Business Model Architecture by Design

Ronald C. Beckett and John Dalrymple

> *"Architects in the past have tended to concentrate their attention on the building as a static object. I believe dynamics are more important: the dynamics of people, their interaction with spaces and environmental conditions."*
>
> John C. Portman Jr. (1924–2017)
> Award-Winning Architect and Real Estate Developer

In this article, we view business models as complex deal-making activity systems organized to create, deliver, and capture value. Unlike some other viewpoints, we emphasize both system components and their interconnection. Business activities are carried out by a network of actors drawing on a network of resources, and individual firms seek to configure these intersecting networks to enhance their competitive positioning. The business model literature refers to the significance of antecedent activities in providing context – opportunities the firm decides to pursue, the strategy adopted, and requisite capabilities. Drawing on this literature, we propose an approach to framing business model context. Drawing on the information systems literature, we identify a toolkit facilitating activity system architecture design. We suggest how this both draws out the underlying complexity of a business model and shows how a multiplicity of views makes sense.

Introduction

Chesbrough (2010) suggests that a great idea launched in conjunction with an inappropriate business model will be less successful than an average idea launched in conjunction with a great business model. Indeed, it has been observed that an innovative approach to conducting business can be a source of competitive advantage (e.g., Teece, 2010), resulting in an increasing emphasis on business model innovation (Foss & Saebi, 2017). Thus, questions around where to start, how to innovate, and what to innovate give rise to an ongoing research agenda. Sustainable businesses rely on the generation of income and other forms of support and may be represented as a complex activity system having a specific architecture (e.g., Amit & Zott, 2015; Zott & Amit, 2010), the development of which requires the rationalization of multiple viewpoints to be effective. What is the value proposition/deal and why does it make sense? Where and when are deals that provide mutual benefits negotiated? How is value delivered and by whom? How does a firm's business model relate to its strategy and accessible capabilities (e.g., DaSilva & Trkman, 2014; Teece, 2010)?

An enterprise business model does not exist in isolation; it is linked to a broader business ecosystem, and new concepts emerge from a parallel innovation ecosystem (e.g., Dougherty & Dunne, 2011). Reflecting on contextual and conceptual frameworks is seen to be an important practice in finding new ways to meet customer needs (e.g., Souto, 2015).

The literature provides some advice about designing a business model by drawing on established practice as a template (e.g., Gassmann et al., 2014), about adapting a current business model, and about mapping as-is and to-be situations (e.g., Osterwalder et al., 2014). However, as Osterwalder and Pigneur (2013) point out, "the core issue many organizations face today is the lack of a process that allows them to come up with entirely new and viable business model alternatives from which to choose."

This article addresses this perceived gap by adopting a system design perspective to consider the question: *What tools might help us design an enterprise-specific business model?* We draw together observations from three literature streams in framing system architecture

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design practice: some with a business model orientation, some with an enterprise architecture orientation, and some with a design thinking orientation. We then develop a toolkit that may be used to support business model architecture design and discuss its utility and consistency with observations from the extant literature. We start by considering matters of context, approaches to representing complex entities, and the design lifecycle.

Background

There are many articles cited in the business model, enterprise architecture, and system design literature streams. Here, in the interest of brevity, we generally limit our references to review articles and current viewpoints, as these also incorporate prior studies.

Business model context

Although there is general agreement that business models outline a firm's value creation, capture, and delivery mechanisms, there are a variety of definitions. One states that "a business model is the design of organizational structures to enact a commercial opportunity" (George & Bock, 2011); another indicates that, "whenever a business enterprise is established, it either explicitly or implicitly employs a particular business model that describes the design or architecture of the value creation, delivery, and capture mechanisms it employs" (Teece, 2010). Mitchell and Coles (2003) represented a practitioner perspective in stating that "a business model comprises the combined elements of 'who', 'what', 'when', 'why', 'where', 'how', and 'how much' involved in providing customers and end users with products and services".

Massa, Tucci, and Afuah (2017) undertook a critical assessment of prior business model research and identified three viewpoints on what constitutes a business model: 1) cognitive/linguistic schemas and mutual understandings describing what a business does; 2) formal representations/descriptions of generic components of a business model; and 3) as a focus on those particular attributes of real firms that give a competitive advantage and superior performance. They reflected on why there might be multiple perspectives and on the relationship between business models and strategy, noting that traditional theories of value creation and capture were biased towards the supply side. The notion of customer–provider value co-creation is a current demand-side topic of active discussion (e.g., Grönroos & Voima, 2013). Spieth and co-authors (2014) made similar observations in the context of business model innovation: firstly, explaining the business in support of strategy development; secondly, representing the running business using models and pursuing efficiency, and thirdly, developing the business through the exploration of new opportunities and sources of sustainable competitive advantage.

DaSilva and Trkman (2013) contend that business models represent a specific combination of resources (resource-based theory of the enterprise), which through transactions (transaction cost economic theory of the enterprise), generate value for both customers and the enterprise. They see a business model as an operational configuration of dynamic capabilities required to enact the enterprise strategy. Wirtz and co-authors (2016) assessed research focus areas, business model definitions, and components in more than 600 articles to offer a definition of the concept and characterize the components of an integrated framework in terms of strategic, customer and market, and value creation components. Unlike most business model representations, they added financing and capital models to revenue and cost factors in considering financial value generation and capture.

Allee (2000) noted that, although a traditional view of value creation considered a supply chain and its supporting infrastructure, in a knowledge economy, this is being superseded by thinking about value networks. Aversa and co-authors (2015) reflected this view, defining the modular components of a business model in terms of interacting value creation, capture, and delivery structures. And although traditional supply chains may focus on the flow of physical artefacts, both intangible artefacts (e.g., software) and intellectual capital may be important trading assets. Malone and co-authors (2006) adopted the business model as a unit of analysis in considering the relative financial performance of thousands of American businesses, as this gave more coherent outcomes than mapping using business sector filters. They characterized specific business models in terms of a combination of assets traded (financial, tangible, intangible, or intellectual; our adaptation) and the trading process (ownership transfer of assets created or of assets acquired, providing access to assets as a landlord or broker) (see Table 1) that represented strategic choices selected by a firm. It was noted that some firms had established different operating units having different business models, and we note that some firms combine these to offer a unique value proposition (e.g., jet engine manufacturers offering a lease/maintenance package). In practice, although a firm may choose a particular Table 1 model type, an associated set of decisions

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Table 1. What kind of business are we in? Sixteen core business model types (Adapted from Malone et al., 2006)

	Type of Asset Involved			
Trading Role	**Financial**	**Physical**	**Intangible**	**Intellectual**
Supplier	Entrepreneur	Manufacturer	Inventor	Educator
Distributor	Financial Trader	Wholesaler / Retailer	IP Trader	Collaborator
Landlord	Financial Landlord	Physical Landlord	Intellectual Landlord	Contractor
Broker	Financial Broker	Physical Broker	IP Broker	HR Broker

will be made about specific market segments to pursue that utilize the dynamic capabilities of the firm and make business sense: framing transaction, resource, and value structures (e.g., George & Bock, 2011). These structures may be elaborated in terms of generic subtier building blocks, for example using Osterwalder and Pigneur's (2009) Business Model Canvas. Later, we will discuss this level of analysis further.

Foss and Saebi (2017) reviewed 150 articles on business model innovation and suggested there were four research gaps. The first related to the construct: defining the unit of analysis plus the nature of innovation framed as the intersection of the scope of change (business model architecture level or module level change) and the degree of novelty (new to the firm or new to the industry). The second related to congruence: identifying antecedent activities such as strategy development and the nature of innovation outcomes sought. The third related to contingency and moderating variables including organizational capabilities and leadership, the role of learning and experimentation, cognition, and flexibility. The fourth related to boundary conditions: links with other viewpoints (entrepreneurship, sustainability, servitization) and the world external to the firm.

What we take from the foregoing is illustrated in Figure 1, which suggests firstly that the design of a suitable business model is influenced by five elements of context. We observe that these elements provide a bridge with the broader business ecosystem a firm is embedded in. Secondly, there are interactions between these elements independent of, but linked to the business model, for example, matching market opportunities and a firm's goals. And, finally, each of these elements may be a field of study in its own right. To Illustrate: what kind of business have we chosen to establish (see Table 1), and what are its goals? Is the value architecture associated with the delivery of economic, social, or environmental benefits, or with some combination of them (e.g., Dembek et al., 2018)?

Complex system representation and design

Our point of departure here draws on a review by Cilliers (2001) of approaches to understanding complex entities. Firstly, he points out that, in describing a particular complex system, one draws boundaries, implying that this system is embedded in a broader complex system. In the case of business model studies, the boundary is most commonly an individual firm, but in a cooperative, it may be a collection of semi-autonomous firms. Secondly, there is a natural tendency to form hierarchies (see Simon, 1962). This is reflected in most organizational structures and approaches to modelling complex systems. Finally, complex operations may be viewed as networks of interconnected nodes/modules, with a focus on the nature of the connections between them. Here, we note that the business model literature tends to focus on the nodes (components) with less attention given to the connections between them.

Taking a market engagement viewpoint, some researchers have characterized business ecosystem networks in terms of three generic sub-networks: interacting actors and actor bonds, requisite activities and activity links, and requisite resources and resource

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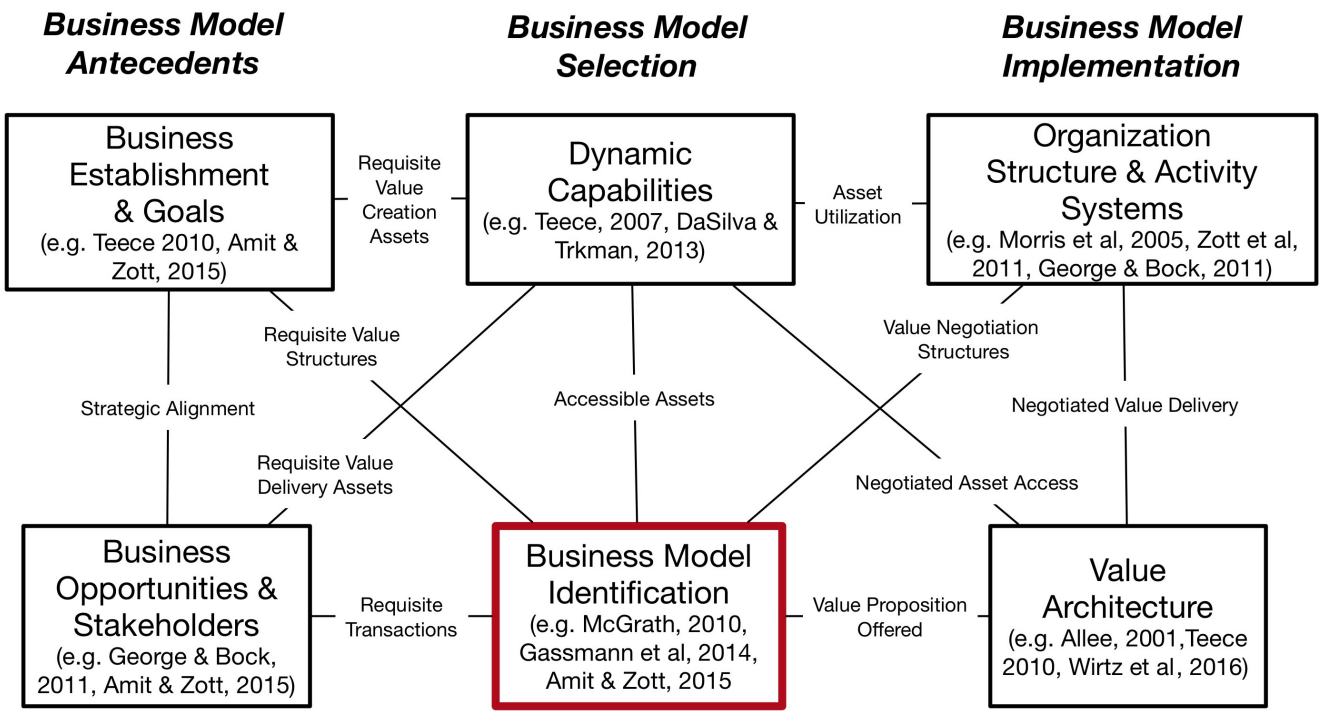

Figure 1. Contextual factors influencing the identification of a suitable business model concept

ties. Matters of individual interactions between companies and business ecosystems (Hakanson & Ford, 2002) and the nature of management practices in this context (Ritter et al., 2004) are considered. In the context of business model structures and previous observations, the following alignment is suggested:

- Actor bonds co-create and deliver value, involving the firm's service entity, its customers, and value network contributors within and external to the firm.

- Activity links are associated with functional transactive structures involving asset ownership exchange or negotiated asset access.

- Resource bonds have financial, physical (product, infrastructure), intangible (software, brand), and intellectual (information, knowledge) components

Viewing business activities in this way introduces the idea that business model structures may be represented as interconnected networks of functional activities.

A number of researchers have drawn on systems engineering tools to help represent and optimize business models:

- Exploring ways in which system dynamics modelling (simulation) tools could be used to support business model design (Cosenz, 2017)

- Considering the interplay between business model and enterprise architecture views of a firms' operations (Fritscher & Pigneur, 2013)

- Drawing on the Zachman (2003) Enterprise Architecture Framework as a tool to help align enterprise architecture with business goals (Nogueira et al., 2013)

- Exploring the idea of system modularity in the context of business model design (Aversa et al., 2015)

It was observed that mapping business model components and their interaction is necessary, that information flows support the linking of value, transactive, and resource structures, that utilizing enterprise architecture tools can give insights into operational activity systems, and that multiple levels of granularity may have to be accommodated.

Architecture by design

Our point of departure here is consideration of system design processes, which include both the consideration

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of the intended system role and requisite functionality, and an architecture description showing how the functional components fit together. Jones and Gregor (2007) reviewed experience with information systems design theory and expanded on a design process view identified by others, learning initially from product design practice. They identified eight evolutionary stages to be considered, with potential iterations involved, which resonates with calls in the literature for a need to consider the evolution and performance of different business models.

In a previous study of the application of design thinking to business model design, we compared traditional design and (proposed) business model viewpoints at concept, requirements, and implementation levels of analysis. This is illustrated in Figure 2, along with a component-based (modularity) view of business model design (Aversa et al., 2015). The discussion earlier in this article has suggested we need to include an overarching context level, and that between the implemented model and the requirements level there needs to be a sub-component definition level, consistent with the multiple viewpoints adopted in the Zachman (2003) Enterprise Architecture Framework. A design process view is shown in Figure 2.

Research Methodology

The research question we are exploring is: *What tools might help us design an enterprise-specific business model?* The authors have prior experience with different business process modelling applications and systems design/operations in a defense industry setting, and we compiled a list of tools used for those purposes (e.g. Mo & Beckett, 2018) that could be applied to help answer the research question.

We firstly viewed business models as complex activity systems that have an underlying architecture (Zott & Amit, 2010). Secondly, we followed the lead of Osterwalder and Pigneur (2013) in considering the utility of information systems tools in supporting business model design. Our initial objective was to support the development of system architecture descriptions, and we drew on an international standard, ISO/IEC 42010:2007 (ISO, 2007) for that purpose. This standard had evolved over several years with contributions from many researchers and practitioners. Elements of this standard reflect observations made in the prior discussion on business model design, for example, that multiple viewpoints are required. The core of the standard – bringing together stakeholders, multiple viewpoints, and an associated rationale – is seen to be consistent with the application of stakeholder theory (e.g., Jensen, 2010). One of the authors had more than five years of experience using this standard, which showed that mapping interactions between multiple viewpoints was greatly facilitated using Design Structure Matrices (Browning, 2016). Simple matrices such as the Boston Consulting Group (BCG) Market Growth-Share Matrix, where one variable is mapped against another, have long proven helpful in exploring business scenarios. Table 1 represents an example of this kind of matrix. Another form of matrix, the Relationship Matrix, shows which system entities are connected and may describe some attributes of each connection. We have used this in exploring interactions between different business model components.

Findings

Developing a complex system architecture description
An adapted overview of the ISO/EIC 42010 architecture description framework (ISO, 2007) is shown in Figure 3. Some elements of the framework are shown as representing business model antecedents. The core system architecture description represents a detailed set of requirements and is informed by inputs from stakeholders and multiple viewpoints that represent a knowledge base drawing on prior experience and models, by a generic form of architecture and by the rationale for the selection of a particular design.

We suggest this latter set of activities represent the approach adopted by practitioners using Osterwalder and Pigneur's (2009) Business Model Canvas in mapping a firm's current business model elements. Generally working in a facilitated workshop setting, a cross-section of stakeholders contribute multiple viewpoints that provide detailed firm-specific information about each component of the business model canvas.

A business model view linked to activity theory
We have followed the lead of Zott and Amit (2010) and represent the business model architecture element as a six-component model based on an activity theory that also considers interactions between elements (Engestrom, 2000; Jones & Holt, 2008). Some attributes of an activity theory framework are:

- All six components are interconnected, with 15 dyadic two-way links, and tensions within these linkages can point to opportunities for innovation. For example, the buyer wants to minimize price but the seller wants to maximize it.

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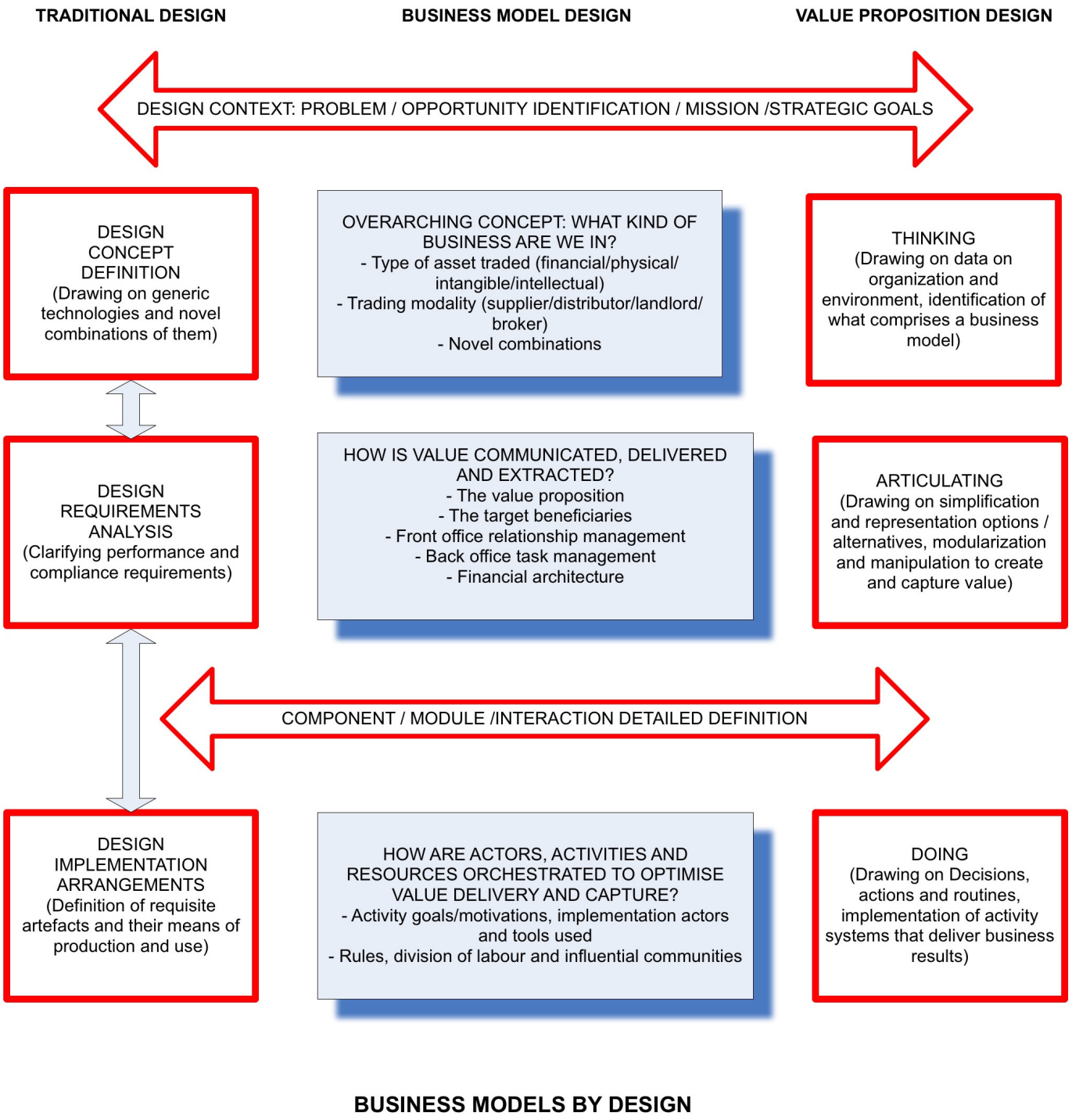

Figure 2. Multiple design viewpoints

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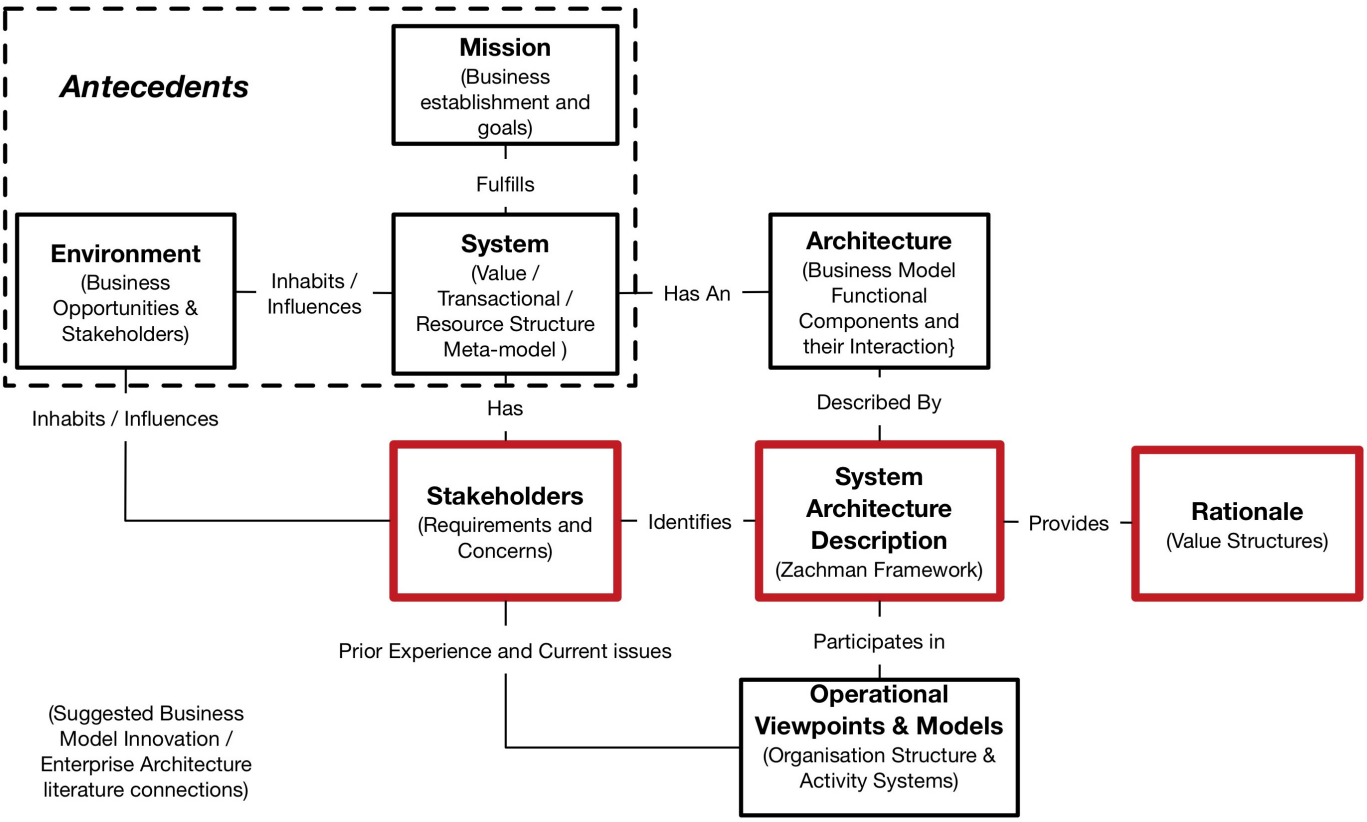

Figure 3. An ISO/EIC 42010:2007 representation of a business model architecture description framework (ISO, 2007)

- Each dyadic link may be influenced by a third moderating component. For example, there may be rules moderating subject (service entity) – object (value proposition) activities.

- The six-component framework can be adopted as a way of thinking and used in a recursive manner. For example, a separate object may be to develop new dynamic capabilities, but who will do it, what tools might be used, and what is the potential impact on the higher-level activities?

A representation of this framework in a business model context is shown in Figure 4. Deal-making activities are at the core, and it is the role of a service entity to stimulate and support such events-in-time. Deal-making events are not continuous, and each one may have some unique characteristics. The term service entity has been used to represent the activity theory subject as it may be a person, a team, or an intelligent agent. The nature of the negotiated deal and the deal-making process may require interaction with the four other elements: the marketplace, the firms' dynamic capabilities, its value network, and benefit/cost architecture (e.g., what may be offered at what cost). If we were to view all 15 interactions in this way, we would have 60 topics to consider, reflecting the underlying complexity.

We propose the Zachman (2003) framework be used as a tool to map a system architecture. It supports descriptions at multiple levels of granularity consistent with design stage viewpoints (e.g., Figure 2), and the six interrogatives can be aligned with the activity theory elements, as shown in Table 2.

Consideration of the "When?" viewpoint introduced a topic not well represented in the business model literature. Different kinds of businesses have quite different engagement dynamics and mechanisms. A large project-based firm may only negotiate contracts a few times a year or every few years, whereas a firm selling consumables may be negotiating deals every few minutes. Each requires quite different types of service entity.

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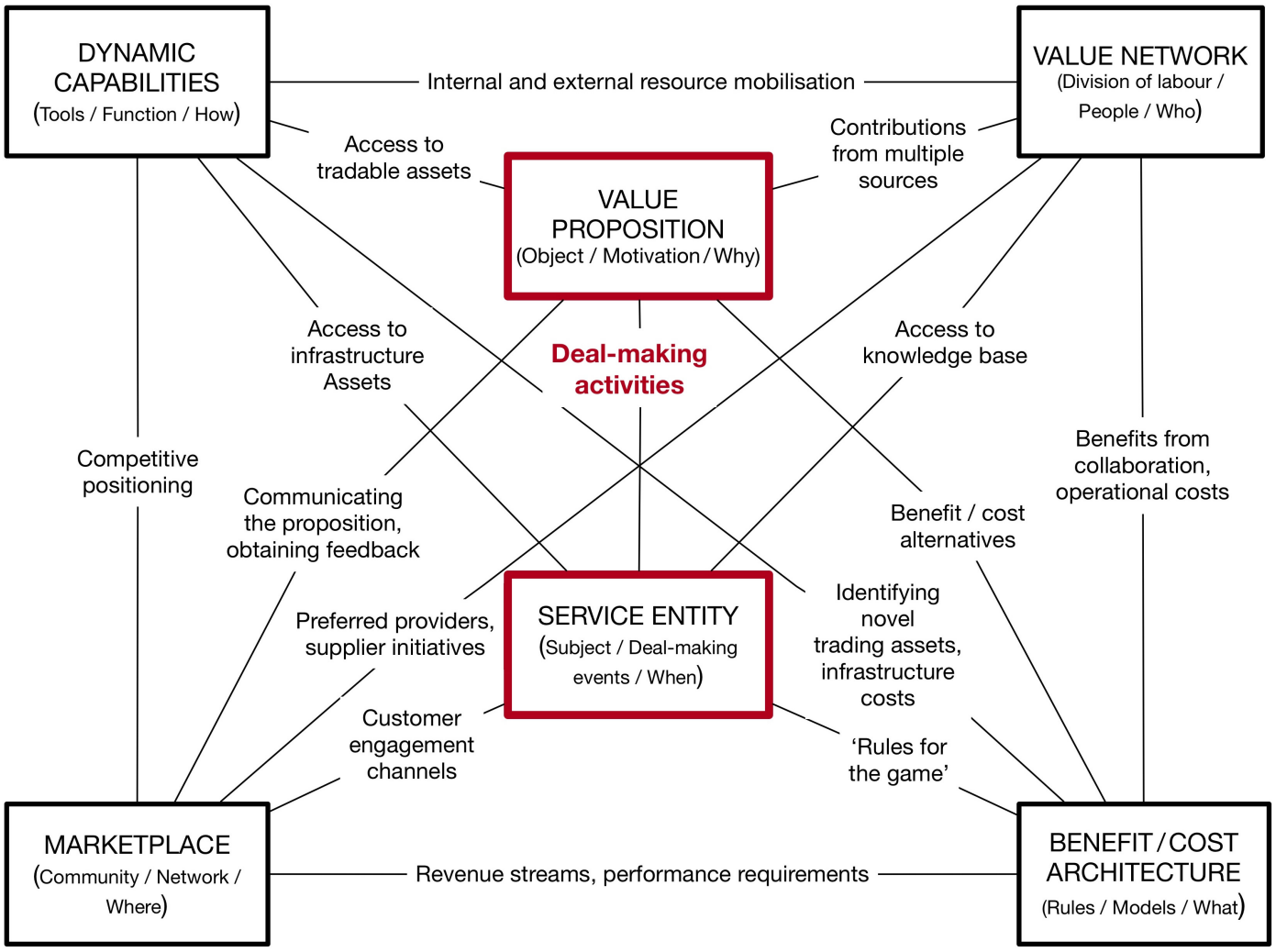

Figure 4. Business model components and their interactions. The figure represents a combination of an Activity Theory framework (Engeström, 2000) and the Zachman (2003) Enterprise Architecture Framework Interrogatives, shown in brackets as (Activity Theory / Zachman Entity / Zachman Question).

Mapping interactions between components of a business model

We used the Design Structure Matrix tool extensively in conjunction with other tools in researching detailed combinations of interactions. For example, we extended Table 1 using the four types of assets plus the four types of trading to create an 8x8 matrix. One quadrant represented the view presented in Table 1, which could be read as given a particular trading mode, what kinds of asset do we primarily offer. The complementary view suggests, given a strength in a particular asset class, what are our trading options? The asset/asset quadrant suggests a resource-based view: given we trade in a particular kind of asset (e.g., intangible, like software), what other assets are needed to support this (financial, physical, intellectual or additional intangibles)? The trading mode /trading mode combination might suggest: what combination of trading modes might we assemble as a foundation for a unique business model? By way of example, the Uber taxi service model may be viewed and a broker / landlord combination. These conversations may be helpful in designing innovative business model concepts

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Table 2. Aligning business model concepts: Zachman (2003) Architecture Framework Interrogatives and Activity Theory (Engeström, 2000)

Business Model Concept	Zachman Architecture Framework Interrogatives	Activity Theory Business Model Representation
Value Structures: What is the deal?	Why? (Motivation for buy-in)	Object: A mutually beneficial value proposition
	What? (Models of business transactions)	Rules: Revenue, benefit / cost trade-offs and regulatory contract conditions
Transactive Structures: Value / Deal Negotiation	Where? (Networks of market activities)	Community: Marketplace and its dynamics
	When? (Timing, Events – making it happen)	Subject: Service entity (organization of deal-making events)
Resource Structures: Value / Deal Delivery	Who? (People – creating and delivering value)	Division of Labour: The firm's value network
	How? (Function – driving processes)	Tools: Dynamic capabilities (tradable and infrastructure assets)

Conclusion

The introduction to this article raised three questions related to innovative business model architecture design and what kinds of tools might support this. We make an original contribution by adapting the use of a set of tools previously applied in different professional settings but which may not have been used in a business model architecture design context before.

First question: Where to start?
Our proposal considers matters of context and concept, which are regarded in the business model literature as antecedents of business model design. An antecedent model is illustrated in Figure1. What is the firm's mission, its establishment, and operational rationale? What characterizes its operating environment? What dynamic capabilities are available to the firm? We view dynamic capabilities as a combination of tradable assets (which may be a product or the provision of services) and infrastructure assets that facilitate market engagement, value creation, and value delivery.

Second question: How to innovate?
The design literature suggests following an evolutionary process (e.g., Figure 2) where there may be iterations between stages. Our proposal is to ask key questions about business models as activity systems. Draw on a set of tools comprising the ISO/IEC 42010 architecture description standard (Figure 3), a six-component generic business model architecture that considers interactions between business model components (Figure 4) and an adaptation of the Zachman (2003) Enterprise Architecture Framework, which brings together multiple viewpoints having different levels of granularity. A potential advantage of the Zachman framework is that it can also be used to establish congruent information systems and technology resource overlays on the business model representation. All three tools are claimed to have recursive properties and can be applied at a global system or subsystem/component level.

Third question: What to innovate?
Our proposal is to follow the suggestion of Foss and Saebi (2017): innovate at the component level (e.g., enhance dynamic capabilities) or at the architecture level with a focus on interactions between components (e.g., change relationships with customers (see Osterwalder et al., 2014). Whichever is chosen, use the Design System Matrix to map what else may have to change in conjunction with the innovation.

Amit and Zott (2015) had suggested that matters of governance, architecture, and content be considered in business model design. We suggest that all actors influenced need to be viewed as stakeholders, and drawing

on an activity theoretical model (Figure 4), operational governance may be associated with division of labour/value network arrangements spanning internal and external activities.

We further contribute to theory by illustrating that, although many researchers may search for a single definition of a business model and see the literature as lacking coherence in this regard, viewing a business model as a complex activity system actually requires the amalgamation of multiple viewpoints.

A macro-view links a type of model with enterprise context (Figure 1 and Table 1). At this level, a simple descriptor such as a retailer or manufacturer conveys some level of understanding about the context of a particular business. At this level, business model innovation may be facilitated by changing from one kind of business to another or by considering particular combinations (e.g., manufacturer plus retailer). At a meso-level, the focus is on value creation and value capture rationale delivered from a combination of transactive and resource structures (Massa et al., 2017). Table 2 illustrates the application of an enterprise architecture model to link this viewpoint with six lower-level generic components. Figure 4 shows these components and interactions between them. This representation draws on activity theory (Engeström, 2000) where it is suggested that opportunities for innovation can be found in tensions between the linkages. Other researchers may utilize a larger number of components, introducing a finer level of granularity. It is our contention that however the functional architecture is represented, it is necessary to describe each business model instance at a finer level of granularity again, building on contributions from multiple stakeholders to obtain a usable representation. This practice is demonstrated in the application of the widely utilized Business Model Canvas where facilitated workshops are established to fill in the specifics associated with each component.

One transactive structure attribute introduced by mapping against the Zachman (2003) Architecture Framework is consideration of temporal factors – viewing transactions as events or sets of deal-making events managed by a service entity (Table 2). This resonates with the literature on service dominant logic, and it is a topic for future research.

From a practitioner viewpoint, just as the Business Model Canvas (or alternatively Figure 4) has acted as a boundary object at a component level of analysis, we contend that the ISO/IEC 42010 model (Figure 3) can serve a similar purpose in characterizing the total system. This claim is based on direct experience using it with defence industry practitioners seeking to service innovative public–private partnerships. Instead of a canvas, a set of wiki pages, each representing one element of the model and containing prompts, was used to support the development of architecture descriptions by virtual teams. A design structures matrix was used to show relations between them. In this instance, opportunities for innovation were identified by considering macro-level change scenarios in the business context, with particular reference to the operating environment.

About the Authors

Ron Beckett is an industry practitioner with more than 30 years of experience in the implementation of creative change and innovation management in Aerospace and Manufacturing. He frequently works at the academia–industry interface, with a focus on Learning to Compete. Ron is an Adjunct Professor at Swinburne University, and he has held similar appointments at several other universities. He has authored or co-authored more than 100 conference papers, journal articles, and book chapters related to the pursuit of best practice in extracting value from innovative ideas, knowledge management, and effective collaboration implementation.

John Dalrymple holds a BA (Hons) from the University of Stirling and a PhD from the University of Strathclyde in Scotland where he worked with the Scottish Enterprise Foundation to improve the performance of small and medium-sized companies. He was Founding Director of the Centre for Management Quality Research at RMIT University. John, the staff, and students of the Centre were regular recipients of "Best Paper" awards at international conferences. His publications have attracted more than 1100 citations to date. John was the Editor of the *Quality Assurance in Education* journal from 2003 until 2019. He has supervised over 20 PhD candidates to successful completion. In October 2018, John was presented with the J. M. Juran Award by the Australian Organisation for Quality.

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