# Navigating Digital Transformation and Decentralization in Digital Business Ecosystems

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**Abstract**

In today's landscape of highly networked organizations striving for better coordination and trustworthy solutions within their enterprise systems, the role of conceptual modeling is crucial. It serves to bolster the fusion of essential principles and practices vital for the effective development of enterprise systems, particularly in the realms of Digital Business Ecosystems and Blockchain technologies. This entails tackling the complexities involved in the reconfiguration of Digital Business Ecosystems that incorporate blockchain or other forms of Digital Platforms. Through conceptual modeling, a comprehensive perspective is provided that aids in the dissection and comprehension of digital business ecosystems. This approach facilitates the investigation of various strategies during both the inception and management stages. Given the significant transformations that occur in blockchain-driven business ecosystems, this research underscores the importance of reexamining two principal conceptual modeling dimensions: (1) the evaluation of business value via an $e^3$*value* model, and (2) the analysis of business processes through a BPMN model.

**Keywords**

Digital Business Ecosystems, $e^3$*value* model, BPMN

## 1. Introduction

Establishing an ICT-enabled ecosystem requires diverse requirements-oriented perspectives, for which various conceptual modeling languages are useful [1]. To remain competitive, companies must adapt quickly to dynamic business conditions. This adaptation involves aligning business models with these changes, designing business processes for seamless value exchanges, and ensuring that IT applications meet evolving company objectives [2]. The business model and business process perspectives are crucial, each with unique considerations. We use $e^3$*value* language [3] for business models and BPMN [4] for business processes. Although they share some ontological elements, they also have significant differences. The connection between process models and value models continues to be a focus of research, which can be categorized into two main areas: (1) exploring the general relationships between process models and value models, and (2) specifically determining how to derive a BPMN model from an $e^3$*value* model and vice versa.

Both the $e^3$*value* and the BPMN models aim to represent entities in the real world, such

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as ecosystems, but they do so differently. Gordijn, Akkermans, and van Vliet [5] identified fundamental ontological differences between these models. For example, in $e^3value$ , actors are legally responsible entities, while in BPMN, the resource lanes represent the parties performing the work. Similarly, a value activity in $e^3value$ creates a positive economic value flow, while a BPMN activity may involve only costs.

Bodenstaff [6] established formal consistency rules between coordination models (a type of process model) and $e^3value$ models. The concept is to align value transfers with message flows. When quantified, an $e^3value$ model calculates net value flows based on needs, actor numbers in a market segment, and dependencies, showing if the model is economically viable. If a value transfer matches a message flow, consistency can be verified by simulation.

Other models are also derived using $e^3value$ models. Zlatko [7] used them to create goal models, and Schuster and Motal [8] applied them to derive Resource Agent Event (REA) [9] models and coordination models such as UMM [10, 11]. Buder and Felden [12] studied the expressiveness of $e^3value$ and UML class diagrams [13] in representing value models and their influence on business processes, emphasizing the transformation of value model concepts into process levels to improve user understanding.

Pijpers and Gordijn [14] stressed the difference between ownership and logistic transfer. In $e^3value$ , the focus is on the transfer of ownership or the right to benefit from a service, while the process models focus on the flow of ownership, which involves physical access rather than ownership. Weigand et al. [15] extended this to include rights to resources, such as borrowing a library book.

Hotie and Gordijn [16] synthesized recent work on deriving process models from $e^3value$ models. Their approach highlights two key design decisions: (1) trust, affecting the sequencing of value transfers and message flows, and (2) possession, important for logistics providers who need to physically possess items to deliver them [17].

The main question is whether the $e^3value$ business model can inform a BPMN process model and vice versa. Our goal is to translate business model insights into process models that capture business value. Automating this conversion is challenging due to semantic differences [18]. We argue that this transformation requires a conceptual design process with many design decisions [5]. Although desirable, our research does not extend to creating an automatic compiler for this derivation.

In summary, the problem is framed as:‘how to design an $e^3value$ model based on a BPMN model” and ‘how to design a BPMN model based on a $e^3value$ model” [18, 19, 20, 17, 21]. Our guidelines facilitate the transition between the BPMN and $e^3value$ models, allowing efficient (re)design of complex digital business ecosystems and expediting model derivation based on ecosystem requirements.

## 2. Current Research Focus

My research focuses on designing and reengineering complex digital business ecosystems in our hyperconnected world. I specialize in conceptual modeling and the impact of disruptive IT innovations such as platforms and blockchain technologies. My methods include literature reviews, design science, case studies, interviews, experiments, focus groups, surveys, hypothesis

testing, and technical action research, using both quantitative and qualitative analyses.

- **Sustainable Digital Business Ecosystems:** I design fair and equitable digital business ecosystems, advocating for decentralized business models that resist monopolistic tendencies and promote inclusivity.
- **Practical Blockchain Implementation:** I apply design science to implement blockchain technologies in various domains such as Fintech, Food and Agriculture, ICT4D, and Green Energy, exploring solutions for secure, transparent, and efficient transactions.

## 3. Key Achievements and Contributions

I have developed and redesigned business ecosystems, bridging the gap between business requirements and IT solutions in various domains.

### 3.1. Projects

- **Fintech - Decentralized peer-to-peer Securities Trading:** Since 2020, I have collaborated with the Dutch National Bank to create a decentralized global exchange platform for peer-to-peer trading of tokenized securities. This project, involving DNB, VU Amsterdam, private banks, and the European Anti-Money Laundering (AML.EU), uses process and value modeling to transition from AS-IS to TO-BE business ecosystems. The project emphasizes ethical and fair digital trades.
- **Music360 - Intellectual Property Rights (IPR):** This ecosystem supports musicians and artists/producers in receiving payments for their work displayed in museums or played in public venues. A joint project between VU Amsterdam and Universitat Politècnica de València (UPV), it involves stakeholders like SENA [22], which manages performers' and producers' rights in the Netherlands. The project aims to create a fairer ecosystem for lesser-known artists.
- **Seeds Value Chain - Web alliance for Re-greening in Africa (W4RA [23]):** Smallholder farmers in Mali face challenges in the seed-producing value chain. This project helps farmers identify and address bottlenecks, make informed decisions for the upcoming year, and understand the importance of AI models, ensuring timely investments in pesticides, fertilizers, and base seeds.
- **Green Energy - Photovoltaic (PV) Cells Tokenization:** This project facilitates green energy trading by enabling communities to share and sell surplus energy via a blockchain platform, ensuring transparent energy pricing. Led by 2tokens [24] in collaboration with VU Amsterdam, it rethinks collaboration and fair trade in green energy communities

## 4. Conclusion

My research focuses on digital platforms, business analytics, and conceptual modeling, combining academic and practical approaches to drive innovation. The aim of this paper is to bridge the gap between theory and real-world application, influencing decision-making in organizations

and governments. My goal is to ensure that advancements in these fields promote sustainable growth, inclusion, and ethical practices. I envision digital business ecosystems that are efficient, profitable, and socially responsible. I am committed to sharing my findings to inspire further research and mentor the next generation of researchers and practitioners.

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