that it would make sense for FluCo to remove it together | ***Conditional*** |
| | | Feasibility | Given the strong relationship FluCo has with the 3PL provider, who already has specialised trucks to transport hazardous waste, it would seem feasible to arrange this new service | ***Yes*** |
| | | Viability | Similarly, given FluCo's strong relationship with their 3PL provider, it would be possible to negotiate a good price for the additional service, in a way that would benefit both, FluCo and the 3PL | ***Yes*** |
| **2a** | Provide educational material to doctors (and nurses) for how to properly administer FluCo's vaccines | Desirability | It would need to be tested whether providing such educational materials related to 'how to administer the vaccine' is actually desired by the doctors, since it is a fairly basic procedure. However, it could also be explored whether other related materials could be provided (e.g. educational materials on relevant recent developments in medicine related to flu) | ***Conditional*** |
| | | Feasibility | All the relevant knowledge can already be found within FluCo (e.g. in the medical and the research and development team) and would just need to be consolidated into a doctor-/nurse-friendly format (e.g. in print or online) | ***Yes*** |
| | | Viability | Depending on the format (i.e. print or digital), this might require more or less investment and the opportunity would need to be evaluated in more depth from a commercial perspective (e.g. would providing these materials help generate more sales or establish better relationships?) | ***Conditional*** |

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| Set | Opportunity | Criteria | Rationale | Passed? |
|---|---|---|---|---|
| **2b** | Find a way to utilise the returned vaccines (e.g. by recycling them) | Desirability | Unused and returned vaccines currently represent 5% of all sold vaccines and cost the company a significant sum of money as they need to be disposed of without the possibility to re-use any of the vaccine's elements (e.g. vials) | ***Yes*** |
| | | Feasibility | Currently, no technology is available to cost-effectively disassemble and clean the vaccines | ***No*** |
| | | Viability | N/A | ***N/A*** |
| **3** | Offer customers the opportunity to order more than just FluCo's products on their e-commerce platform | Desirability | Customers would appreciate not having to go to different e-commerce platforms for different products and brands when they purchase their medical supplies | ***Yes*** |
| | | Feasibility | Further analysis will be required to understand what products could be added (e.g. complementary products to vaccines) | ***Conditional*** |
| | | Viability | Adding other products to FluCo's e-commerce store would increase the average size of the order basket, and help drive higher margins, however, cost of doing so would need to be evaluated in more detail | ***Conditional*** |
| **4** | Allow smaller customers to pay on credit, rather than asking them to pay straight away | Desirability | Smaller customers (e.g. independent doctors, smaller clinics) would appreciate the option for deferred order payments; this would potentially lead to larger orders | ***Yes*** |
| | | Feasibility | Given FluCo's established financing resources for larger customers, the firm would be able to set up similar financing options for smaller customers | ***Yes*** |
| | | Viability | It would be necessary to explore how much additional sales smaller customers would drive, if they had the option to pay later; potentially a decision could be made whether its economical to serve smaller clients at all, and whether FluCo perhaps should only work with larger customers, i.e. distributors | ***Conditional*** |

The Desirability-Feasibility-Viability (DFV) framework, as applied in Table 6.3.19, has proven helpful in evaluating the various re-configuration opportunities generated in Step 5 of the method (as shown in Section 6.3.6). Although the DFV framework does not provide practitioners with immediate answers to how to reconfigure a particular identified *"opportunity"*, it was demonstrated that it can be effectively used to evaluate the opportunities at a higher level and generate a set of potential practical next steps. For example, it allowed to quickly evaluate the opportunity "1a" from Table 6.3.19 – *"Reduce the standard speed of collection of vaccines to reduce costs"* – and identify that there is demand to do so and that FluCo would be able to implement it, but that the opportunity would also need to be evaluated more thoroughly to understand whether it makes sense economically. The usability of this approach has resonated particularly well with the FluCo interviewees due to its *"simplicity and effectiveness"*, as described by one of the interviewees, and allowed FluCo to take away the identified opportunities for potential implementation in the future.

### *6.3.8 Artefact evaluation summary*

Section 6.3 focused on the evaluation of the business model artefact and its utilisation method that were developed in Section 6.2 based on the methodology outlined in Section 4.3.8. The evaluation process has shown that the proposed artefact, and the method associated with it, are indeed capable of both, expressing a vaccine supplier's business model, and also identifying potential options for re-configuration (and potential improvement) of the business model in a systematic way. Moreover, the evaluation process has also helped refine some of the definitions of the artefact, specifically those of the various business model dimensions. The frindings from the evaluation process are discussed in the next Chapter and then summarised in Chapter 8.

## *6.4 Chapter Summary*

In this Chapter, the business model artefact conceptualised in Chapter 5 was further developed and evaluated using an in-depth vaccines manufacturer case study as per the methodology outlined in Sections 4.3.7 and 4.3.8.

The development stage involved conducting a number of interviews with stakeholders from the case study firm to help identify additional elements for the artefact that could offer a more detailed understanding of an organisation's business model and its value flows (and their properties).

The developed artefact was then evaluated through additional in-depth interviews from within the same case study firm. The evaluation process has shown that:

- The developed artefact is capable of capturing and expressing the key elements of a business model (in the B2B e-commerce and vaccine manufacturing context), as well as the key properties of its underlying value proposition
- It has shown that the proposed artefact utilisation method can offer a structured approach for the application of the developed artefact, and more importantly, an approach to identify business model re-configuration opportunities

The findings from this Chapter, and how they address the research question, are discussed in the next Chapter.

# 7 Discussion

## *7.1 Introduction*

Following the business model design artefact conceptualisation, development, and evaluation, this Chapter discusses the key research findings in the context of the main research question. The identified "unknowns" from Chapter 5 and the overall research approach are also discussed.

## *7.2 Discussion on research questions and research approach*

This thesis set out to explore the design of business models in the vaccines supply and B2B e-commerce context, with the main research question formulated as follows:

***How might configuration theory and design-science approaches inform the design of business models?***

The process of answering the above question and conceptualising, developing, and evaluating the proposed business model design solution artefact generated a number of research findings. These are discussed below, with the process of getting from the data to the findings summarised in Figure 7.2.1 and Figure 7.2.2.

Firstly, the findings confirmed that the core of a business model (in the vaccine supply and B2B e-commerce context) can indeed be captured through the five proposed business model elements, including: (1) the value creation dimension, (2) the value delivery dimension, (3) the customer dimension, (4) the value capture dimensions, and (5) the value proposition flow. The confirmation of these elements supports the validity of the foundation of the proposed solution artefact, but beyond confirmation, it does not offer any new theoretical insights, because the dimensions have been well-established in the business model literature for quite some time now (e.g. Wirtz et al., 2016; Zott et al., 2011; Teece, 2010). However, the novelty appears to come from *how* the five proposed elements appear to link with each other, which to the best of the author's knowledge, has not been previously captured in such a way in the existing business model literature. Specifically, it has been shown that the fifth element of the solution artefact – the value proposition flow – can act as a linking mechanism that connects the other four dimensions of a business model mentioned above (1-4), helping explain the relationship among these dimensions in a more granular. This new view is comparable to existing supply chain/network thinking where value flows (e.g. product, service, information) move through various stages of a value chain or nodes of a supply network (e.g. Srai and Gregory, 2008; Troutt et al., 2001; Gulati et al., 2000). However, this view does not appear to exist as such in

the business model domain, where currently a value proposition is considered more of an output of the overall business model for a specific customer (e.g. Taran's et al., 2016; Richardson, 2008, Osterwalder et al., 2005), rather than an integral element of how the business model operates. It is worth mentioning that developing a new view of the value proposition was not anticipated to play a major part in this research. However, this deviation from original research expectations (i.e. to better understand model design in the vaccine supply and B2B e-commerce context) was not surprising, as deviation is an integral part of design-science's abductive method, which drives the generation of more *creative* solutions during the research process (vs. other research methods, as discussed in the methodology Chapter).

In addition to the main research question, the above finding also helps answer one of the sub-questions this thesis set out to explore as identified in Section 3.8 (i.e. ***What are the dimensions of a business model (from a design-science perspective?)***). It does so by conceptualising and developing four key dimensions of a business model artefact (i.e. value creation dimension, value delivery dimension, customer dimension, and value capture dimension), and then proving through case study evaluation, that the four dimensions can in fact be viewed as the key dimensions that allow to capture and express a vaccine supplier's business model.

The research findings have also confirmed that the fifth element within the proposed business model design solution artefact, i.e. the value proposition flow, can indeed be expressed in terms of tangible, intangible, and monetary components. In doing so, this view offers additional configurational granularity vs. existing business model design frameworks (e.g. Zott and Amit's Activity System Perspective (2010) or Osterwalder and Pigneur's Business Model Canvas (2010)). This is key in helping to gain a better understanding of the configurational mechanism through which the dimensions of a business model interact with and influence each other. Further findings generated during the artefact development process allowed to enhance the potential business model configuration granularity through identification of the five properties assigned to each component: (I) volume, (II) velocity, (III) veracity, (IV) variety, and (V) value, thereby also establishing a more sophisticated link between the business model and information systems literature (e.g. Grover et al., 2018; Jagadish, 2015), where a business model's value flows can now be viewed in a similar way to the information systems' data flows.

It has also been confirmed that, in the context of the proposed solution artefact, each business model dimension possesses certain intrinsic input-process-output (IPO) capabilities that influence the value proposition flows within a business model by affecting their components

and their underlying properties, and as a result, the overall configuration of the business model. This finding supports the relevance of the capabilities perspective in the business model context (e.g. DaSilva and Trkman, 2014), but arguably extends it to a more granular level. That is, capabilities not only support the generation of value flows to create an output of a business model, but affect the value flows *within* the whole business model (i.e. at each business model dimension) at an input-process-output level (Chan and Ngai, 2011). This finding further adds to the granularity of understanding of the mechanism of how and why the value flows can be considered dynamic (i.e. changing) within a business model, and therefore, how the business model dimensions interact with each other – an existing knowledge gap in the literature (e.g. Foss and Saebi, 2017; Wirtz et al., 2016; Zott et al., 2011).

The above findings help answer the second sub-question identified in Section 3.8 (***What is the mechanism through which the business model dimensions interact with each other?)*** by conceptualising (based on literature) and then proving using a case study, that, from a configuration perspective, a value proposition can indeed be viewed as a linking mechanism for the four core business model dimensions mentioned earlier. Specifically, it has been shown that the linking mechanism affects each dimension in terms of their capabilities, and that the dimensions also affect the linking mechanism in return (in terms of its configuration of properties), as it flows from one dimension to the next. This effect arguably establishes a specific interrelatedness among the dimensions (which will be recommended to be explored in future research).

In terms of findings, the collective elements of the developed solution artefact also provide a starting point for addressing another existing knowledge gap, which relates to a lack of a more structured classification of value exchanges and their interdependencies within pharmaceutical organisations in terms of information, materials, and finances (Narayana et al., 2014). Of course, given the specificity of the single vaccine supply context, the artefact may not be generalised to the wider pharmaceutical context, but its ability to structure the "value exchanges" in terms of tangible, intangible, and monetary components, while also considering five properties of each, indeed provides a novel, if not better, way to classify those value exchanges. Wider application of this structure and the ability to configure value flows may also provide a novel business model-driven view on how to effectively set up B2B e-commerce platforms in healthcare organisations – an existing knowledge gap in the literature (Lin et al., 2011).

Overall, it could be argued that the main research question has been answered in a satisfactory manner by the proposed (conceptualised, developed and evaluated) artefact, which offers a novel way to design and/or (re-)configure business models (in the vaccine manufacturing and B2B e-commerce context). The design-science approach has played a successful role in shining new light on what was asked in the main research question, given the focus on iteration and solution development (vs. trying to provide an explanation). Equally, configuration thinking has led to defining new elements of a business model that have previously not been considered in the business model literature.

Finally, it is also worth noting that despite the limitation of just having one case study, the richness of the collected inputs has arguably allowed to generate, as well as to validate, meaningful theoretical ideas and concepts within the vaccine supply and B2B e-commerce context. (The selection of the single case has been extensively discussed in the methodology Chapter in Section 4.3.7[13].) Although only four stakeholders were available for the in-depth interviews during the artefact development stage (due to timing and access challenges within FluCo), these stakeholders, being in most senior roles within the organisation, were still able to provide extensive and relevant data points for the purpose of this research, covering strategic, business model-specific, and operational aspects of the business. Similarly, although the artefact evaluation stage leveraged inputs from only seven interviewees, theoretical saturation (Eisenhardt, 1989) seemed to appear after the fourth interviewee, with further interviews adding more in terms of refinements of the language and definitions. Based on these refinements (and building on the working definition from Section 5.2.1), an alternative definition of a business model was derived as follows:

***A business model is the logic or configuration behind creating, delivering, and capturing value through a specific value proposition being offered by an organisation to a customer, where the value proposition is a form of value exchange among the business model dimensions, consisting of tangible, intangible, and respective monetary flows, all of which are enabled by the organisation's and the customer's resources and capabilities***

[13] Examples of highly-cited papers and theses with single cases have also been highlighted in Table 4.3.5

Where the value proposition could be defined as follows:

***A value propositions is a dynamic combination of tangible and intangible value flows, along with their respective monetary value flows, that fit and flow through the business model's value creation, delivery, and capture dimensions, while meeting the dimensions' configurational requirements and the customer's needs***

The advantage of these definitions is that it allows to systematically think of each specific value proposition flow component (i.e. tangible, intangible, or monetary) within a business model, and focus on whether its properties and the receiving capabilities (at each business model dimension) are properly configured, thus allowing to identify potential options for optimisation of the business model.

Finally, for clarity, the research process of getting from data to results is illustrated in Figure 7.2.1 and Figure 7.2.2 for the artefact development and evaluation stages covered in Sections 6.2 and 6.3.

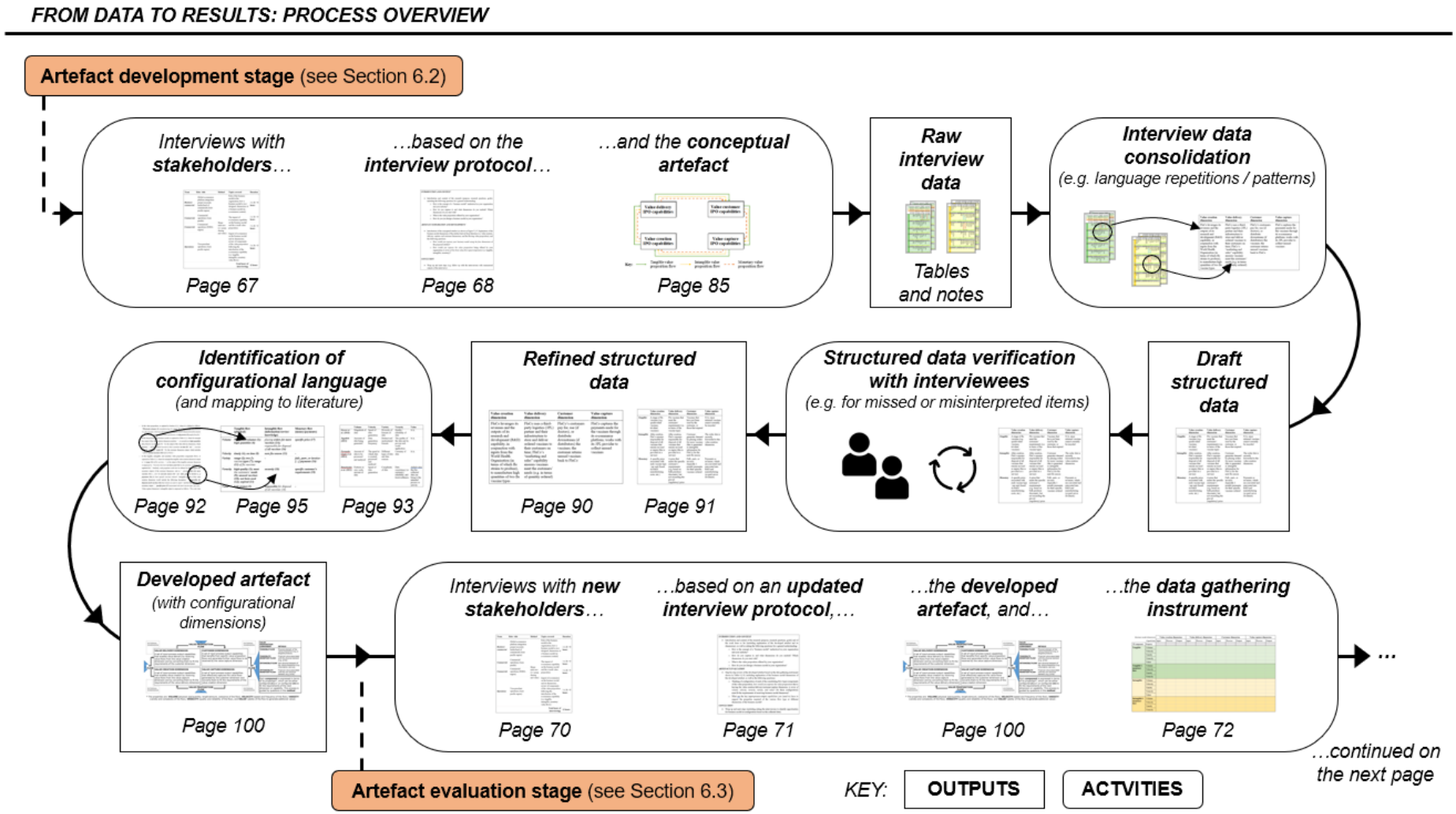


Figure 7.2.1: Diagrammatic overview illustrating the process from data to results (Part 1)

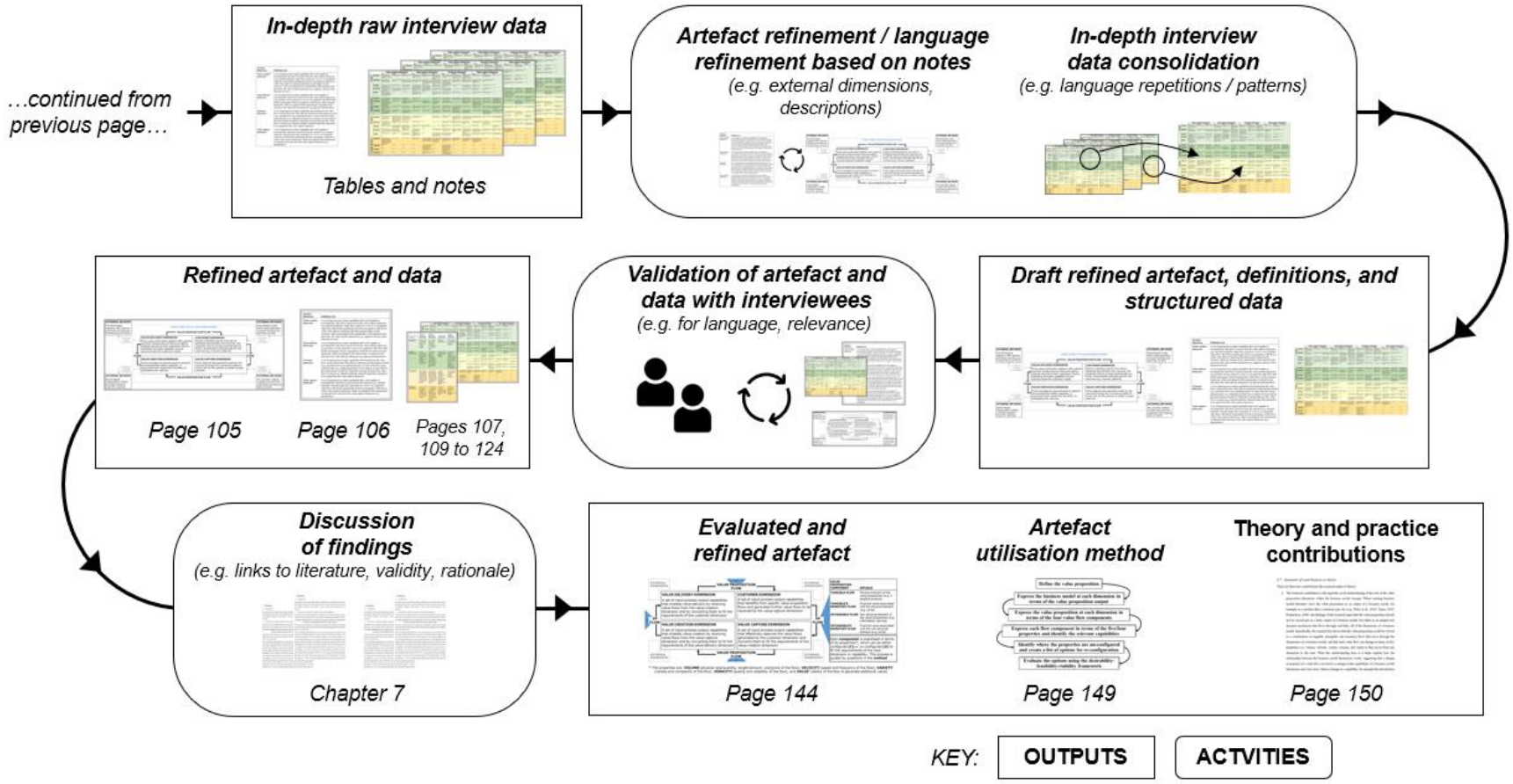


Figure 7.2.2: Diagrammatic overview illustrating the process from data to results (Part 2)

## *7.3 Discussion on the "unknowns"*

Beyond the main research questions and the sub-questions discussed in the previous Section, it should be noted that the "unknowns" identified in Section 5.3, have also been successfully resolved throughout the artefact development and evaluation Chapter. Specifically, with regard to unknown (i) *"how does the solution artefact help explain the aspects of value (proposition) flows and their interrelationship with the business model dimensions?"* it has been shown that the proposed artefact can help explain the aspects of business model value flows at multiple levels. Firstly, evaluation of the artefact in Section 6.3 has demonstrated that a business model can be captured and expressed using the four proposed dimensions, all of which are interlinked by a value proposition flow, as mentioned earlier. Secondly, the FluCo case has demonstrated that a value proposition flow can be captured and expressed as a combination of tangible, intangible, and their associated monetary flow components, which move from one business model dimension to the next. Thirdly and finally, the artefact offered a more granular perspective on each value flow component (vs. existing academic frameworks) by establishing a set of properties that define those components. Collectively, the above points support the hypothesis that a value proposition is a dynamic concept, which changes in terms of its flow components and their properties, as it moves from one dimension to the next, implying that there is a direct relationship between the value proposition flow and the dimensions. This relationship and the value proposition's dynamic nature is in return facilitated by the various input-process-output resources/capabilities found within each of the dimensions, which define the properties of the flows.

With regards to "unknown (ii)": *"how can a business model be configured while accounting for the interaction among its dimensions (using the solution artefact)?"* and (iii): *"what is the method for utilizing the solution artefact in a practical context?"*, these have been discussed and answered throughout Chapter 6. For "unknown (ii)", a business model configuration approach has been developed, which utilises a value proposition lens and allows to re-configure the business model by changing the value proposition's properties (i.e. volume, velocity, veracity, variety, and value). "Unknown (iii)" was resolved by developing and evaluating the proposed artefact utilisation method in Sections 6.2.7 and 6.3, respectively.

# 8 Conclusions

## *8.1 Introduction*

This Chapter concludes this thesis by revisiting the main research question and summarising the research findings, and the theoretical and practical contributions, under an integrating artefact for business model design. The research's limitations, and potential areas for future work are also discussed.

## *8.2 Revisiting the research question and approach*

This research set out to explore how configuration theory and design-science approaches might inform the design of business models (which is explored in the business-to-business e-commerce vaccine supply context). A design-science-driven research methodology was used to conceptualise a business model design framework (which is also referred to as a "solution artefact"). In doing so, relevant concepts from the strategic management literature (incl. configuration, network thinking) were integrated with the established business model knowledge to:

a. define the key dimensions of the artefact (i.e. value creation, value delivery, customer, value capture), and to
b. propose a concept, in the form of a value proposition, that links those dimensions in a coherent and relevant way

The artefact was then developed further using a set of case study interviews to identify additional artefact elements that would allow capturing and expressing an organisation's business model in more detail. The developed artefact was then evaluated through further in-depth case study interviews.

## *8.3 Key findings*

The key findings that emerged from this research are:

- A business model of a vaccine manufacturer with a business-to-business e-commerce platform can be defined and captured in terms of four dimensions (1-4) and one linking mechanism (5). These include (1) the value creation dimension, (2) the value delivery dimension, (3) the customer dimension, (4) the value capture dimensions, and (5) the value proposition flow
- The value proposition flow acts as a dynamic linking mechanism that flows through the four business model dimensions and can it be expressed in terms of a tangible, an

intangible, and two monetary components (one monetary component for each of the two other components); each component can be further expressed in terms of five properties of (I) volume, (II) velocity, (III) veracity, (IV) variety, and (V) value, where the latter – (V) – is the only property that does not apply to the monetary flows

- Each business model dimension possesses (or requires) intrinsic input-process-output (IPO) capabilities that support and influence a particular configuration of the value proposition components as they flow through each dimension. Vice-versa, a desired configuration of the value proposition components can also inform (and drive) the setup of alternative capabilities at each business model dimension, and consequently also drive the configuration of the overall business model
- The configuration of properties (of the value proposition components) can be captured in a binary way, as either configured or un-configured, to effectively highlight opportunities for re-configuration of the value proposition components (and/or of the IPO capabilities). The process of acting on those re-configuration opportunities results in the re-design of the overall business model
- The previously undocumented dynamic nature of the value proposition (i.e. that it changes as it flows from one business model dimension to the next) suggests that in order to design better business models, there is a need to not only consider the customer's configuration requirements (and those of their IPO capabilities), but also those of the other business model dimensions (i.e. value creation dimension, value delivery dimension, and value capture dimension). This suggests that the value proposition should be viewed not just as an output of a business model, but an integral part of how the business model functions

## *8.4 Summary of research contributions*

### *8.4.1 Business model design artefact*

The research findings summarised in Section 8.3 were developed using the insights generated from the utilisation of the business model design artefact shown in Figure 8.4.1, which represents the first key output of this research. The artefact contributes to business model literature with an improved understanding of the relationships among the dimensions of a business model by offering a novel perspective on the role and function of the value proposition flow (within the business model concept) and on how its configuration can influence the setup of the business model capabilities (and vice-versa). In design-science context, the artefact

represents a novel conceptual way of representing (a simplified view of) a business model through formal notations and language, providing a novel solution for the given context (i.e. vaccines manufacturing firms with B2B e-commerce platforms). The artefact's dimensions are summarised following the illustration of the artefact.

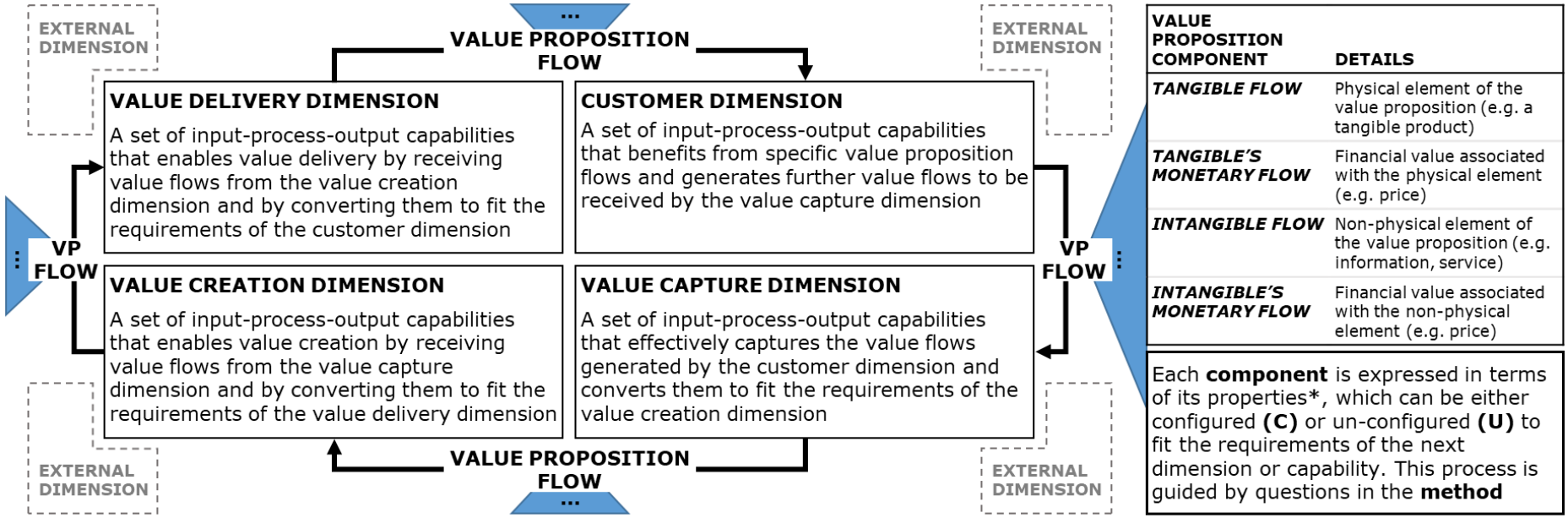


Figure 8.4.1: The business model design artefact

**Note:** (1) Value property is not applicable to monetary flows

**Business model dimensions**

The core of the artefact consists of four business model dimensions: (1) the value creation dimension, (2) the value delivery dimension, (3) the customer dimension, and (4) the value capture dimension. These dimensions have been conceptualised based on contemporary academic knowledge (as discussed in Section 4.3.6) and developed and evaluated using a case study in which the dimensions' usability was confirmed in a real-world context (specifically in vaccines manufacturing and B2B e-commerce). As the names suggest, the four dimensions of the artefact are responsible for creation, delivery, use (by the customer), and capture of value through specific input-process-output (IPO) capabilities that each dimension possesses. The four dimensions are linked in a loop through the flow of a fifth element: (5) a value proposition. These dimensions can be defined as follows:

**(1)** **Value creation dimension** – A set of input-process-output capabilities that work together to recombine the value flows received from the value capture dimension (e.g. recycled materials, usage data, money) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the value delivery dimension that then prepares them for the customer, while accounting for the requirements of the external nodes relevant to the value creation dimension (e.g. suppliers, data providers, fin. services)

**(2)** **Value delivery dimensions** – A set of input-process-output capabilities that work together to recombine the value flows received from the value creation dimension (e.g. product, service, price) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the customer dimension, while accounting for the requirements of external nodes relevant to the value delivery dimension (e.g. physical infrastructure)

**(3)** **Customer dimension** – A set of input-process-output capabilities that benefit from the value flows received from the value delivery dimension of the business model (e.g. a product/service at a particular price), as well as the flows from external nodes (e.g. additional product/service features not provided by the main business model) for which the customer then provides value flows in return (e.g. returned materials, demand/usage data, payments), to be captured by the value capture dimension

**(4)** **Value capture dimension** – A set of input-process-output capabilities that work together to recombine the value flows received from the customer (e.g. returned

materials, demand/usage data, payments) in a way so as to generate value flows that fit the requirements (based on properties of the flows) of the value creation dimension, while accounting for the requirements of external nodes relevant to the value capture dimension (e.g. shareholders)

The external nodes of the artefact account for outside stakeholders that provide inputs (e.g. raw materials) to the core dimensions of the business model; or who benefit from outputs of the individual business model dimensions' outputs (e.g. for dividend payments).

**(5) Value proposition – the linking mechanism for the business model dimensions**

The value proposition within the solution artefact is represented by a dynamic concept that changes as it flows through each dimension of the business model. More specifically, the artefact expresses the value proposition as a combination of tangible (i.e. physical), intangible (i.e. non-physical, such as services or data), and their respective monetary components, which can be configured in terms of five properties: (I) volume, (II) velocity, (III) variety, (IV) veracity, and (V) value. Each property can be either configured (C) or un-configured (U) to fit the input-process-output capabilities of each dimension. The configuration properties are described in more detail in the *"value proposition properties"* Section below as well as in Table 8.4.2.

**Business model capabilities**

The input-process-output capabilities are intrinsic parts of each business model dimension and are a simplified representation of any resources or capabilities an organisation might require to receive (input) a particular value proposition flow component, to process it, and to output a new flow for the next dimension within the business model "loop". These capabilities could for example include vaccine manufacturing facilities, materials recycling, or information processing capabilities. An exhaustive list of such capabilities was not deemed pragmatic, and would vary from case to case anyway. But, a set of such (resources and) capabilities, as identified during this specific case study, is shown in Table 8.4.1 as an example.

Table 8.4.1: Examples of input-process-output capabilities of a value capture dimension that receive a value proposition (based on FluCo – the main case study of this work)

| Type | Related to… | Details |
|---|---|---|
| ***Input capabilities*** | Tangible flow | Capability and facilities to receive returned vaccines (e.g. collection service and warehouse) |
| | Intangible flow | Capability to capture incoming demand/order data (e.g. infrastructure, servers) |
| | T&I Monetary flows | Capability to receive payments made by the customer (e.g. payment platform partnerships) |
| ***Process capabilities*** | Tangible flow | Capability to sort through the returned vaccines and dispose of them if necessary (e.g. recycling capability) |
| | Intangible flow | Capability to process incoming demand/order data into insightful information (e.g. analytical tools) |
| | T&I Monetary flows | Capability to convert payments into relevant currencies if necessary (e.g. capability to deal in multiple currencies) |
| ***Output capabilities*** | Tangible flow | Capability to forward the returned vaccines to the value creation dimension for rework (e.g. repurposing capability) |
| | Intangible flow | Capability to send accurate and relevant demand/order information to the value creation dimension (e.g. server infrastructure) |
| | T&I Monetary flows | Capability to allocate payments to the relevant stakeholders (or other dimensions) (e.g. financial department) |

**Value proposition properties**

The business model's input-process-output capabilities enable the configuration of the five properties of the value proposition components, which are a core part of the proposed artefact. Analysis of these properties supports the *systematic* identification of (re-)configuration opportunities for a business model. These properties are defined as shown in Table 8.4.2.

Table 8.4.2: Properties of the value proposition flows

| | **Tangible flow** | **Intangible flow** | **Tangible's and intangible's monetary flow** |
|---|---|---|---|
| ***Volume*** | Physical size and weight and/or quantity of the flow | Hours of service provided; amount of data associated with the flow | Cost / price of the flow |
| ***Velocity*** | Speed and frequency of the physical flow | Speed and frequency of data transfer or service delivery | Speed and frequency of payments for the respective flow |
| ***Variety*** | Variety and complexity of the physical flow | Variety and complexity of the intangible flow | Currency of the flow |
| ***Veracity*** | Quality and reliability of the physical aspects of the flow | Quality and reliability of intangible flows | Reliability of the flows |
| ***Value*** | Ability of the flow to generate additional value (e.g. through functional differentiation, re-use) | Ability of the flow to generate additional value (e.g. through emotional differentiation) | N/A |

### *8.4.2 The artefact method*

The artefact method represents the second key output of this research. It constitutes a set of conceptual, yet actionable instructions and questions for effectively utilising the artefact discussed in the previous Section. The method was developed as part of the research process, incorporating the learnings and experiences collected during the case interviews. The artefact's method is captured in Figure 8.4.2.

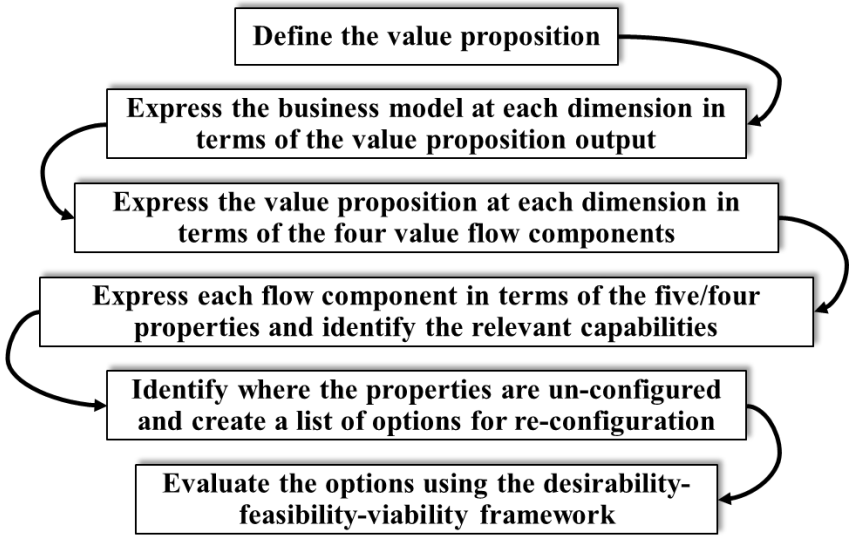


Figure 8.4.2: The business model artefact's utilisation method

Where the individual steps of the method are as follows:

**(1)** Define the value proposition in terms of its value creation, delivery and capture activities, as well as who it is intended for (i.e. the customer)

**(2)** Express the business model at each business model dimension in terms of the defined value proposition output, starting with the value creation dimension

**(3)** Express the value proposition in terms of the four value flow components (i.e. tangible, intangible, and their respective monetary flows) at each business model dimension, starting as an output of the value creation dimension

**(4)** Break up each value flow component (i.e. tangible, intangible, etc.) and express it in terms of its five (or four for monetary component) properties at each dimension of the business model as they flow through the input-process-output capabilities of the dimensions (as shown in the data gathering instrument in Table 4.3.10)

**(5)** Review each the properties of each component and identify those where the value proposition flows are not-configured – that is where a flow's property does not fit the requirements of the receiving capability. Next, consider options to reconfigure the flows (e.g. change the output capability to make the flow fit the dimension, change the receiving capability, or remove the flow). Questions to ask at each dimension to whether they are configured or not would be based on the 5V properties, and would include:

   a. Does the value proposition (i.e. product, service) flow in the right quantity and at the right cost/price?

b. Does the value proposition (i.e. the physical product, the service, the payment) flow at the right speed and frequency?

c. Does the value proposition (i.e. the physical product, the service, the payment) flow in the right composition/type/format?

d. Do the value proposition flows meet the quality and reliability requirements of the receiving dimension?

e. Do the tangible and intangible value proposition flows meet the value expectations of the receiving dimension?

**(6)** Having generated a number of options for potential re-configuration in the previous step, assess whether the options could be implemented using the Desirability-Feasibility-Viability framework by asking the following questions:

a. Desirability – is there demand or need for the given option?

b. Feasibility – can the option be realistically implemented?

c. Viability – can the option be successfully implemented (i.e. is it worth it economically?)

## *8.5 Summary of contributions to theory*

There are three key contributions this research makes to theory:

- The foremost contribution is the novel understanding of the role of the value proposition dimension within the business model concept. Where existing business model literature views the value proposition as an output of a business model, for example as a product that a customer pays for (e.g. Wirtz et al., 2016; Teece, 2010; Richardson, 2008), the findings of this research argue that the value proposition should not be viewed just as a static output of a business model, but rather as an integral and dynamic mechanism that flows through, and links, all of the dimensions of a business model. Specifically, the research has shown that the value proposition could be viewed as a combination of tangible, intangible, and monetary flows that move through the dimensions of a business model, and that each value flow can change in terms of five properties (i.e. volume, velocity, variety, veracity, and value) as they move from one dimension to the next. This understanding helps explain how the relationship between the business model dimensions works, suggesting that a change in property of a value flow can lead to a change in the capabilities of a business model dimension, and vice-versa. A change in a capability, for example the introduction of a B2B

e-commerce platform, can change the capabilities across each of the dimensions, as well as the properties of the value proposition. This new understanding addresses the knowledge gap around the relationship of business model dimensions (e.g. Foss and Saebi, 2017; Wirtz et al., 2016), as discussed in Section 3.7.

- Secondly, the validation of the solution artefact's dimensions and value flows within the vaccine supply context – and by extension the pharmaceutical context – address an existing knowledge gap related to classification of value exchanges and their interdependencies within pharmaceutical businesses in terms of information, materials, and finances (Narayana et al., 2014) through the proposed business model perspective by offering a structured view of the value exchanges and how they link within an organisation's business model.
- Finally, the insights provide a foundation to explore the interrelationship between the individual business model dimensions and contribute to the pharmaceutical industry-related e-commerce business model literature by highlighting reconfigurable elements of a business model in a detailed way. Wider application of this understanding, where organisations interact through B2B e-commerce platforms, may support the development of a better view of how to effectively implement B2B e-commerce platforms among other healthcare organisations (incl. public organisations) by offering a new (business model-driven) perspective on how an e-commerce platform implementation can help the organisation achieve its business goals (e.g. by ensuring that value exchanges are "configured" to the needs of the relevant stakeholders or business model dimensions) – an academic challenge that was identified by Lin et al. (2011). This understanding could ultimately also have an important societal impact, as "proper" B2B e-commerce platform business model configuration could facilitate improved accessibility to healthcare products to healthcare provider, and/or create better health-related databases

To the author's best knowledge, this research is the first of its kind to attempt to propose and document the dynamic nature of the value proposition flow within the academic business model context. This is achieved by elevating the role of the value proposition (and its properties) above the traditional core business model dimensions (i.e. value creation and capture) (Massa et al., 2017) and proving that a value proposition changes as it flows from one business model dimension to the next. As such, this outcome advances the established business model thinking (e.g. Baden-Fuller and Haefliger, 2013, Teece, 2010) from:

a) *a business model needs to meet the needs/requirements of the customer*

to

b) *a business model needs to meet the configuration requirements of the customer AND those of its own value creation, delivery, and capture dimensions*

As per the main research question, this work successfully extended the configuration theory (e.g. Fiss et al., 2013; Miller, 1996) to the business model domain in a previously un-applied, yet meaningful way. More specifically, the research has shown that certain configurable properties of the business model's value proposition (i.e. volume, velocity, veracity, variety, value) are the key drivers behind the capabilities underlying in a business model. This suggests that (a), particular configurations of the value proposition's properties require specific enabling input-process-output capabilities at each of the business model dimensions, and vice-versa (b), that certain capabilities will influence the configuration of the value proposition's properties within a business model. As such, a configuration approach to business model design, as utilised in this research, supplements the business model work of Casadesus-Masanell and Ricart (2010) by proposing a mechanism for a better understanding of the relationships among the individual business model dimensions – a key gap in the business model literature (Wirtz et al., 2016).

Finally, the above contributions would arguably not have emerged if it was not for the utilisation of the design-science research paradigm and approach as outlined in Chapter 4, which focuses not on trying to explain phenomena through observations, as traditional natural and social science research methods do, but on creating a solution to a problem through a set of iterative steps informed by both practice and theory.

## *8.6 Summary of contributions to practice*

The artefact offers a deep level of detail for understanding and capturing business models. From a value proposition-centric perspective, the artefact is more comprehensive than for example, the widely-adopted Business Model Canvas tool (Osterwalder and Pigneur, 2010), allowing practitioners to analyse more variables and to experiment with a wider and more nuanced range of business model designs and configurations. As such, it can act as a checklist for practitioners wanting to engage in the business model (re-)design/(re-)configuration and experimentation process, while also offering them the ability to facilitate the *systematic* identification of possible optimisation/re-configuration opportunities of the overall business model. In the process, managers will benefit from a practically feasible and easy-to-implement business model design approach in which capabilities, value proposition properties, and their

relationships are considered. The artefact also enables business model designers to identify how a change in one element (e.g. a capability or a value proposition property) could affect another, as for example highlighted in the case study, where the B2B e-commerce platform, as a capability, could facilitate faster flows of payments to FluCo.

## *8.7 Research performance criteria review*

Finally, a number of performance criteria were set out in the methodology Chapter to ensure the research output's quality. These are revisited in Table 8.7.1.

Table 8.7.1: Research performance criteria – revisited

| **Performance criteria** | **Description** |
|---|---|
| ***Practically relevant*** | The artefact is capable of identifying valuable insights in current real-life business situations, as supported by the case study, suggesting that they could be relevant tools for managers |
| ***Theory-driven*** | The artefact was developed by bringing together a set of well-established theories (incl. business model, configuration and network thinking) – for details see the methodology Chapter |
| ***Non-trivial*** | While the artefact is capable of expressing an organisation's business model at a high-level to quickly provide clarity; it can also be used to study an organisation in significant depth by looking at the specific capabilities of each business model dimension and the detailed properties of the value proposition flows |
| ***Clearly defined*** | Each of the artefact's elements and dimensions is clearly expressed and explained in Section 8.4.1 |
| ***Valid*** | The artefact was developed following a set of logical steps based on a strict methodology as outlined in the methodology Chapter |
| ***Credible*** | Each of the artefact's elements was evaluated and informed using inputs from interviews with senior stakeholders that constituted a part of a real-life business case study from the pharmaceutical industry, specifically within vaccine manufacturing |
| ***Valuable*** | Although the artefact was evaluated using only one case study, evaluation and the design-science methodology suggest that they can equally be applied in other cases within the same class of problems (as discussed in Section 4.2) |
| ***Contributes to knowledge*** | Contributions to theory were summarised in Section 8.5 |
| ***Offers a practical solution*** | As shown during the case study evaluation process, the artefact is capable of finding new or improved practical solutions to challenges in the business world, specifically within *"business model design in the vaccine supply and B2B e-commerce context"* |

## *8.8 Research limitations and future work*

The produced work has successfully addressed the main research question set out at the beginning of this research. However, as so many other research efforts out there, this thesis was also subjected to a number of limitations that influenced the outcomes. These limitations and proposed future research avenues are mentioned and discussed in this final Section.

One of the first limitations of this research is rooted in the utilised methodology, as developed in Chapter 4. Design-science-driven work arguably has a shorter life-span of validity compared to other theories developed using traditional research methods, since design-science outputs focus on being practically relevant (Dresch et al., 2015) and on being *"good enough"* to provide solutions to particular classes of practical problems (Simon, 1996). Because new (business) practices and theories are constantly being developed in both, academia and industry, and the business environment itself continuously changes, the proposed artefact will likely have to be adjusted, or completely redeveloped, to incorporate those changes relatively soon. However, considering the pace of change in the modern world, it could be argued that this applies to all knowledge, particularly in the business domain.

It would also be inappropriate to deny that a larger number of cases would have improved the validity of the proposed artefact, as argued by classical case study methodologies (e.g. Ketokivi and Choi, 2014). However, the single case was deemed sufficient for the purpose of this research as it provided relevant, in-depth inputs from the most senior stakeholders within the firm, and the overall context of uncertainty and volatility in supply and demand, as well as the supply network, technological and infrastructural complexity arguably offered a suitable test-bed for the propose of evaluating the developed solution artefact (and potentially extrapolating the findings to less complex business model systems in the future) . The argument for using a single case study was also supported by the selected methodology, which was discussed in Section 4.3.7.

The case study evaluation process also highlighted that the use of the artefact is limited by a certain minimum requirement of business experience for its successful application. More specifically, the business model "designer" needs to have at least some relevant understanding of core business challenges to analyse an organisation using the proposed artefact in order to propose and evaluate options for improvements at the business model and value proposition levels. For example, business experience was particularly helpful in this research during the evaluation of the options using the Desirability-Feasibility-Viability (DFV) framework, where the designer had to judge how the individual options performed against those criteria based on

conversations with relevant stakeholders and own understanding of the issues. The business experience was critical, as it would have been not feasible to provide a specific method for evaluating each generated option as part of this research. Another example of relevant external knowledge relates to the market conditions and their impact on the elements of the business model (e.g. economic conditions may dictate the level of the customer's capability to make payments). However, a systematic way to analyse the relevant external factors, such as Porter (1985)'s classic Five Forces, is currently not integrated into the proposed artefact. An element that addresses those factors and relates them to the individual components of the artefact could be built into them as part of future research.

From a more technical perspective, the artefact does a satisfactory job of exploring and explaining the relationships between the dimensions of the business model of an organisation, and how a change in one dimension can affect the other. However, at a deeper level, where properties of the value proposition flows are considered (e.g. volume, velocity, etc.), the proposed research has not explored in detail the impact of change in individual properties on each other (e.g. how a change in velocity of the intangible value flow affects the volume of the monetary flow). This is because it was simply not feasible to incorporate that analysis into this research, given the time constraints. And although, the proposed property-level view is still deemed useful, in particular to understand what capabilities are required to support the value flows (based on their properties), future research exploring the interdependence of the value properties would be helpful (for example through quantitative modelling/analysis).

Finally, another limitation related to the property-level analysis within the artefact, is around the proposed configuration options for those properties. They were explored in a binary way (i.e. as configured or un-configured). While the research has indicated that un-configured properties of value flows can produce inadequate performance in real business models, it has not been conclusively proven that it is the case, since the FluCo case study has shown that organisations can still operate successfully, even if the flows are not configured appropriately (e.g. where FluCo's velocity/speed of collection services was un-configured to the needs of the customer). Although, the argument still persists, that for an optimal business model performance, all flows need to be configured, future research could explore properties and their configurations that are critical to "proper" operation and performance of business models. Moreover, future research could also develop specific configurational archetypes, following Miller (1996)'s view on configuration, by understanding the patterns those configurations of properties could fall into, and thus identifying business model and value proposition

archetypes, such as Srai and Gregory (2008) have done for supply network configuration archetypes.

# Appendix

Table 8.8.1: Review of additional business model literature

| Authors | Paper title | What the authors identified… |
|---|---|---|
| Amit and Zott (2012) | *Creating value through business model innovation* | In this paper Amit and Zott used their theoretical findings to provide a practical perspective on business model design through six key questions. These questions encourage holistic 'business model' thinking view of one's organisation. This provided a foundational understanding of the business model concept and its relevance in practice |
| Chesbrough (2010) | *Business model innovation: opportunities and barriers* | Chesbrough argued that processes of experimentation and effectuation must be introduced into businesses in order to effectively overcome the barriers to business model innovation |
| Chesbrough (2007a) | *Business model innovation: it's not just about technology anymore* | The author highlights the need innovate not only in the R&D department, but also on the business model side, to successful commercialise the developed technologies |
| Chesbrough (2007b) | *Why companies should have open business models* | Chesbrough argues that in order to *"partake more fully in the benefits of open innovation, companies need to develop the ability to experiment with their business models, finding ways to open them up"* (e.g. through re-configuration?). Achieving that requires creation of processes for conducting "experiments" and assessing them |
| Daspit (2017) | *Business model innovation: from systematic literature review to future research directions* | The author contributed a broad classification scheme to introduce a common language for BMI researchers in an effort to transcend disciplinary boundaries. At each stage of the review provided, research gaps are identified and opportunities for further exploration are noted, including the use of new or alternative methods in business model research, and the need to translate insights into practical relevance |
| Doz and Kosonen (2010) | *Embedding strategic agility: a leadership agenda for accelerating business model renewal* | The authors proposed three meta-capabilities that can help organisations avoid business model rigidity in times of strategic change. One capability specifically relates to the ability of de-coupling activities/resources and modularising business processes. However, no formal frameworks were proposed through which those capabilities could be viewed, suggesting a knowledge gap related to visualising the de-coupling/modularising of business models |

| | | |
|---|---|---|
| Gordjin and Akkermans (2001) | *Designing and evaluating e-business models* | The authors developed a first-of-its-kind visual e-business modelling approach based on an IT systems analysis and provided the foundational understanding of the business model concept |
| Hossain (2017) | *Business model innovation: past research, current debates, and future directions* | The author argued that the concept of business model (innovation) is still in its infancy and is highly fragmented. One of the main knowledge gaps identified in this paper is the lack of understanding how business model innovation differs from other types of innovation, such as those in products and processes |
| Johnson et al. (2008) | *Reinventing your business model* | Johnson and colleagues provided a practical perspective on business model design and innovation, as well as demonstrated the relevance of the business model elements identified in theoretical work to practice |
| Massa et al. (2017) | *A critical assessment of business model research* | The authors suggested that business models can be interpreted in three different ways, implying a variety of different uses for the business model concept: (1) as attributes of real firms and how they do business (in terms of activities, capabilities, etc.), (2) as cognitive/linguistic schemas (that is the way the business' employees understand and communicate how the company makes money), or (3) as formal conceptual representations of how an organization functions (e.g. symbolic, mathematical, or graphical depictions). This provided a foundational understanding of how business models can be viewed |
| Vendrell-Herrero et al. (2018) | *Digital business models: taxonomy and future research avenues* | This paper reviewed 'digital business models' articles and identified that ICT- or digitally-enabled technologies play a critical role in enhancing the process of value creation, delivery, and capture of an existing value proposition – that is in the process of enhancing the business model, but have concluded that a better understanding of mechanisms and capabilities that explain the 'enhancement' process is still missing in the literature |
| Wirtz et al. (2016) | *Business models: origin, development and future research perspectives* | Wirtz and colleagues have provided a review of the recent literature related to the business model domain. This included identifying key knowledge gaps, one of which included the need for more research on the interactions and relationships between the individual business model elements |

| | | |
|---|---|---|
| Wirtz et al. (2010) | *Strategic development of business models: implications of the web 2.0 for creating value on the internet* | In this paper a framework was developed that explains how aspects of web 2.0 can affect business models This provided an understanding of how changes within organisations related to new technologies can influence business model design |
| Zott and Amit (2008) | *The fit between product market strategy and business model: Implications for firm performance* | This paper examined the fit between a firm's product market strategy (i.e. differentiation or cost leadership) and its business model and finds that the two are complements and not substitutes. However, the authors also identified that little research has been conducted so far on how business models evolve, and in particular, how they coevolve with the product market strategy of the firm (i.e. the broad type of the value proposition) |
| Zott et al. (2011) | *The business model: recent developments and future research* | This article reviewed literature on business models in which the authors examined the concept through multiple lenses. The review revealed that academics do not agree on what a business model is and that the literature is developing largely in silos. However, the authors also found emerging common themes among scholars of business models, including: (1) the business model is emerging as a new unit of analysis; (2) business models emphasise a system-level, holistic approach to explaining how firms "do business"; (3) firm activities play an important role in the various conceptualisations of business models; and (4) business models seek to explain how value is created, not just how it is captured. This provided a foundational understanding of the business model concept |

Table 8.8.2: Storbacka's (2011) list of 64 practices and capabilities for effective business models

| **Develop** | **Create demand** | **Sell** | **Deliver** |
|---|---|---|---|
| ***Commercialisation*** | | | |
| **Value research:**<br>Regular planning is carried out with customers<br>The firm uses research methods to define what is valuable for customers<br>A goal of the firm is to initiate innovation together with selected customers<br>Customer value is quantified in the early phases of value proposition development<br>Lead customers are involved in idea creation and value proposition development<br>There are contract models for lead customer involvement | **Value proposition:**<br>Segment specific value propositions have been defined<br>The role of sales & account management is to work proactively with customers already before they send out a RFQ<br>The firm co-operates with industry associations to leverage its own visibility<br>Product managers' campaign plans are developed with sales management | **Value quantification:**<br>Customer specific value propositions are linked to customers' business concerns<br>Dedicated configuration tools are used to create customer-specific value propositions<br>The dialog with the customers' decision makers covers critical business issues and the financial value associated with them<br>Sales illustrates the value of the value proposition to the customer<br>The same tools for quantifying customer value are used across the firm<br>Identified risks are factored into the pricing of the value proposition | **Value verification:**<br>The sales process ensures accurate input to the order-delivery-process<br>Contract handover to delivery enables quick ramp up of delivery operations<br>The value created to the customer is regularly verified<br>True customer profitability is measured and followed up systematically<br>References of value proposition delivery projects are shared though a case repository<br>New value propositions (created for specific customers) are documented in such a way that they can be sold to other customers |

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| ***Industrialisation*** | | | |
|---|---|---|---|
| **Value proposition development:**<br>Value proposition development is focused on customers' processes and financial drivers<br>There is an ability to close the gap between customer needs and the firms' offerings<br>There is a hierarchical value proposition structure (e.g. standardized components defined)<br>Standardized value proposition components are coded in the Enterprise Resource Planning or Product Data Management system<br>Rules for structuring value propositions permit flexible adaptation to customer situations | **Value proposition availability:**<br>There are predefined value proposition configurations for different segments<br>The documentation of configurations is based on results from earlier deliveries<br>Value propositions are priced based on value to customers (not cost plus)<br>There are guidelines for differentiating prices between segments/customers<br>The performance level that the value propositions make possible for customers is specified<br>The sales and account management organization is regularly updated about the availability of different value propositions | **Value proposition configuration:**<br>Configurators are used for configuring customer value propositions<br>There are contract models which support value based pricing of value propositions<br>There is a systematic value based pricing discipline for value propositions<br>Business case analyses (from the provider's point of view) are carried out<br>There is a centralized tendering unit that provides support for making tenders<br>Business control supports sales by with standard costing data on value propositions and individual value proposition components | **Value proposition delivery:**<br>A communication process enables the firm to get/provide information from/to the customer at the right time during delivery<br>Delivery is monitored and corrective actions are taken when delivery is at risk<br>Network partners' roles are clearly defined in contract models and templates<br>The interface and communication with partners is clearly defined<br>Value propositions are developed in order to support the customer’s long-term value creation |

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| ***Platform*** | | | |
|---|---|---|---|
| **Strategy planning:** | **Management system:** | **Infrastructure support:** | **Human resources management:** |
| Value proposition business vision and goals have been defined by top management. | The organizational structure enables sales to work efficiently with other functions | There are specialized intelligence people available to support sales with analyses | There are defined skill profiles for all the roles that relate to value proposition sales |
| The financial impact of value proposition business has been estimated to be significant | The customer dimension is visible in the organizational structure | Knowledge repositories are used for gathering business intelligence | Competencies needed in value proposition business have been identified |
| Focus markets for value proposition business are defined (e.g. customer groups, industries, geographical areas). | The current roles and responsibilities enable team work cross-functionally | Customer/model contracts are available in a centralized library | The bonus scheme is aligned with company strategy |
| There are defined segment strategies (business goals are set and followed up) | New roles (e.g. Value Proposition Manager, Value Proposition Architect or Value Proposition Integration Engineer) have been established | Legal support for contract negotiations is provided (model contracts and/or centralized legal advice) | Bonus schemes reward for cross-functional teamwork (i.e. participating in sales case development, product development). |
| Value proposition portfolio management is in place (what value propositions to develop, invest in, drop, launch, outsource etc.) | Metrics have been defined for measuring and managing business | A CRM system supporting value proposition sales is in active use across the organization | Staff are provided with training in consultative and value selling |
| The total risks associated with different contracts are assessed regularly | | Value proposition delivery is managed in the ERP (Enterprise Resource Planning) system | |

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