Navigating Sustainable Business Model Transitions Through Tooling, Language, and Context by Intermediaries

A Data Science-Based Longitudinal Case Study

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Abstract

This paper describes the first phase of our research into the influence of language construction and context-specific factors on business model tools for sustainable business models within the advisory process of intermediaries. Employing a longitudinal case study, we follow two intermediaries for a year and combine machine learning methods, participatory principles, and qualitative methods to understand this complex process better. Our research focuses explicitly on intermediaries' role in guiding SMEs using business model tools through this transition. We examine how language construction and contextual factors influence the use of business model tools in the advisory process. By analyzing 196 articles and books on Sustainable Business Model Tools (SBMTs) and business models using Latent Dirichlet Allocation (LDA), our preliminary findings provide a basis to uncover insights that contribute to developing a toolkit to improve intermediaries' support for SMEs while also achieving sustainable change. The dataset resulted in 10-15 potential topics covering innovation, sustainability, customer value, digital transformation, and management processes. Further refinement of our search process and algorithms is needed to specify these topics, emphasizing language construction and context-specific factors for understanding how intermediaries can guide SMEs in adopting sustainable practices effectively.

Keywords

Tooling, Sustainable Business Models, Intermediaries, Topic Modelling

Introduction

Our early-stage research is a comprehensive exploration of the impact of language and context on intermediaries' utilization of multiple value-creating business model tools. By applying advanced data science methodologies, we aim to deepen our understanding of how these insights can enhance the advisory processes and propel sustainable transitions in small and medium-sized enterprises (SMEs). Our focus on intermediaries is not arbitrary; it stems from their crucial role in advising SME clients. SMEs often struggle with effectively integrating sustainability into their operations (Moursellas et al., 2023). Despite their significance in achieving sustainability goals, a noticeable lack of research focuses on these organizations (Khoja et al., 2022).

Our research aims to address this knowledge gap and equip intermediaries and SMEs with the requisite knowledge to address sustainability challenges more effectively. The shift towards sustainable business practices is essential for SMEs. However, navigating this transition presents challenges, such as lacking resources and expertise to implement the necessary changes. Intermediaries play a vital role in supporting SMEs in this journey, guiding them through the complexities of adopting sustainable business models (SBMs), often using various tools and methods to do so.

Despite their crucial role, knowledge gaps stemming from understanding context-specific language and the intricacies of using business model tools hinder the effectiveness of intermediaries' support (van Lente et al., 2020; Hargreaves et al., 2013). These gaps may result in misinterpretations and ineffective implementation of sustainable transformation processes. This paper will, therefore, focus on language construction and context concerning sustainable business model tooling.

By researching the advisory process of two Dutch intermediaries, we examine the influence of language and context on SMEs in transitioning to SBMs. We use NLP and Machine Learning techniques, such as text mining and topic modeling, to extract insights into how language construction and context influence the usage of SBM tools. This data-driven approach offers a new perspective on the challenges and opportunities faced by intermediaries, shedding light on the vital role of language construction and contextual understanding in creating multiple values.

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The research question guiding this conference paper is: to what extent can applied data science methods facilitate the development of a context- and language-sensitive business model tooling that empowers intermediaries to guide SMEs through sustainable business changes?

Our research aims to understand better the relationship between intermediaries and business model terminology's multifaceted and context-dependent nature and evolution. Business model concepts evolve and are subject to various domain-specific interpretations, which may lead to misunderstandings that impede their practical application (Szopinski et al., 2022). By focusing on adapting business models to address complex societal issues, our research underscores the potential for organizations to achieve individual success and contribute to broader societal and ecological impacts. The paper demonstrates how synthesizing and contextualizing knowledge about tooling can provide user-friendly support for SMEs facing complex sustainability challenges. The outcomes of this research contribute to knowledge for accelerating sustainable transitions in the business sector.

The remainder of this early-stage research is structured as follows: we briefly outline the theoretical underpinnings that inform our work, followed by a description of the methods. We then present our initial findings, leading to a discussion of these results and a conclusion with reflections on their implications and future directions for research.

Background

Organizations face various market-related and societal challenges, such as the energy transition, inclusion and diversity, the long-term availability of healthcare, and challenges related to digitalization (Broerse and Bunders-Aelen, 2010, Johansen and van den Bosch, 2017, Nosratabadi et al., 2020, Geissdoerfer et al., 2020). These wicked problems highlight the importance of transitioning to SBMs that combine financial, ecological, and social values (Evans et al., 2017). Business models provide an overview of an organization's value-creation, capturing, and delivery, often including the value proposition, resources, key activities, cost and revenue model, value chain, and target market (Massa et al., 2017, Chroneer et al., 2015, Osterwalder and Pigneur, 2010, Zott et al., 2011). Business model descriptions illustrate strategic priorities driving organizational innovation through their attributes, conceptualizations, and interpretations (Massa et al., 2017). SBMs prioritize multiple value creation, which is the simultaneous pursuit of social, ecologic, and economic value creation, considering all relevant stakeholders, resulting in these organizations being essential to stimulating and implementing sustainable innovations, contributing to organizational distinctiveness, and catalyzing sustainable transitions (Koers-Stuiver et al., 2023, Bocken et al., 2014, Geissdoerfer et al., 2016, Bhatnagar et al., 2022, de Lat and Nijhof, 2023, Jonker and Faber, 2019). Sustainable transitions refer to fundamental shifts in society's functions, intending to replace existing practices with new sustainable systems (Köhler et al., 2019). Yet, SMEs often struggle to incorporate sustainable strategies into their business models.

Multiple value creation is complex and multidimensional, leading to various challenging application scenarios that require a multifaceted approach. Because it requires transdisciplinary knowledge, differing perspectives affect how sustainable business model tools are understood (Haynes & Alemna, 2022; Velter, Bitzer, & Bocken, 2022). This results in an interdisciplinary demand for practical tools and strategies to implement sustainable business models effectively. Due to this, SMEs often turn to intermediaries for guidance

and manage this fragmentation and ambiguity, frequently using (self-designed) models (Kanda et al., 2018, Köhler et al., 2019).

Intermediaries drive sustainable transitions (Kivimaa et al., 2019). These organizations play an essential role in assisting SMEs in overcoming knowledge gaps by leveraging a mix of specialized knowledge, engaging with key stakeholders, and implementing effective change management strategies. During these change processes, intermediaries often use business modeling and (self-developed) business model tools to manage complexity and support designing, developing, and implementing sustainable business models. However, intermediaries face challenges in keeping pace with the rapidly evolving market, particularly in navigating the vast array of business tools and sustainability information and effectively deploying the necessary resources to achieve their clients' sustainability goals (Breuer et al., 2018, Kivimaa et al., 2020). Likewise, these rapid changes and transdisciplinary knowledge may challenge how effectively intermediaries can guide these transition processes in which language plays an important role (Sancak, 2023).

For intermediaries to be successful, language construction and contextual understanding are needed, highlighting the importance of clear and accessible business model tooling that can be adapted to contextual needs and stakeholder preferences (Kanda et al., 2018, Bhatnagar et al., 2022). However, the business model tooling landscape is complex, characterized by discipline-dominated fragmented overviews and many frameworks, canvasses, tools, ontologies, concepts, and numerous dimensions for (multiple) value creation and business model innovation (John et al., 2017, Augenstein and Fleig, 2018). Adding to this complexity is language diversity influencing the individual and the group, potentially affecting the interpretability of the tooling and value-creating concept (Lecomte et al., 2023). It is, therefore, essential to understand how language constructions used by intermediaries and their clients affect working with business model tools.

Language construction covers many aspects that influence how language is used, created, and interpreted, stemming from psycholinguistics, sociolinguistics, semiotics, and cognitive linguistics(Bera et al., 2014, Spivey et al., 2012, Wen and Taylor, 2021, Holmes and Wilson, 2022). Effective language construction involves practical and relevant content that aligns with the existing knowledge and ambitions of individual employees and the organization (Baker & Welter, 2020). Tools are effective when users understand the language and terminology (Szopinski, Massa, John, Kundisch, & Tucci, 2022). The extent to which business model tooling language is comprehensible is influenced by personal factors such as cognitive abilities, language processing skills, and user prior knowledge (Baron and Ensley, 2006). Experience significantly contributes to language construction, including industry exposure, ecosystem understanding, supply chain familiarity, organizational type, management team composition, company size, and corporate culture. Contextualized language construction significantly impacts how users interact with SBM tools. It influences several key stages: finding and selecting the right tool, effectively using it, and successfully translating its outputs into organizational benefits. Ignoring these interactive stages

through a "one-size-fits-all" approach risks achieving suboptimal results that are difficult to replicate across different sectors (Moratis et al., 2018, Gibbs and Beavis, 2020).
Our research objective is, therefore, to explore, from the intermediaries' perspective, how language construction and context affect the interaction with SBM tools. Likewise, we set out to better understand the challenges SMEs face incorporating multiple value-creating strategies within their business models and how business model tooling can facilitate this process.

Method

Our research into the influence of language construction and context on business model tools for sustainable business models within the advisory process of intermediaries employs a mixed-method approach, integrating participatory principles, data science techniques, and qualitative research methods to gain a better understanding of this dynamic process (Creswell and Clark, 2007, Tashakkori and Teddlie, 1998, Burns et al., 2021). We use a longitudinal case study design (Eisenhardt and Graebner, 2007, Gerring, 2007, Yin, 2009) to study the advisory process of the intermediaries and their clients over time. To structure this process we use the six-step CRISP-DM approach (Van den Heuvel et al., 2023, Wirth and Hipp, 2000, van den Born et al., 2023). /This design enables us to better understand the complex interplay of language, context, multiple value creation, and business model tooling.

Case Descriptions

Both organizations function as intermediaries, assisting SMEs in incorporating sustainability principles throughout their operations. These organizations are located in the eastern part of the Netherlands. With considerable expertise in SME collaborations, these organizations share a focus on generating positive social and environmental value, ranging from CSRD to Identity Marketing. Such changemakers play a vital role in the multifaceted transition towards sustainability. Their specialized knowledge allows them to accurately identify organizational challenges and needs, facilitating the development of tailored solutions. This project started with a broad problem description: to explore how data science methods can provide deep insights into stakeholder needs regarding sustainable business models and what influences their transition process.

Focus group

This study employs a year-long iterative data collection process involving semi-structured focus group interviews. These interviews are conducted with intermediary organizations and their clients to evaluate and understand the effectiveness of advisory processes in facilitating sustainable transitions. The focus groups with intermediary organizations aim to highlight the challenges and opportunities encountered in these processes, while the

groups with clients explore their perspectives on the effectiveness of these processes and their experiences with integrating various value-creation strategies.
Focus groups are utilized as a qualitative research method that involves participants discussing their perceptions, attitudes, and experiences related to a specific topic. This interactive data collection approach elucidates the research objectives and gathers diverse perspectives (Wilkinson, 1998). During the pre-research phase, observational notes were taken in these sessions to capture immediate reactions and discussions. In contrast, during the main research phase, sessions are recorded to ensure a detailed and accurate transcription of participant responses, facilitating deeper analysis and interpretation of the data.

Data science methods: NLP and Machine learning

Utilizing applied data science methods as NLP techniques, we conduct a scanning review on sustainable business model tools and the influence of context and language on business model transition (Asmussen and Møller, 2019, Munn et al., 2018, Tricco et al., 2018, Duriau et al., 2007). Data science is an interdisciplinary discipline that generates knowledge and value from raw data and uses knowledge and skills from mathematics, statistics, computer science, and domain-specific knowledge, of which machine learning methods are a subset (Hazzan and Mike, 2023, Kang et al., 2020). NLP, using text mining and topic modeling are subset analyses used in data science (Kang et al., 2020). We used a Latent Dirichlet Allocation (LDA) analysis for this paper. The LDA topic model helps discover hidden thematic structures in an extensive collection of documents. Each topic represents a cluster of terms frequently occurring in the papers (Chauhan and Shah, 2021, Welbers et al., 2017). This will provide the foundation for our subsequent content analysis.

Selection of the articles

The scanning review will provide an overview of how language construction and context influence intermediaries and the use of tooling focusing on sustainable transitions. We include business model tooling focusing on multiple value creation, e.g., the pursuit of social, economic, and ecological value creation, as well as “generic” business model tooling. We use the approach of Wolfswinkel et al. (2013) to select relevant papers, which entails the following stages: define, search, select, analyze, and present. We are in the middle of the first three steps using an iterative approach. We started with a narrative review to understand the various fields (Popay et al., 2006).
Please see Table 1 in the appendix underneath the generic list of search words, of which the hits per database have to be added.

For our analysis, we use RStudio (4.3.2) and Atlas. ti (v24) and follow the CRISP-DM process for business process management life cycle, as outlined by Van den Heuvel et al. (2023), which is based on the work of (Wirth and Hipp, 2000). This framework guides us through six crucial steps: defining business objectives, designing processes, modeling, and planning,

deploying and executing, monitoring progress, and optimizing for performance van den Born et al. (2023). In the proposed process, we outline the structured approach over six phases to analyze the role of language and context in SMEs' effectiveness and adoption of SBM(T) via intermediaries.

Phase 1: Business Understanding involves setting clear objectives to investigate how language and contextual factors influence using SBMTs. This phase's activities include an extensive literature review across multiple databases such as Scopus and Web of Knowledge to establish a comprehensive foundation (Wolfswinkel et al., 2013, Popay et al., 2006, Page et al., 2021). This preparatory stage incorporates text mining and topic modeling to uncover latent structures in the data, aimed at enhancing our understanding of language and context within sustainable business practices.

Phase 2: Data Understanding focuses on grasping the challenges intermediaries and SMEs face with SBMTs and the role of comprehensible language in their utilization. This phase entails collecting and analyzing textual data from various sources, including grey-and-white literature and user feedback, to compile a conceptual understanding through tools like Atlas. ti, processed further in R.

Phase 3: Data Preparation aims to organize data for a detailed analysis concerning language construction in SBMTs and its impact on user interaction. Data collection includes interviews with SME personnel and analysis of the language used in SBMTs to assess clarity and relevance.

Phase 4: Modeling explores the relationships between language construction, user characteristics and needs, and their interactions with SBMTs. This phase utilizes statistical and machine learning methods, including text mining and topic modeling, to identify themes and patterns influencing SBMT usage and effectiveness(Salloum et al., 2020).

Phase 5: Evaluation assesses the effectiveness of the developed models in explaining how language and context affect SBMT utilization. The methodology incorporates iterative feedback loops for continuous refinement of the analysis techniques. It is supplemented by internal validation and evaluations through semi-structured interviews and focus groups with intermediaries and their clients.

Phase 6: Deployment concludes the research by translating the findings into practical guidelines for developing user-friendly, context-specific SBMTs. This includes formulating design requirements and developing guidelines for SBMT creators and intermediaries to enhance language construction and contextualization.

Each phase is interconnected, progressively building upon the insights gained to contribute to both theoretical advancements and practical applications in sustainable business model transitions.

Results

We are currently in Phase 1 of the CRISP-DM, where we investigate the influence of language and context on SMEs' effectiveness and adoption of SBMTs. Our initial efforts involve setting clear objectives and conducting an extensive literature review to understand how language and contextual factors impact the use of SBMTs. This foundational work includes data gathering from diverse sources such as Scopus, Web of Knowledge, and Springer Link, followed by NLP approaches to identify patterns and latent structures. The subsequent phases—ranging from understanding and preparing the data to modeling, evaluating, and finally deploying practical guidelines—are meticulously planned to build upon the insights gained from this initial phase to enhance both theoretical understanding and practical applications in sustainable business model innovation.

Focus group – preliminary outcomes

We conducted three focus group sessions, two with Organization A and one with Organization B. Underneath, we describe the general outcomes and overlap between the two organizations. The focus groups were part of the kick-off and aimed to investigate the problem areas in more detail to refine the problem context. These focus group sessions have helped a broader understanding of practical challenges, forming a foundation for innovative sustainability solutions. The sessions were aimed to foster mutual understanding among participants and clarify the scope of collaborative practice-oriented research.

The session began with exploring data science techniques and examining their application in generative AI, including tools like ChatGPT and language models. This led to a broader discussion on validating the current models, employing gap analysis and validation strategies highlighting potential avenues for Business Process Reengineering. This would utilize the existing data warehouse capabilities to map out data processes and formulate a comprehensive data strategy. Key issues identified included gaps in the current data collection methods and the potential to make implicit models explicit. The focus group underscored the need to concentrate on the data processing workflow, which is crucial for developing a robust data strategy. Particular attention was paid to identity verification and how various contextual factors influence these dimensions. It was proposed that this insight could lead to predictive or prescriptive applications. The session concluded with the proposal of developing an interactive dashboard based on the tooling both organizations use. This visualization is envisioned to enhance the practical application of findings in real-world settings.

Preliminary NLP-results

In this exploratory phase, we analyzed 196 articles and books related to (S)BMT to refine our research methods and explore the topic landscape. We used three databases and implemented a snowballing technique to find relevant literature. We focused on clustering the information into topics related to sustainable business model innovation, business model principles, business model architecture, and business model language.

For selecting the number of topics in the LDA model, we considered two metrics: CaoJuan 2009, to be minimized, and Deveaud 2014, to be maximized (Cao et al., 2009, Deveaud et al., 2014), see Fig. 1 underneath. The CaoJuan2009 metric levels off at ten topics, suggesting diminishing returns for fewer topics. Meanwhile, Deveaud 2014 continues to rise at ten topics, indicating more topics would be possible. We are currently experimenting with 10 to 15 topics to determine the optimal number (K) that aligns with our research objectives: insights into the relationship between language construction, context, business model tooling, and the role of intermediaries in catalyzing sustainable transitions.

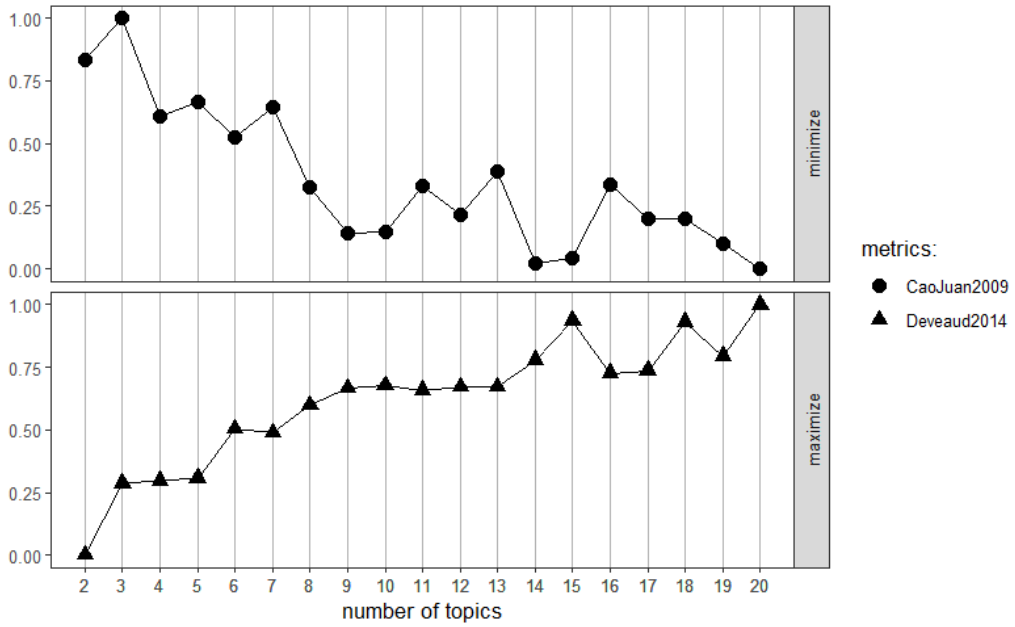

FIGURE 1 TOPICS

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15
1	knowledge	business	social	business	data	business	health	process	service	business	design	–	values	business	business
2	•	model	–	sustainable	–	model	care	management	services	customers	digital	business	research	model	management
3	development	–	stakeholder	sustainability	research	value	healthcare	•	network	model	–	sustainability	–	innovation	change
4	learning	research	value	value	digital	models	•	model	–	–	building	research	knowledge	–	important
5	management	models	stakeholders	models	information	•	patients	system	networks	customer	technology	model	social	management	need
6	organizations	design	business	–	systems	innovation	value	role	information	products	construction	social	study	models	way
7	license	tools	economy	circular	design	customer	people	business	collaborative	value	data	innovation	practice	research	world
8	asian	innovation	environmental	innovation	learning	creation	medical	processes	process	services	circular	management	purpose	bmi	people
9	social	information	circular	design	platform	management	customers	implementation	system	company	material	development	practices	cognitive	make
10	organizational	systems	creation	environmental	system	market	treatment	–	management	product	information	company	methods	strategic	needs

FIGURE 2 LDA OUTCOME K15

We included two images of the results of K10 and K15 topics. These topics still contain a high degree of noise, which needs to be cleaned as it makes the current topics less informative. This noise may come from overlapping terms, character encoding issues (there are still symbols in the topic lists), or irrelevant terms being included in the topics. These preliminary outcomes indicate that topics emphasize innovation, sustainability, customer value, digital transformation, and management processes in the context of business models, all of which are areas where specific tools could be applied. Yet, steps need to be taken regarding insights that aid language construction and context. In the following steps, we will add more documents to the corpus, refining the topic models by experimenting with the number of topics and possibly incorporating more advanced cleaning and pre-processing steps to reduce this noise and improve the interpretability of the topics. For this round, we choose not to apply the stemming function on the words to make them more understandable, as is visible; this also causes unnecessary duplications that influence the model output (organization, organizations, models, models, stakeholders, stakeholders, etc). Additionally, we will make subsamples of cluster themes to see which additional insights this will yield. Right now, the terms seem to focus on aspects of business models and, thus, their contexts, with less emphasis on tooling and language variations.

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10
1	business	social	business	business	•	model	design	data	research	knowledge
2	model	value	sustainable	model	health	business	digital	–	–	•
3	models	business	sustainability	customers	care	–	–	information	values	development
4	innovation	–	value	value	process	management	technology	digital	study	learning
5	value	stakeholder	model	customer	healthcare	process	building	research	cognitive	management
6	–	sustainability	circular	company	patients	service	construction	systems	management	organizations
7	research	stakeholders	models	products	management	network	data	design	change	organization
8	management	environmental	innovation	services	value	value	material	platform	process	people
9	design	sustainable	design	companies	medical	services	information	process	practice	change
10	•	management	–	market	system	product	research	system	managers	organizational

FIGURE 3 LDA OUTCOME K10

To visualize how the topics are distributed and related to the corpus, we plotted the topics in a cluster using a t-SNE visualization. The number of topics can be seen on the right side of the image. t-SNE is a dimensionality reduction technique, which we use to reduce the multi-dimensional topic spaces into a 2-dimensional space to visualize the distribution and separation of topics (Anowar et al., 2021). Each color cluster represents documents from the corpus primarily associated with one of the ten topics identified by the LDA model. The proximity of points suggests how similar the documents are regarding their topic distribution.

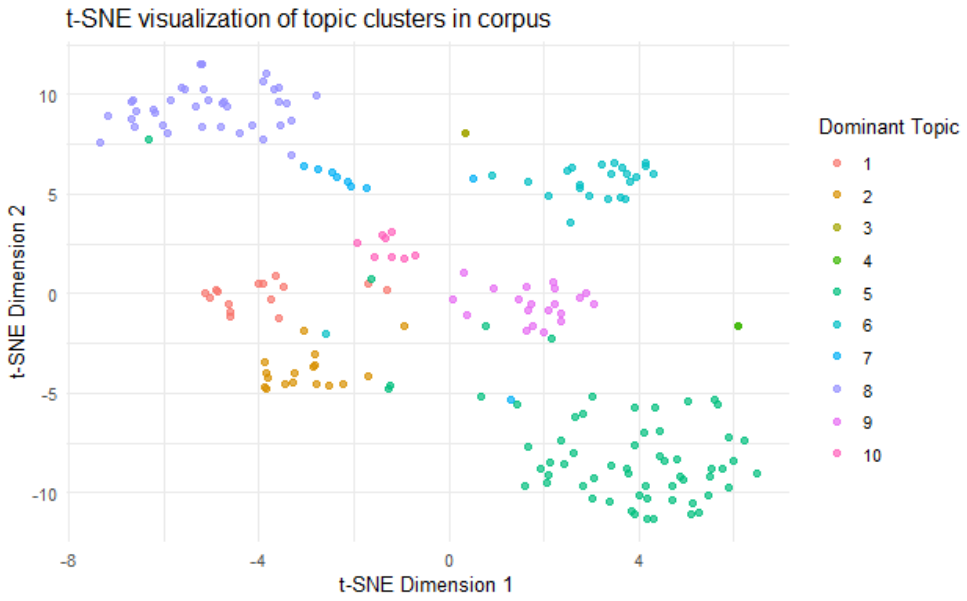

FIGURE 4 CLUSTERING TOPICS OVER THE CORPUS.

The clusters that are highly separated from others imply that the documents in these clusters have a distinct set of topics. For instance, if Topic 6 is, in this sample, a distinct cluster, implying that documents in this category have a specific language that does not commonly appear in documents of other topics. Other clusters are closer or overlapping, suggesting that the documents share similarities in their topic distributions regarding their thematic or linguistic similarity. For example, if Topic 2 overlaps with Topic 3, which may imply that discussions about social values often include sustainability aspects within business models. Topics that are more spread out, such as Topic 5, may indicate that the topic is discussed in various contexts, suggesting that healthcare management is a versatile theme that intersects with many other topics in the corpus. Individual points far from the central cluster of their topic may represent documents that, while predominantly about one topic, contain significant elements of other topics. For example, an outlier in Topic 7 may be a document that is mainly about digital technology but also heavily features elements of design or innovation from Topics 1 or 4

Discussion and Conclusion

This initial phase of our research has begun to provide insights into the potential role of language and context in shaping the effectiveness and adoption of SBMTs by SMEs. Through a literature review, NLP analysis, and focus groups, we have begun to identify key themes and challenges. With our research, we highlight the multifaceted, language and context-dependent nature of business model tooling and its role within the advisory process of intermediaries. Our preliminary results suggest a complex interplay between

language construction, context, and the potential of SBMTs to facilitate sustainable innovation.

The initial analysis of 196 articles and books using Latent Dirichlet Allocation (LDA) has generated a preliminary understanding of the thematic landscape surrounding sustainable business model innovation and tooling. While exploration identified relevant topics such as innovation, sustainability, and digital transformation, we encountered limitations due to data noise. This noise, attributed to overlapping terms and encoding issues, highlights the complexity of extracting clear and actionable insights without a more nuanced consideration of language and context. While the initial text analysis revealed promising areas of exploration, further refinements are needed to extract clear insights into the relationship between language construction, context, and SBM tools. The current topics focus on broader business model areas, lacking specific language construction and context insights. The same holds for how these findings aid intermediaries. Additionally, preliminary focus group sessions with two organizations have offered insights into the practical challenges, guiding further refinement of our research context. These discussions have underscored the potential for business process reengineering based on the identified gaps in current data collection methods and the models used. These findings highlight the need for improved data processing, robust data strategies, and potentially predictive applications in business process reengineering.

Though informative, the preliminary results emphasize the necessity of further articulating the subsequent phases of the CRISP-DM in the organizational contexts, expanding our corpus, and refining our machine learning methodologies to better capture the nuanced interplay between language, context, and tooling. The use of t-SNE visualizations illustrated how to examine the distribution and relationship between topics, yet it will be more informative when we continue with our research.

Limitations

No study is without limitations, and neither is ours. We are still at the beginning of this research, and although we have had the initial kick-off with the intermediaries, we are still in the beginning phase of our study. We have had three sessions but the final manuscrips have not yet been included in this conference proceeding. Hence, these outcomes are only preliminary findings that will help develop a design and action-oriented approach that ensures the practical relevance of this research for intermediaries and SMEs (Jacobs et al., 2018). We trust that iterating the results of our machine learning methods with and for the work field will enhance our research's theoretical and practical relevance. At the same time, the objective of this conference paper was to delve into the research topics using machine learning rather than to generalize findings; the sample and processing limits generalizability and should be acknowledged. The document selection strategy should identify cases that most accurately exemplify the phenomena of interest. Consequently, the approach to

document selection may introduce retrieval bias and sample selection bias, impacting the breadth of applicability of the insights gained (Grimmer et al., 2022). This bias will be mitigated once we have more text data to analyze. To achieve this, we must define our research focus more precisely and establish clear boundaries to structure our approach.

Future research

Given our study's preliminary and evolving nature, several opportunities exist for advancing our understanding of language construction, context, and its influence on applying business model tools for sustainable transformations. We adopt an intermediary perspective, but assessing the influence of language construction, context, and tooling from the ecosystem or network perspective would also be highly informative. This approach could analyze how broader interactions and interdependencies within the system shape tool application and effectiveness. Moreover, our research focuses on two intermediaries in the Netherlands, including more intermediaries from diverse contexts with different cultural, industrial, and organizational settings, which would enable comparative analyses, especially when combined with data science methods. Lastly, incorporating machine learning methods into business model research holds significant potential. Using data-driven approaches allows for large-scale studies, identifying previously unseen relationships and enabling more robust insights into the impact of language construction, context, and tools on sustainable transformations.

* The authors used ChatGTP and Gemini to edit the text and troubleshoot the codes in R. These scripts and prompts are available upon request.

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Appendix

Indicative list of search words. We changed sustainablity for “multiple value creation” , “social value”, “societal value”, “environmental value”, “sustainable transition”, “sustainable innovation” in the search strings. Likewise, we searched for “business model*”, “business modelling”, “sustainable business model”, Additionally, we changed data science to the more specific tearms as “NLP”, “Machine Learning”, “Topic Modelling”, “Text Mining”, “Gen AI”, “LDA”, “LSA” in the search strings to narrow down. We replaced tool for “framework”, “method”, “canvas” and “typology”. To search for language, we used “psycholinguistics”, “sociolinguistics” “psychodynamics”, “language construction”, “sense making” and “cognition”. To search for context we also used: “contextual”, “internal factors”, “external factors”, “market”, “network”, “ecosystem”. We replaced “intermediaries” with “consultants” and “adcisors”. To focus on the change processes we also searched for “organizational change”. To check whether there we concepts that we did not include, we used the concept-tool in Atlas.ti to establish a list with concepts based on the articles selected.

TABLE 1: INDICATIVE SEARCH WORDS

“data science” AND “business model tool*”AND “”sustainab* and “intermediar*”
"sustainable" AND "business model*" AND "tool"
“data science” AND “business model tool*”AND sustainability
“change management”AND “language” AND “sustainability
“data science” AND “sustainability” AND “business model”
“data science” AND “multiple value creation” AND “business model”
“NLP” AND “sustainability” AND “business model”
“LDA” AND “sustainability” AND “business model”
“LSA” AND “sustainability” AND “business model”
“topic modeling” AND “sustainability” AND “business model”
“text mining” AND “sustainability” AND “business model”
"business model* tool" AND “challenge*“
“business modelling” AND “tool” AND “sustainability”
“organizat* change” AND “language” AND “tools”
“language” AND “sutstainabl*