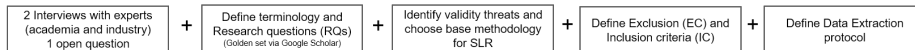


Appendix - Business modeling and flexibility in Software-intensive product development

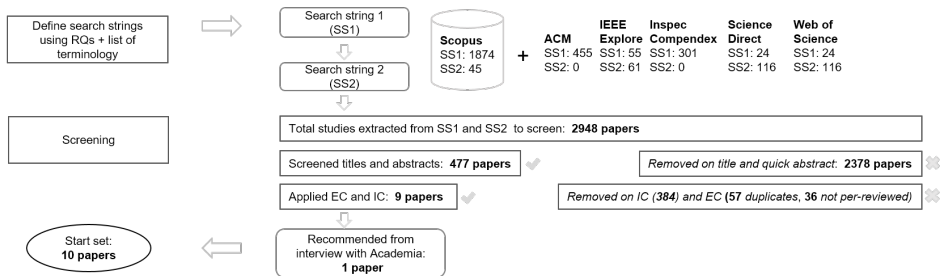
For brevity, and publishing reasons, this appendix is supplied as supplementary information to the I3E 2018 conference paper “*Business modeling and flexibility in software-intensive product development - A Systematic Literature Review*”. Parts of the text is also published in other journal papers.

Figure 1 presents an overview of the research process.

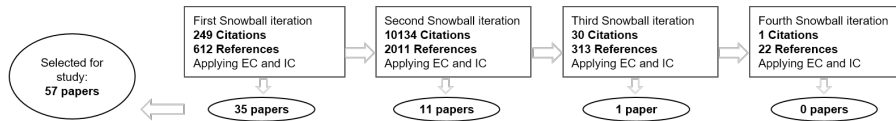
1. Design of Literature review



2. Define start set



3. Execute snowballing iterations



4. Data extraction, analysis, and synthesis



Figure 1: Research methodology overview

Appendix A. Inclusion and exclusion criteria

To identify literature related to our research questions, we developed the Inclusion criteria (IC) and Exclusion criteria (EC) listed in Table A.1. These criteria allow us to explore why BM is used, how it is applied, and what solutions currently exist. Since our research topic covers multiple research disciplines, we decided to address the RQs by designing the IC as wide as possible, to give us a large variety of articles discussing BM (IC1) in any relationship to effectiveness and efficiency. To evaluate BM efficiency, it is important to connect the business strategy via the business model to the execution of the business model with a traceability to daily operations and results. So to understand if business modeling enables effectiveness and efficiency, we want to know how a business model can be operationalized by developing the right type of flexibility (variability in the realization, IC3) matching all desired strategic and tactical choices (business flexibility, IC2).

Table A.1: Inclusion and Exclusion criteria.

Criteria	Evaluate(=Yes)	Reasoning
EC1	Exclude if Not written in English	Must be able to read and understand to evaluate Basic Quality assurance of paper Snowballing will give many duplicates
EC2	Exclude if Not peer-reviewed	
EC3	Exclude if duplicated	
IC1	Does the abstract, introduction, conclusions (or full text if needed) mention purposes, benefits or challenges (PBC) for business modeling?	Papers must identify real problems and issues related to business model, business modeling or business model innovation.
IC2	Does the text mention aspects of business flexibility (BF)?	BM is becoming increasingly complex due to growing business ecosystems and the digitalization of the value delivery, which both introduce a need for variability in the offering. Offering services on top of products are one example to address BF.
IC3	Does the text mention aspects of variability in the realization (VR)?	Planning a business model is not enough. It needs to be efficiently realized as well, so the business flexibility needs to be matched with a variability in the realization of the business model. Offering Software Product lines (SPL) or Product Service Systems (PSS) are examples of addressing VR.
IC4	Is it an empirical study?	We want to investigate how business models are used in practice, and not only in theory. Empirical is done in an industrial context, no student work, no proof of concept, no examples even if they are "based on real data"
IC5	Is it referring to a SIPD context?	The realization of business models is highly dependent on software due to the digitalization of the value delivery. This opens up new opportunities for value capture (and value creation) in the business ecosystems.

Business modeling allows an organization to identify and prioritize changes to current business operations (content, activities, and governance). This change is continuously translated into a realization of the business model, through experimentation or otherwise, by understanding how the desired flexibility can be operationalized using modularity in design and software-based systems to support content, activities (all stakeholders, e.g., internal organization, partners, suppliers, and customers) and governance.

Effectiveness and efficiency should be evaluated from the gap between all strategic and tactical choices, in combination with how the organization (and supporting software) utilize the remaining flexibility to create satisfied customers in everyday transactions. The dilemma of not only implementing the right flexibility (supporting the needed business options) but also implementing it efficiently, is key to success, i.e., the right level of variability in the realization combined with the appropriate changeability in the realization to facilitate experimentation with the operationalized business model.

The selection criteria was based on IC1 AND (IC2 OR IC3 OR IC4 OR IC5) to achieve a broad selection of papers as possible. If only the term Business model were used (and not specifically Business modeling), the paper could still be a candidate if it referred to activities related to creating, maintaining, or otherwise using a business model.

Appendix B. Selected articles

The list contains all selected papers, with the papers related to flexibility highlighted with bold face **P[id]**.

Paper ID	Authors/Ref	Year	Rigor			Relevance				EP4	No. of RQ+IC
			C	SD	V	C	Sc	Su	RM		
P1	Woodard et al. [1]	2013	1	1	1	1	1	1	1	2	4
P2	Rohrbeck et al. [2]	2013	0.5	1	0	1	0	1	1	1	3
P3	Reim et al. [3]	2013	0.5	0.5	0	0	0	0	0	2	3
P4	Hackney et al. [4]	2004	0.5	0	0	1	1	0	0	3	2
P5	Chew [5]	2014	1	0	0	1	0	0	0	2	4
P6	Ballon [6]	2007	0	0	0	1	0	0	0	1	3
P7	Loss & Crave [7]	2011	0	0	0	1	0	0	0	2	3
P8	Romero & Molina [8]	2011	0	0	0	0	0	0	0	3	3
P9	Höflinger [9]	2014	0.5	1	0	0	0	0	0	2	3
P10	Goel et al. [10]	2009	0.5	0	0.5	0	0	0	0	3	3
P12	Casadesus-Masanell & Ricart [11]	2010	0	0	0	1	0	1	0	3	3
P13	Chesbrough [12]	2010	0	0	0	1	0	0	0	2	3
P14	Demil & Lecocq [13]	2010	1	0	0.5	0	0	1	0	2	2
P15	Doz & Kosonen [14]	2010	0	0	0	0	0	0	0	1	2
P16	Dubosson-Torbay et al. [15]	2002	0	0	0	0	0	0	0	2	2
P17	Hacklin & Wallnöfer [16]	2012	1	0.5	0	1	1	1	1	1	3
P18	McGrath [17]	2010	0	0	0	0	0	0	0	1	3
P19	Richardson [18]	2008	0	0	0	0	0	0	0	2	3
P20	Storbacka & Nenonen [19]	2011	1	1	1	1	1	1	1	2	2
P21	Zott & Amit [20]	2010	0	0	0	1	0	0	0	2	2
P22	Baden-Fuller & Morgan [21]	2010	0	0	0	0	0	0	0	2	3
P23	Gao et al. [22]	2011	0	0	0	1	0	1	0	3	2
P24	Kindström [23]	2010	1	1	0.5	1	1	1	1	2	4
P25	Meier & Massberg [24]	2004	0	0	0	0	0	0	0	3	2
P26	Meier et al. [25]	2010	0	0	0	1	0	1	0	3	3
P27	Richter et al. [26]	2010	0	0	0	0	0	0	0	2	2
P28	Schuh et al. [27]	2009	0	0	0	0	0	0	0	3	1
P29	Zott et al. [28]	2011	0.5	1	1	0	0	0	0	2	4
P30	Amit & Zott [29]	2001	1	1	1	1	1	1	1	3	2
P31	Baden-Fuller & Haefliger [30]	2013	0.5	0	0	0	0	0	0	3	3
P32	Osterwalder et al. [31]	2005	0	0	0	0	0	0	0	2	3
P33	Al-Debei [32]	2010	0.5	0	0	1	1	1	1	2	3
P34	Bouwman [33]	2006	0	0	0	0	0	1	0	3	3
P35	Buder & Felden [34]	2012	1	1	1	0	1	0	0	1	4
P36	Cortimiglia et al. [35]	2015	1	1	1	1	1	1	1	1	2
P37	Ghezzi [36]	2013	0.5	0.5	0.5	1	1	1	1	1	4
P38	Ghezzi [37]	2012	0.5	0	0	1	1	1	1	3	2
P39	Haaker et al. [38]	2004	0.5	0	1	1	1	1	1	2	2
P40	Krumeich et al. [39]	2012	0	0.5	0.5	0	0	0	0	2	2
P41	Zolnowski & Böhmman [40]	2011	0.5	0.5	0	0	0	0	0	1	2
P42	Andries & Debackere [41]	2007	1	1	0.5	1	1	1	1	3	2
P43	Björkdahl [42]	2009	0.5	0.5	0.5	1	1	1	1	3	2
P44	Casadesus-Masanell & Llanes [43]	2011	1	0	0	0	0	0	0	3	2
P45	Doganova & Eyquem-Renault [44]	2009	0.5	0.5	0	1	1	1	1	2	4
P46	Mason & Leek [45]	2008	0.5	0.5	0	1	1	1	1	3	2
P48	Lindström [46]	2014	0.5	0.5	1	1	1	1	1	3	2
P49	Eurich et al. [47]	2014	0.5	0.5	0	1	1	1	1	1	3
P50	Ning et al. [48]	2011	0.5	0.5	0	1	1	0	0	3	0
P51	Dmitriev et al. [49]	2014	1	1	1	1	1	1	1	1	2
P52	Schneider & Spieth [50]	2014	0.5	0.5	0.5	1	0	0	1	1	3
P53	Short et al. [51]	2013	0	0	0	1	1	0	1	1	2
P54	Meier & Boßlau [52]	2013	0.5	0	0	1	1	1	1	1	4

Paper ID	Authors/Ref	Year	Rigor			Relevance				EP4	No. of RQ+IC
			C	SD	V	C	Sc	Su	RM		
P55	Giessmann et al. [53]	2013	0.5	0	0.5	1	0	0	0	3	3
P56	Salgado et al. [54]	2014	0.5	0	0	1	1	1	1	1	3
P57	Kim et al. [55]	2008	1	0	0	0	0	0	0	3	2
P58	Mason & Mouzas [56]	2012	1	1	1	1	1	1	1	3	2
P59	Salgado et al. [57]	2014	0	0	0	0	0	0	1	3	2

Table B.2: Selected papers including extracted properties, including the start set, with Paper ID, reference, authors, rigor and relevance scores (EP3), paper content (EP4), and the number of topics addressed by the paper (RQ1+RQ2+IC2+IC3).

Appendix C. Data Extraction properties

Table C.3 lists the data extraction properties used for this study and maps their relevance to each RQ. Properties EP1-EP4 are evaluated per paper and used to analyze the relevance to industry for each paper's contribution. Properties EP5-EP9 use open coding and the extracted data was thematically and narratively analyzed.

Table C.3: Data Extraction properties.

Id	Evaluate	How	RQ mapping
EP1	Research Methods	Action research, Case study, Conceptual analysis, Design Science research, Experiment, Interview, Literature review, Not stated, Other	Relevance of paper
EP2	Paper Context	SW intensive, Industry, General (e.g. Literature review), Non-industry (in priority order)	RQ1 and relevance
EP3	Rigor & Relevance of the paper	Detailed rubric definitions per aspect [58] Rigor: Context is described Rigor: Study Design is described Rigor: Validity is discussed Each Rigor aspect measurement: Strong description (1), Medium description (0.5), and weak description (0) Relevance: Context (weight=8), i.e. in industrial setting Relevance: Scale (weight=4), i.e. realistic size and industrial scale Relevance: Subjects (weight=2), i.e. industry professionals Relevance: Research Method (weight=1) Each Relevance aspect measurement: Contribute to relevance (1), Do not contribute to relevance (0)	Overview and relevance
EP4	The relevance of the paper content in respect to Business modeling.	Coded 1-3: (1) Business modeling. The paper discuss specifically the process of modeling your business (2) Business model. The paper mainly focus on the Business model and discuss how different aspects of the Business model constructs are developed (3) Other. It only refers to a specific business model(s), or discuss specific instances thereof, or a topic related to business model (e.g. flexibility). Therefore of minimal significance to our study.	RQ1
EP5	IC1-IC3	Use ATLAS TI to extract related quotes for each RQ.	RQ1, RQ2
EP6	Business Element context	Use ATLAS TI to extract related quotes referring to a part of the business model construct, what it is, why it's important and how it is used and relates to other parts.	RQ1
EP7	Practice/Technique	Use ATLAS TI to extract quotes referring to a practice or technique presented, described or used.	RQ1, RQ2
EP8	Measurement perspective	Use ATLAS TI to extract quotes related to - Product view (how well is the value created) - Process view (how efficient have you organized the value flow) - Resource view (how well is the resource utilized and adapted for the needed task) - Project view (how efficient is the goal fulfilment) - Relationship view (how effective is the communication)	RQ2
EP9	Success indicator and metric	Use ATLAS TI to extract related quotes.	RQ2

Property EP1 and EP2 are subset of property EP3 (Rigor & Relevance) where property EP2 categories the paper's context. We extend the definition of Context (EP3 [58]), by adding (large-scale) Software intensive industry. The relevance parameter (EP3), we coded with binary weights (originally proposed as plain sum of 0 or 1), allowing us to visualize the impact of different relevance aspects. The weights were guided by RQ1, hence setting our priority: Industry (8), Scale (4), Subjects (2) and Research method (1), e.g. a value of 9 or higher would represent anything in "industry" with at least one additional relevance aspect met. Originally the Relevance element of property EP3 focus on the paper's context in relation to industry so we added property EP4 (Paper content) to map the relevance of each paper's content related to answering the RQs.

EP5 corresponds to our inclusion criteria (IC). EP6 was used to look for patterns on the business model construct as to describe what it is, why it is important and how it is used. This is important since the topic of BM is wide and lacks a clear definition. EP7-EP9 was used to understand the context for effectiveness and efficiency as related to business modeling.

Appendix D. Quotes of purpose, benefit and challenges

Quotes of purpose (P) often sets the general context, while quotes of challenges (C) or benefits (B) often are a reflection of how well a solution to a specific problem works. Benefits refer to a solution with good enough results while challenges refer to potential issues to obtain a satisfactory result.

Table D.4 lists the quotes of purposes (P), benefits (B), and challenges (C) for business models and business modeling, extracted from the selected studies (see Appendix B for paper references). All quotes have been categorized into common areas (first column), and then listed under respective primary context they are found in. We use prefix notation (+) for benefit, (-) for challenge, and [Pid] for the paper reference. The items (P,B,C) marked with a **bold face** in the table, belong to the specific papers answering RQ2. For clarity, we provide the complete PBC-table for all selected papers.

Common areas	Strategy & Planning (Define)	Daily operations (Execute)	Governance & communication
Value creation, value capture	<p>Conceptual discussion and visualization of value creation/capture [P2]</p> <p>Articulate Value proposition [P7], [P13],[P35]</p> <p>Identify a market segment and value chain [P7], [P13],[P20]</p> <p>Appropriate value from technology [P36]</p> <p>(+) depicts the logic for value creation/capture [P17]</p> <p>(+) fosters innovation and increases readiness for future [P32]</p> <p>(+) rigorously describes and analyses business with system dynamics [P36]</p> <p>(-) hard managing tension between value creation and value capture (trade-offs monetization) [P5]</p> <p>(-) hard managing service flexibility (segmentation, QoS) [P5], [P24]</p> <p>(-) ensure consistent service experience (multi-channels) [P5]</p> <p>(-) a total value need consideration (not only financial) [P53]</p>	<p>Reconfiguration of roles and relationships [P8], [P20]</p> <p>Determining the logic for value [P30]</p> <p>(+) captures how resources transforms into customers willingness to pay for value [P18]</p> <p>(-) Service vs. Product centric create conflicts, balancing is difficult [P1][P24]</p> <p>(-) low effectiveness (customer experience) of value co-creation (organization/customer) [P5]</p> <p>(-) it is difficult to incorporate closer customer interaction [P24]</p> <p>(-) how to acquire resources in value chain not previously available in-house [P24]</p>	<p>Describe and classify businesses [P32],[P22]</p> <p>Meeting customer's needs [P58]</p> <p>Compare value creation approaches [P32]</p> <p>(+) facilitates strategic discussion and finding creative solutions [P2]</p> <p>(+) it is a structural template for mapping existing value logic [P17]</p> <p>(+) reduces imitability, create sustainable advantage [P24]</p> <p>(+) creates novel approach for using services in value creation [P41]</p> <p>(+) it is explicative and predictive power to value creation [P45]</p> <p>(+) helps calculate technology value to investors, customers, partners [P45]</p> <p>(-) complex coordination for ecosystem collaboration [P2]</p> <p>(-) negatively influences optimal value co-creation in aligned processes [P5]</p> <p>(-) new value (co-)creation focus on relationship-centric aspects [P7]</p> <p>(-) difficulty in identifying market opportunities due to changing customer needs [P9]</p> <p>(-) difficulty to effectively communicate (articulate, visualize) emerging value proposition [P24]</p> <p>(-) hard to analyse business process vs. value activities [P35]</p> <p>(-) many frameworks has many deficits concerning consistency and value activities [P35]</p> <p>(-) lacks a quantitative way to convey value and no sales model for perceived value [P48]</p> <p>(-) difficult to visualize value for integrated offers [P48]</p> <p>(-) BM has a dual nature conceptualizing value and organizing for that value (in different life cycles) [P51]</p>

Common areas	Strategy & Planning (Define)	Daily operations (Execute)	Governance & communication
Cost, revenue, profit	<p>Estimate cost/revenue potential [P7]</p> <p>(+) depicts actual structures for a company to profit from business [P9]</p> <p>(+) experiment with cost before investing [P18]</p> <p>(-) “black-hole” investment [P18]</p> <p>(-) incorporate requirements for lean consumption and achieve the objectives of service profit chain [P5]</p> <p>(-) develop technology innovations in an adaptive process (trial-and-error) with cost as main cause for readjustments [P51]</p>	<p>(-) adaptation to environment by trial-and-error [P51]</p> <p>(-) amount of human resources needed for modeling [P56]</p> <p>(-) new revenue streams driven primarily by customer perceived value instead of internal cost [P24]</p>	<p>Incentives to engage in and control operations [P20]</p> <p>(-) maintain accurate definition of ownership conditions in a collaborative business model, and revenue model considering risk distribution [P54]</p> <p>(-) maintain a new value chain reward system [P24]</p>
Mind-set, Knowledge	<p>Experimenting [P2], [P22], [P49]</p> <p>Shift company’s boundaries [29]</p> <p>Exploit business opportunity [P22], [P29]</p> <p>Foster Innovation [P32]</p> <p>Increase knowledge [P29]</p> <p>(+) focus beyond company-centric focus [P17]</p> <p>(+) shifts focus from WHAT resources to HOW to use them [P18]</p> <p>(+) BMI enables strategic renewal [P36]</p> <p>(-) turns shared meaning into identity lock-ins [P17]</p> <p>(-) resistance to change [P17]</p> <p>(-) plan for “experimentation and learning” in established companies [P18]</p> <p>(-) systematic servitization (product to service shift) [P24]</p> <p>(-) hard to define business requirements (lack of information and specific details) [P56]</p>	<p>Enhance creativity, unlock barriers of innovation [P2]</p> <p>Build trust [P2]</p> <p>Increase readiness via portfolios and simulation [P9], [P32]</p> <p>Build knowledge [P22]</p> <p>(+) uses of mixed techniques between Business and IT improved communication and IT development [P56]</p> <p>(-) how to achieve organizational and customer learnings incorporated into iterative design [P5]</p>	<p>Mediating, facilitating and sharing strategic discourse [P17], [P36]</p> <p>Address lack of knowledge [P45], [P22]</p> <p>(+) unlocks barriers of innovation + building trust [P2]</p> <p>(+) breaks cognitive structures and act as communicative, mediating device for shared meaning and commitments [P17], [P32]</p> <p>(+) improves understanding, language and legitimacy [P17], [P32]</p> <p>(+) formalization forces implicit understanding becoming explicit (move strategy into execution) [P17]</p> <p>(-) lack of formality and analyst dependency with high skills [P56]</p> <p>(+) promotes outside in view on customer value [P18]</p> <p>(+) provides early warning for threatened BM via analysing dynamism of competitive advantage [P18]</p> <p>(+) highlights consistency strategy and BM building blocks [P24]</p> <p>(+) provides new insights (externalize, map and store knowledge) [P32]</p> <p>(+) fosters systematic BMI [P32]</p> <p>(+) unambiguously defines dimensions, properties and semantics [P33]</p> <p>(+) visualization improves understanding [P32], [P56]</p> <p>(+) helps define goals [P32]</p> <p>(+) educates decision-makers for informed decisions, goals and requirement engineering [P32]</p>

Common areas	Strategy & Planning (Define)	Daily operations (Execute)	Governance & communication
Means	<p>Innovation and technology management [P29] Plan and design business logic [P32] Understand complex interplay [P31] Adopt servitization to further enhance global competitiveness [P54] (+) Prepares implementation (identifying joint activities with priority and validating the business model) [P2] (+) Helps to build better strategies (e-business) [P32] (-) Business model design requires better integration with strategy analysis [P37] (-) Difficult to be systematic (too slow, too detailed, iterative) [P17] (-) limited empirical validation [P17] (-) provides good insights but lacks support where to start investing to reach future business [P18] (-) capture customer's reaction to new technology [P5] (-) hard to effectively balancing (conflicting) requirements (user and design) and strategic interests (of partners) [P39] (-) tools conceptual, complicated and too time consuming (for network centric BM) [P53] (-) paradigm shift business activities and consumption patterns must be aligned with environmental and social objectives [P53]</p>	<p>Change and implement business logic (and business process execution) [P17], [P32] Realize strategic tasks [P9] Support resource fluidity [P15] Commercialize ideas & technology [P29] (+) better requirement engineering [P32] (+) facilitates and improves choices in IS/IT [P32] (-) difficult to mobilize and align available resources (not only internal but also extending external base) in time [P9], [P15], [P24] (-) integration, agility and change [P10] (-) barriers to change business model are real processes and tools are not good enough [P13] (-) a structured service development process connected to the business model [P24]</p>	<p>Alignment of strategy, business organization and technology [P32] Manage flexibility and increase change capability [P58] (+) improves measuring, observing and comparing business logic [P32] (+) improves design of sustainable business models [P32] (+) improves alignment of strategy, organization and technology and integration business IS/IT domains [P32] (+) BM may enable strategy execution and how operational choices affect company's performance [P37] (+) helps to react to environment change due to strategic flexibility and dynamic capabilities [P52] (-) hard to reach and maintain alignment of business model and information system model [P59] (-) value co-creation is a hard cooperative process (speed, coordination, compromise) [P8] (-) how to industrialize large-scale service offerings [P24] (-) how to avoid isolated change (relationships, value, dynamic portfolio) [P24] (-) hard to visualize, document and share basic elements due to relationships and speed of change [P26], [P32] (-) hard to achieve consistency between BM and BPM and achieve real improvements with BPM [P35] (-) lack of appropriate methods and tooling for BM integrated with BPM [P35] (-) BM design requires better integration with strategy analysis models [P37] (-) discovery of goals and rules no common process for elicitation [P56]</p>
Ends	<p>Describe position of company in value network [P7], [P13], [P29] Formulate competitive strategy with goals and objectives [P19] [P37] Act as receipt for the business [P22]</p>	<p>Operationalize strategy [P36], [P37]</p>	<p>Alignment of strategy, business organization and technology [P32] Act as a scale model and role model for characterization of similarities and definition of difference [P22]. (+) facilitates and improves choices in IS role and structure [P32]</p>

Common areas	Strategy & Planning (Define)	Daily operations (Execute)	Governance & communication
Assessment	<p>Deal with uncertainty [P2] [P52][P54]</p> <p>Holistic picture of future state [P2][P32]</p> <p>Explain strategic issues (value creation, competitive advantage, company performance etc.) [P36],[P29]</p> <p>Support Leadership unity [P15]</p> <p>Explore and design promising business concepts/ideas [P32], [P36], [P41]</p> <p>Strategy and business model innovation [P17] [P36], [P52], [P53]</p> <p>(+) facilitates strategic discussion with shared insights to barriers/drivers (visual + levels of details) [P2]</p> <p>(+) facilitates interaction to create strategic options and share mediate strategic discourse [P17]</p> <p>(+) help to better understand the business and its important parts [P24]</p> <p>(+) helps to improve planning, change and implementation (with knowledge and facilitate choice of indicators) [P32]</p> <p>(-) difficult managing dynamics (agility, adaptability, planning, decision) for alignment to environment and other organizations [P2], [P5], [P7], [P9], [P36]</p> <p>(-) different methods or patterns not aligned, no guidance how to obtain final design [P49]</p> <p>(-) neglects the relevance for environment - focus on model-internal consistency [P49]</p>	<p>Alignment of control and value parameters [P6]</p> <p>Mapping of business roles or interactions onto technical modules, interfaces, etc. [P6]</p> <p>Analyse functioning of an organization [P32]</p> <p>Describe use of information technology [P32]</p> <p>Improve the Business-IS/IT dialogue [P32],[P56]</p> <p>(+) managing a business model portfolio can lead to flexibility in re-organizing resources [P9]</p> <p>(+) low-risk experiments via simulation [P32]</p> <p>(-) balancing act between customer, revenue, cost, functionality (e.g. local adaptation vs. sw platform) [P1]</p> <p>(-) mutual alignment between steps/organizations/customers when performed iteratively and holistically [P5]</p> <p>(-) how to match consequences of environmental changes onto company with best fit [P9]</p> <p>(-) a continuously learning business model experimentation [P13]</p> <p>(-) business model change (hard decision, risky organizational adjustments, and collective commitment) [P15]</p> <p>(-) efficient management of information (explore vs. create collective understanding) is difficult [P45]</p>	<p>Force decisions [P2]</p> <p>Analyse Business model fit [P49]</p> <p>Bridge static view for change and performance over time [P14]</p> <p>Computerize DSS for better design, critique and simulation of new BMs [P32]</p> <p>Understand how technology is converted into market outcome [P29] [P31]</p> <p>Provide contextual information [P35]</p> <p>Identification of critical success factors and investigate performance [P41]</p> <p>Proof, persuasion, comparison and benchmarking [P45], [P55]</p> <p>(+) creates common language, shared priority and forces decisions [P2]</p> <p>(+) improves dealing with uncertainty (reduction by sharing, turn into advantage, enhance understanding of barriers) [P2]</p> <p>(-) difficult to deal with uncertainty, complexity and dynamism [P54]</p> <p>(+) facilitates brainstorming (today and future) and integrative (no theory bias) [P17]</p> <p>(+) helps reducing complexity (visual) [P32]</p> <p>(+) improves mutual understanding Business and IT domains [P32]</p> <p>(+) facilities identification of key indicators to follow execution of plan [P32]</p> <p>(-) difficulty in reliable monitoring of key indicators [P54]</p> <p>(+) BM as “scale model” demonstrates feasibility and worth to partners [P45]</p> <p>(-) achieve joint strategy when decisions create cross-functional/divisional conflicts [P5]</p> <p>(-) align social, organization, and technology (due to richness and change of knowledge economy) [P7]</p> <p>(-) difficult to choose from massive results regarding BM design experimentation [P18]</p> <p>(-) hard to identify threats to BM in time [P18]</p> <p>(-) managed different abstraction levels and get the details right in execution [P19], [P21]</p> <p>(-) requires decision-making on multiple parameters of activity systems [P21]</p> <p>(-) BM has a dual nature (instance vs. classification) [P22]</p> <p>(-) hard to overcome resistance to and awareness of need to change [P52]</p> <p>(-) over-estimate/false impression of your ability to change [P52]</p>

Table D.4: Quotes on purpose, benefits and challenges for BM.

Figure D.2 illustrates the distribution of quotes (P,B,C) related to the main contexts for all

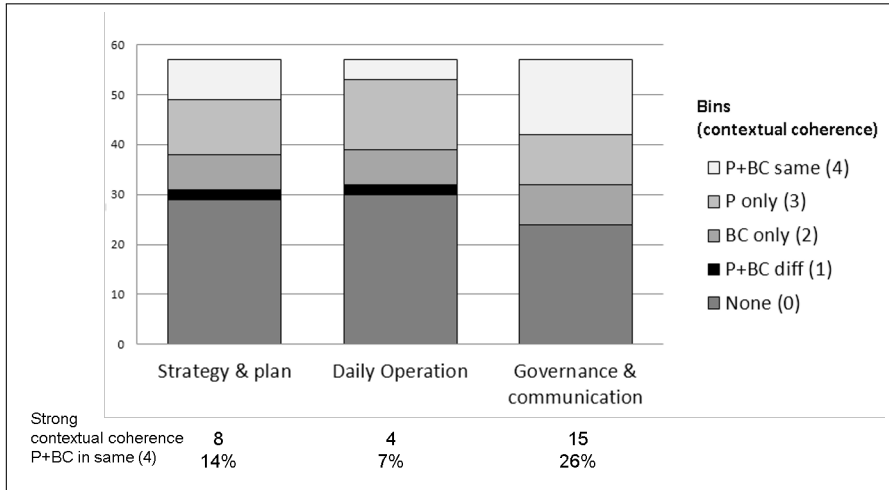


Figure D.2: Barplot quotes of purpose, benefits+challenges, distributed over the main contexts for all 57 papers

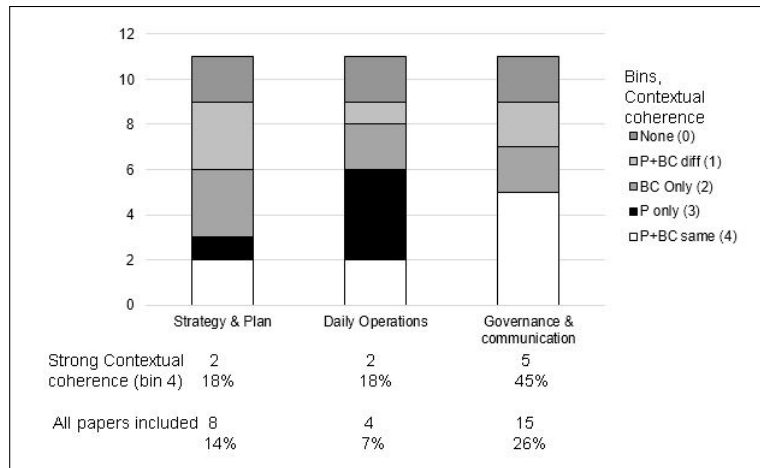


Figure D.3: Barplot quotes of purpose, benefits+challenges, distributed over the main contexts for RQ2-papers

57 papers. To identify any contextual patterns we binned each paper's data in five bins: 4=Purpose and Benefit+Challenge in same context; 3=Purpose only; 2=Benefits+Challenges only; 1=Purpose in different context than Benefit or Challenge; 0=No quotes on purpose, benefit or challenge. An individual paper may have quotes in more than one context. Strongest contextual coherence is found in bin 4, with the highest ratio for the 'Governance & communication' context (26%). The largest contextual ambiguity (bin 1) is found in 4 papers [P8, P13, P19, P49] where a purpose is stated in one context while the benefit or challenge is claimed in another context without specific detailing. Romero & Molina discuss the purpose of value co-creation, as a hard cooperative process (speed, coordination, compromise) with the challenge of managing the experience-sharing network, and how that affects the business modeling [P8]. Chesbrough discusses business model innovation with purposes related to formulating competitive advantage, value proposition and value chain definition while concluding challenges as a lack of tool support and continuous learning related to BM experimentation [P13]. Richardsson discusses the purpose of formulating and achieving goals and objectives while concluding challenges as managing the different abstraction levels towards execution and getting the details right [P19]. Eurich et al. discuss the purpose of transforming the business opportunity into an organizational implementation via experimentation and business model fit, while concluding challenges in practical aspects like lack of details, not aligned design processes, disregard of external influences etc [P49]. In addition, we find it worth noting that a large portion of the papers lack statements on purpose, benefit, or challenge making a discussion around effectiveness and efficiency more challenging due to vague contextual information. We interpret abstraction levels and lack of details to be a contradicting and challenging issue for effectively and efficiently defining context to improve understanding and communication.

When we analyse the RQ2-papers only, see Figure D.3, we see a stronger contextual coherence for the 'Governance & communication' context (45%). Also, there is a slight focus shift away from 'Strategy& plan' towards 'Daily Operations', as well as from 'Mind-set & knowledge' towards 'Means'. This is a likely consequence, since the key purpose with flexibility is to achieve speedy change, therefore pushing focus towards solutions (Means).

Surprisingly, many papers have a low contextual coherence for the listed Purpose, Benefit, and Challenge, making it difficult to directly compare the results across the papers.

Appendix E. References

This list of reference contains detailed bibliographic information for all selected papers, see Appendix B.

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