Transitioning to the Circular Economy: A Business Architecture Approach

Enabling Organizations to Transition to the Circular Economy While Delivering Bottom Line Benefits

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Abstract

Whether driven by the need to excel or simply the need to survive, organizations around the globe face competing and seemingly irreconcilable demands. Business leaders additionally face numerous challenges that overwhelm mid-to-long-term priorities. Topping the list are the need to address economic downturns, increased competition, growing customer demands and shifting tastes, asset utilization, regulatory demands, security challenges, and revenue and profit margin growth. These demands are complicated by unforeseen economic, environmental, and geopolitical factors. Long-term strategic goals complicate the picture further.

Should business leaders focus on optimizing traditional business models or on deploying new, innovative business models?

Enter the topic of the circular economy. The circular economy is centered on deploying a closed loop system focused on productivity, reuse, product longevity, waste elimination and prevention, and overall sustainability. Unfortunately, with all of the other issues that organizations face, the circular economy may not be on top of the priority list. This raises the question; is it possible to transition to the circular economy while meeting near-term challenges, business model optimization, and innovation goals under an integrated, actionable approach?

Achieving tactical and strategic goals and transitioning to the circular economy does not have to be a binary choice. Many of the benefits associated with the circular economy coincide with widely accepted business goals and objectives. Unfortunately, envisioning how various goals and objectives align requires viewing an organization through a holistic lens, a perspective many often lack. Historically, organizations have tended to execute strategies, large and small, through a wide-ranging collection of fragmented, poorly aligned initiatives that often splinter and stumble across business unit silos. This situation is problematic for the status quo but even more problematic for business leaders seeking to take on a growing number of strategic initiatives.

This whitepaper provides an overview of the composition and impact of the circular economy from a business architecture perspective, along with the role of business architecture as a means of transitioning an organization to becoming a player in the circular economy. Business architecture provides the means where seemingly disconnected goals and objectives can be integrated under a common, holistic set of strategic initiatives through a coordinated, ecosystem-wide roadmap. To demonstrate the power of business architecture the paper leverages a formal framework and explores an example of an automotive company seeking to optimize its traditional manufacturing business model while concurrently seeking to deploy a new and innovative, digitally connected customer business model.

Organizations are capitalizing on business architecture today as a means of executing a wide range of strategies. Transitioning to the circular economy presents an ideal scenario for leveraging business architecture to concurrently execute this transition while pursuing a wide range of near- and long-term demands. Incorporating the circular economy into the strategic planning mix can produce a wide range of well-coordinated business and sustainability benefits.

1. Circular Economy Motivations and Roadmap

Sustainability is the ability to exist with the goal being to “create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements for future generations” (EPA, 2015). The three pillars of sustainability are generally accepted to be environmental, social, and economic (EPA, 2015). The establishment of a circular economy is perhaps the most emblematic proposition towards sustainability, involving changes along all three of these pillars. The circular economy is expected to preserve the environment by moderating resource extraction, distribute wealth by boosting the demand for localized labor, and sustain the economy by preventing waste while...
extending the fruition of materials and products thus maximizing their return value. Figure 1 highlights the difference between the linear economy and the circular economy.

As depicted in Figure 1, the circular economy represents a paradigm shift, where strategic focus shifts to preserving asset value for as long as possible, versus the linear economy, which is based on maximizing the speed of asset flow and disposal (Stahel, 2019). The circular economy further differentiates from the linear economy in its intent to maintain value in addition to creating it anew, optimize stock management in addition to stock flows, and increase asset utilization efficiencies along with production efficiency. For example, in the circular economy materials used in production are recycled, components are repaired or refurbished, and products are reused. The longer an asset is maintained within the economic ecosystem, the more its value will be leveraged. Further to this basic concept, implementation of such “value cycles” involves a shift in labor focus from mere production to production and maintenance, thus implying a partial redistribution of labor demand from centralized factories to localized repair workshops.

Benefits of circular economy adoption have been documented through several studies. For example, the Ellen McArthur Foundation and the McKinsey Center for Business and Environment published a 2015 study focused on mobility, food, and building industries in the EU, showing that the adoption of circular economy would bring cost savings of 25% by 2030 (Ellen McArthur Foundation & McKinsey Center for Business and Environment, 2015). This study is summarized in Figure 2.
Compared to the linear take-make-dispose pattern, circular economy patterns are in principle more connected because they rely on the interlock of actors along a cycle, with respective independent behaviors and value perspectives. Transitioning to a circular economy implies changes in consumer behavior along with pricing models, which challenges existing business models. For example, consumer spending patterns would need to shift from repetitive purchases of the cheapest item to a purchase-and-maintain pattern that considers extended product life spans. As part of this transition, consumer preferences would shift towards durability and repairability and consumption patterns would refocus on asset sharing “as-a-service” versus ownership.

The circular economy model, though perceived as necessary or even desirable by many, is far from being mainstream in industry. While the circular economy delivers environmental, social, and economic, sustainability on a global level as well as business opportunities for entrepreneurs, individual industries and companies within those industries require a roadmap for transitioning to the circular economy that incorporates motivational aspects for those organizations.

A roadmap implies a pathway for incremental transition to the circular economy that blends actions and milestones with bottom line results. Such a roadmap must be based on a formal discipline that views the organization holistically and can identify key investments, maps the effects on user experience and behavior, articulates transition phases, predicts the impacts of changes, and effectively manages risks. Ideally, transitioning to a circular economy aligns to and influences business strategies and business model innovation. Business architecture and the role it plays in end-to-end strategy execution provide such a roadmap. The strategy execution path shown in Figure 3 provides an overview of the roadmap that may be used for any planning initiative.

![Figure 3: Strategy Execution Path Leveraging Business Architecture (Business Architecture Guild®, 2020)](image)

The Figure 3 roadmap applies to any plans or investments that begin with strategic objectives and move through impact analysis, solution design, initiative definition, and deployment over a series of iterative business transformations large and small. Goals focused on transitioning towards the circular economy would be integrated into this planning and execution model in order to align and optimize a coordinated set of investments that can, for example, satisfy and align customer or revenue related objects with circular economy related objectives.

2. **A Business Architecture Approach to Strategy Execution**

Business architecture delivers business ecosystem-wide transparency as the basis for strategy execution and business model optimization. Business ecosystem is defined as “One or more legal entities, in whole or in part, that exist as an integrated community of individuals and assets, or aggregations thereof, interacting as a cohesive whole towards a common mission or purpose” (Business Architecture Guild®, 2020).

Business architecture’s cross-ecosystem perspective ensures that strategy execution and business model optimization are not obscured by siloed business unit constraints, while providing a clear line-of-sight into all aspects of customer and partner engagement. For example, a *Use Product* or a *Take a Trip* value stream provides aftermarket visibility into customer product and service utilization along with the role of partners.
in those activities. Business architecture’s foundation is based on formally defined capabilities, information concepts, value streams, and organizational views, providing the basis for realizing business strategies, complying with policies, delivering products and services, optimizing stakeholder value delivery, and executing initiatives.

Figure 4 introduces the Business Architecture Framework™, a formal definition of the makeup and context of the business architecture discipline, as defined by the global association, Business Architecture Guild®. The framework has been globally adopted and is in use by countless organizations around the globe and will serve as the point of reference for this business architecture in the context of this whitepaper.

Figure 4: Business Architecture Framework™ (Business Architecture Guild®, 2020)

The business architecture framework shown in Figure 4 depicts the three foundational aspects of business architecture: the holistic business architecture knowledgebase, a wide range of business scenarios that leverage business architecture, and the business “blueprints” that embody a wide variety of knowledgebase-derived business perspectives required to deliver business value for one or more business scenarios. For example, a merger scenario would leverage a combination of organization, capability, and information domains.

Figure 4 highlights each of the 10 business architecture domains housed within a central knowledgebase. These domains and cross-domain associations form a rich tapestry of ecosystem-wide business knowledge that may be used to plan, communicate, and execute a wide range of business scenarios. For example, capabilities, which represent a finite set of rationalized, non-overlapping business objects and actions against objects, provide a comprehensive perspective of “what” an organization does. One example of a business object is “material”, which encompasses a wide variety of types, such as ore, ingredients, parts, fuel, and subassemblies. A second business architecture domain, information concepts, uniquely defines these business objects, corresponding types and states, and relationships with other information concepts.

Two additional domains round out the business architecture “baseline”. Value streams frame how an organization delivers customer, partner, and internal stakeholder value. When value streams are aligned to capabilities that enable value delivery and the information required by those capabilities, organizations have the basis in place to execute strategy, optimize business models, and rationalize and prioritize corresponding initiative investments. Organizations have the basis to formalize and streamline investments and related initiatives on an enterprise scale, with a clear understanding of the role of each business unit and business partner in end-to-end strategy execution.
Section 4 provides practical examples as to how business architecture enables business model optimization and innovation for an automotive company seeking to achieve a cross-section of business goals and objectives.


Rather than one single loop as shown in Figure 1, a circular business ecosystem is the combination of several possible loops that reuse, re-manufacture and resell goods and re-extract or recycle components and materials. While the linear economy seeks to maximize value by achieving the highest speed of production, consumption, and replacement along a chain, the circular economy’s goal is to maximize value by extending the fruition of assets. This complex pattern is often represented by “the butterfly diagram” (Ellen MacArthur Foundation, 2019), as shown in Figure 5.

![Figure 5: Circular Economy Butterfly Diagram (Ellen MacArthur Foundation, 2019)](image)

Various stakeholders are involved in each of the branches that participate through different roles, each one according to their own value perspectives. Based on the self-sustaining circularity, each stakeholder’s actions should interlock in closed loop fashion while still allowing each actor’s pursuit of independent value. This requirement highlights the circular economy’s complexity.

Business architecture offers a systematic approach to deciphering business ecosystem complexity and determining progress on transitioning that ecosystem towards the circular economy. Business architecture additionally helps uncover opportunities within existing business models, predict the change impacts and related risks, surface regulatory considerations, and align initiatives needed to enable the transition from a linear to the circular economy.
Circular economy patterns apply to various assets or idling capacities, such as time, space or facility, utility, products, skills, and capital shared among stakeholders who extract value from them as long as possible through repeating “value cycles”. A value cycle is defined as “the closed loop path formed by the branches described in a circular economy that maximizes the lifecycle of value carriers”.

For purposes of this discussion, a value carrier is defined as “a business object shared iteratively among stakeholders in a circular economy, by which stakeholders achieve value”. The term business object is broadly interpreted and represents any physical or logical tangibility that can be shared or exchanged across a business ecosystem. In a circular economy, value carriers maybe be shared, maintained, refurbished, repurposed, regenerated or disassembled for reuse. Value carrier and business object differ because not every business object carries value. Examples of value carriers vary by industry, but might include vehicles, materials, products, assets, capital, competencies, routes, locations, and so on.

Incorporating business architecture into this picture aligns value carriers through “stories”, or business scenarios, centered on value streams encountered along the value cycles. A value stream is "An end-to-end collection of activities that create a result for a customer, who may be the ultimate customer or an internal end-user of the value stream” (Business Architecture Guild®, 2020). Value streams are enabled by capabilities and corresponding information concepts, which are based on formally defined, ecosystem-aligned business objects. Value cycles, therefore, represent a collection of value streams influencing each other where they share the same value carrier, each of which is aligned to stakeholders, enabling capabilities, and corresponding information concepts. The above concepts and corresponding relationships are illustrated in more detail in the sections that follow and are summarized in section 6.

4. **Business Architecture’s Role in Circular Economy Strategy Execution**

Value streams, capabilities, information concepts, stakeholders, and business units (i.e., organization) collectively form a foundational business architecture capable of representing any business ecosystem across any industry sector. Expanding this business ecosystem perspective to incorporate strategy, policy, product, and initiative domains, as introduced in section 2, provides the basis for achieving successful, end-to-end strategy execution to accommodate a wide variety of business scenarios.

The overview of business architecture’s role in transitioning to the circular economy that follows examines ongoing innovation within the manufacturing industry. The discussion begins by examining traditional and newly emerging business models for manufacturing, corresponding strategies to optimize and transition to these business models, and the role of business architecture to achieve these strategies. Existing business model evolution and new business model innovation enable organizations to transition to the circular economy while delivering bottom line benefits.

4.1. **Defining Business Models for the Circular Economy**

Traditional manufacturing business models offer multiple opportunities for organizations to engage in the circular economy. The automotive industry business model shown in Figure 6, as viewed through the Business Model Canvas (Osterwalder et al, 2010), represents a traditional manufacturing firm, where the company designs, builds, and sells vehicles to individuals through a dealer network and to companies and government agencies in the case of fleet sales.
Figure 6: Traditional Automotive Industry Manufacturing Business Model

The manufacturing business model in Figure 6 focuses on a traditional automotive industry model, where the company builds vehicles and distributes them through a dealer network. The customers in this model are viewed as the individuals who purchase vehicles via a dealer as well as companies and government agencies that acquire multiple vehicles for their fleets. Rapid automotive industry transformations are forcing companies to be more competitive, reuse more materials, increase vehicle longevity, and increase customer satisfaction through an enhanced customer experience.

Optimizing existing or traditional business models can achieve aspects of sustainability envisioned by the circular economy. For example, improved fuel economies, a shift towards electric vehicles, reduction and reuse of waste, and end-of-life buy-back programs all align to the overall goals of the circular economy. However, it may take the introduction of new, innovative business models to augment and accelerate steps towards sustainability. While the longstanding business model shown in Figure 6 will continue to be refined based on continuous innovation, new business models can emerge, opening up new avenues of opportunity and sustainability.

Figure 7 depicts a second automotive industry business model, one that encapsulates innovations being pursued by many companies within the automotive industry. This new business model is focused almost entirely on the aftermarket customer experience, where the focal point is on direct customer engagement of vehicle owners, lessees, drivers, and passengers. Different companies assign varying names to this business model, but for purposes of this discussion it will be called the “digitally connected customer”.

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Key Partnerships
- Suppliers
- Automotive Dealers
- Unions
- Transportation Partners

Key Activities
- Producing Vehicles
- Producing Parts
- Delivering Vehicles to Market
- Building Reseller Relationships

Key Resources
- Supply Chain
- Dealer Network
- Skilled Labor
- Advanced Technologies

Value Propositions
- Quality Vehicles
- Technological Innovation
- Rapid Recall
- Reliable Parts
- Loyal Customer Base

Customer Relationships
- Via Dealership Models
- Direct to Companies for Fleet Sales
- Direct for Aftermarket Sales

Channels
- Dealer Sales
- Direct Parts Sales
- Direct Fleet Sales

Cost Structures
- Personnel Costs
- Material & Equipment Costs
- Innovation & Research Costs
- Dealer Fees & Royalties

Revenue Streams
- Vehicle Sales to Individuals
- Vehicle Fleet Sales
- Aftermarket Parts Sales

Customer Segments
- Individuals
- Corporations
- Governments
- Rental & Leasing Companies
The digitally connected customer business model describes a path that many automotive manufacturers have long eyed, yet in many ways contrasts with the previously shown, traditional business model. The digitally connected customer business model seeks to engage customers directly, improve the customer experience at point of use, create an aftermarket revenue stream, and extend the life of the customer relationship and the life of the vehicle. Engaging directly with the customer when they take a trip or require assistance establishes a bond between the automotive manufacturer and the customer that may not exist under existing business models. Strategically, companies in multiple industries are seeking to establish or improve direct relationships with the end customer, where revenue and long-term growth opportunities can expand dramatically.

The digitally connected customer business model differs in many ways from traditional business models. For example, a company deploys aftermarket products in the form of in-vehicle technologies, performs vehicle monitoring and real-time data capture, directly engages vehicle owners, drivers, and passengers, enables real-time assistance, and establishes partnerships with key technology providers. This new, innovative business model requires high-speed, continuous channel access, which along with a high-tech workforce represents an additional cost structure. Revenue under this business model is aftermarket based, where in-vehicle product and service fees are charged on a recurring or per usage basis.

From the perspective of the circular economy, the digitally connected customer business model seeks to concurrently improve the customer experience and increase aftermarket revenue, while opening up more strategic sustainability opportunities. For example, proactive maintenance activities and real-time customer assistance can lengthen the life of the vehicle and ensure that the manufacturer is engaged in every aspect of the vehicle lifecycle, through use, maintenance, incident management, refurbishment, reuse, recycle, and ultimately disposal, covering the circular economy butterfly scheme shown in Figure 5. One sub-aspect of this business model can involve car sharing. Viewing the digitally connected customer business model holistically allows an organization to incorporate the sharing of vehicles, whether it be via a car sharing subsidiary or via one or more partner organizations.

Regardless of whether a vehicle is owned, leased, shared, or rented, real-time data capture and analytical analysis can expedite research into new ways to extend vehicle life, improve safety, tracking and recovery of key parts/materials at the product end of life, and fine tune the overall production model. In other words,
new business models can deliver bottom line business value while transitioning an organization to the circular economy.

Business architecture plays a vital role in enabling organizations to optimize existing business models as well as providing the basis for deploying new, innovative business models. Because business architecture singularly represents an entire business ecosystem, the same business architecture, when adjusted for business model particulars, represents the ecosystem as a whole.

4.2. Role of Business Architecture in Business Model Optimization

Business model optimization plays an important role in transitioning to the circular economy. Business architecture enables this transition while concurrently enabling organizations to streamline costs, increase revenues, and achieve related strategic objectives. Consider the traditional automotive manufacturing business model shown in Figure 6, which is focused on designing products, retooling production lines, optimizing material utilization, manufacturing products, and selling and delivering those products. Viewing this automotive manufacturing company through the lens of business architecture provides an actionable perspective on the business ecosystem, which in this scenario includes, among other things, the dealer network through which manufacturers engage the end customer.

Figure 8 highlights six value streams relevant to optimizing traditional automotive manufacturing business models. In this traditional business model, the product is the vehicle, plus all add-ons, warranties, and post-delivery services. These business architecture value streams focus on optimizing material inventories, setting up and running assembly lines and other operations, designing and developing new products, creating and deploying the final product, and enabling customers to acquire those products.

Figure 8: Value Stream Focus for Traditional Manufacturing Business Model Optimization

The business architecture value streams shown in Figure 8 deliver the value propositions, shown to the right, for the triggering stakeholder, shown to the left. For example, Figure 8 depicts the Optimize Material Inventory to ensure that the right material is available just in time. Execute Operation, on the other hand, sets up and runs manufacturing shifts, assembly lines, and other operations. Develop Product produces a final product design while Manufacture Product delivers a ready-to-sell or ready-to-deliver product. In this traditional manufacturing business model, the Acquire Product value stream delivers the vehicle to individual customers, often through a dealer network. In keeping with the holistic ecosystem-wide perspective, the Maintain Vehicle value stream represents a customer obtaining vehicle maintenance, again typically through the dealer network.
Value streams form the basis for targeting business objectives, related initiatives, and corresponding investments required to optimize the corresponding, traditional business model. These investments target capabilities that collectively enable one or more of the value streams shown in Figure 8. Planning teams also target capabilities based on performance or gaps, with priority given to high impact, underperforming capabilities. Each initiative seeks to improve the behavior of selected capabilities across an ecosystem to meet one or more business objectives, with those investments synchronized to streamline delivery cycles and related investment outlays. A sampling of high-profile, high-level capabilities that enable the aforementioned value streams includes the following.

**Facility Management:** Tracks, maintains, and configures factories, warehouses, office buildings, and other company-owned, company-leased, and partner-related structures.

**Asset Management:** Tracks, configures, and maintains equipment, tools, hardware, software, and other properties used in a business.

**Operation Management:** Sets up, designs, and synchronizes an orchestration of work that include, for example, factory shifts, shipping centers, assembly lines, service centers, and dealer work shifts.

**Material Management:** Identifies, tracks, and transforms matter used the manufacture of products and includes, for example, raw material, parts, sub-assemblies, chemicals, fuel, and waste.

**Customer Management:** Identifies, tracks, and engages individuals and organizations that are receive or benefit from the organization's products and services, by agreement or other means.

**Partner Management:** Engages third parties that collaborate with the manufacturer to further its mission and goals and includes, for example, suppliers, dealers, and transportation companies.

**Product Management:** Configures and embodies vehicles and related entitlements, such as warranties, as well as aftermarket products that include parts and interactive, in-vehicle services.

These capabilities, corresponding information concepts, and stakeholders form the basis for delivering end-to-end value as framed by the value streams shown in Figure 8. When an automotive manufacturer seeks to optimize its traditional operating model, these value streams and corresponding capabilities, information concepts, and stakeholders form important focal points. For example, an overall strategy to transition towards a circular economy would focus on the previously listed value streams and capabilities engaged in:

- Reusing and recycling material during the acquisition, optimization, transformation, and use of those materials, including optimizing the use of byproducts from the manufacturing process
- Optimizing operations, facility configuration, asset utilization, and partner engagement via improved automation, training, or other means
- Streamlining vehicle delivery and transportation routes and means of fulfillment

Many manufacturing companies are employing these and other strategies, framed from unique end-to-end value delivery perspectives. An example of changes induced by business model optimization is the introduction of remanufacturing. "Caterpillar no longer specifies if a new engine is new or remanufactured, as the technical specifications, sales price and warranty are the same." (Stahel, 2019).

In this case, vehicles that reach end of life reenter the manufacturing cycle as an alternative source of parts, to be refurbished and reintroduced into the supply chain. As a result, a new sourcing channel is added while no disruptive changes are required on the overall manufacturer’s business model.

Besides obvious updates to the capabilities involved in the manufacture product value stream, a decommission vehicle value stream is required to represent the extraction of materials of interest, such as the engine, from vehicles at end of life, which are subsequently delivered to the manufacturing plant through reverse-logistics. The entry point in the decommissioning value stream happens locally, where vehicles are
sold or traded, mirroring the point of sales of new vehicles. Figure 9 depicts the dealer, which is part of the automotive company’s business ecosystem, triggering the Decommission Vehicle value stream.

Figure 9: Additional Value Stream Needed for Remanufacturing

Decommission Vehicle value stream stages are enabled by existing Material Management and a wealth of other capabilities. The value stream may require improving existing capabilities or adding new capabilities to manage vehicle condition, criteria matching, vehicle disassembly, component reuse, product refurbishment, and related scenarios. These capability improvements may additionally surface the need for modifications to information concepts focused on the vehicle and other business objects.

From the manufacturer’s point of view, its traditional focus relates to production and go-to-market stages of the value cycle. For the sake of recycling effectiveness, optimization or expansion of the business model would ideally supply information that enables partner capabilities enabling the Decommission Vehicle value stream. Capability dependency analysis highlights information required from the manufacturer that maximizes the effectiveness of partner-delivered capabilities. Identifying these capabilities, in turn, helps identify the digital technologies required to deliver on key strategies. For example, capabilities that collect remote vehicle telemetry and related conditional data must be made available to enable partner-delivered capabilities needed to evaluate a vehicle prior to its decommissioning.

The holistic mapping of value streams, capabilities, information concepts, and business units across the business ecosystem enables coordinated execution among dealers, the manufacturing company, and other business entities. From an overall perspective, strategic planning can extend across a coordinated view of the development, manufacture, and decommissioning of the vehicle as well as the optimization of material inventories and operations.

4.3. Role of Business Architecture in Business Model Innovation

Business model innovation differs from business model optimization insofar as innovation implies the transition or addition to a new business model while optimization implies the ongoing improvement of an existing business model. For example, the digitally connected customer, as shown in Figure 7 is an innovative business model that focuses on direct customer engagement and the aftermarket customer experience. This new business model delivers new ways to improve the customer experience while opening up opportunities for achieving improved sustainability.

When a new, innovative business model differs materially from existing business models, transitions can be haphazard or even fail. One automotive company, for example, had the right vision, hired the right talent and even re-envisioned the product management role to focus on aftermarket offerings. A second company focused on the technology but lacked the business perspectives required to target and leverage those technologies. In both cases, these companies lacked clear investment focal points. The results were predictable; projects did not align, requirements were off target, and investments were not coordinated.

These companies lacked a clear business ecosystem perspective required to plan and execution a transition to the digitally connected customer business model. This focal point is provided by business architecture, specifically well-articulated value streams, capabilities, information concepts, and stakeholders to aid in visualizing the business ecosystem to enable strategy execution.

One example of business model innovation addressed by the business model in Figure 7 is the car sharing as a service. A “car as a service” business is a reuse cycle where the car represents the value carrier. It delivers
value for the users as well as for the rental company and it is returned all the time, running the loop many times until disposal.

Figure 10 depicts five essential value streams that serve as the focal point for deploying the digitally connected customer business model. In the “car as a service” value cycle, two value streams are fundamental: Take a Trip, representing the customer’s value perspective, and Maintain Vehicle, representing the company’s perspective of asset value maintenance that allows value cycles to be repeated.

Figure 10: Value Stream Focus for Digitally Connected Customer Automotive Industry Business Model

The value streams shown in Figure 10 focus on direct aftermarket customer engagement, including situations where a customer takes a trip, obtains or upgrades in-vehicle products, recovers from an incident, has vehicle maintenance, and captures, analyzes, and disseminates vehicle, trip, customer, incident, and other information. These value streams form the focal point for driving investments to improve the customer experience, drive revenue streams, maximize asset utilization, and achieve new levels of sustainability in the circular economy.

For example, the Take a Trip value stream engages customers directly over the life of a “trip”. Independent devices and in-vehicle products provide navigation, routing, entertainment, and other services, alert the driver to maintenance needs or incidents, and uploads real-time data on the trip, vehicle, product usage, and incidents. The Recover from Incident value stream is initiated when a vehicle failure or customer-reported incident occurs. Customers receive real-time assistance such as dispatching help or even emergency services.

The Acquire Product value stream deploys and activates in-vehicle products and related upgrades that provide navigation, entertainment, shopping, incident recovery, and other services. Product acquisitions can occur in-vehicle or offline with the customer’s choice of timing and device.

The Maintain Vehicle value stream is triggered when a customer determines, either on their own or at the prompting of the manufacturer, that vehicle service is required. While this value stream exists in traditional manufacturing business models, interactive messaging to the customer provides greater insights into specific timing and maintenance requirements.

Finally, the Disseminate Information value stream captures, transforms, and assimilates data captured on the vehicle, trips, routes, incidents, network utilization, and customers. This data is used for a wide variety of purposes that include improving vehicle design, resource utilization, navigation, network utilization, incident response, and other purposes. No personal customer data is ever used or compromised.

An annotated perspective of Take a Trip highlights how value streams are used in business model innovation and strategy execution. Figure 11 depicts an annotated view of the Take a Trip value stream, highlighting
various stages and corresponding enabling capabilities, information concepts, stakeholders, and products used in context of a given stage. Value stream stages serve as the fundamental means of ensuring that capability and information related investments are value oriented and consider the stakeholders engaged at each stage that deliver value for the stakeholder that initiates or “triggers” that value stream. For example, the customer, typically the driver, triggers the *Take a Trip* value stream while the driver and passengers, both of which are consider customers, participate in the value stream.

![Figure 11: Take a Trip Value Stream, Key Capabilities, Information Concepts, Stakeholders, and Products](image)

Figure 11 highlights a sampling of relevant enabling capabilities that collectively further value delivery at each stage. Capabilities in the traditional automotive manufacturing business model are well understood and continue to play a role in the new, digitally connected business model. This new business model, however, requires that additional, new capabilities be introduced to successfully deploy the digitally connected customer business model. Trip Management, for example, is a new capability that would likely not exist in a traditional manufacturing business model. Essential capabilities enabling the *Take a Trip* value stream are shown below.

**Trip Management**: Establishes and tracks initiation and termination of a journey, which may be associated with a combination of routes and locations, and includes the collection of journey-related statistics. Each trip concept is associated with the customers, vehicle, routes, locations, and other concepts for statistical analysis.

**Vehicle Management**: Identifies and tracks the car, truck, or other conveyor associated with a customer, trip, incident, or other scenario, including the capture and provisioning of vehicle data, which may be used to recommend maintenance, assess resale or salvage value, or generally provide insights into sustainability initiatives long-term.

**Customer Management**: Identifies and tracks the driver and passenger(s) associated with a vehicle, related to product, trip, location, and corresponding agreement(s).

**Route Management**: Establishes and plots various courses or avenues, from location to location, that may be associated with a vehicle, trip, or segment of a trip.

**Location Management**: Identifies and interprets specific latitudinal and longitudinal points that are used to associate the whereabouts of a vehicle, customer, or points of interest associated with a given route or trip.

**Incident Management**: Identifies and quantifies unplanned issues that may arise and be associated with a vehicle, route, customer, or trip.
**Material Management**: Identifies and tracks availability and levels of fuel, oil, and related materials relevant to vehicle operation, including parts if repair services are warranted during a trip.

**Product Management**: Identifies, configures, and embodies aftermarket services associated with mapping, navigation, entertainment, emergency access, fuel availability, retail options, and other interactive services. The product concept as defined in a traditional manufacturing business model, which in this case would be the vehicle and related warranties and services, also falls under this information concept.

Capabilities decompose into increasingly more granular capabilities, allowing planning teams to target investments with significant clarity of corresponding outcomes. For example, Material Management decomposes into Material Solidification, Liquefaction, Deformation, Blending, and Combustion, among many other capabilities. If any one of these granular capabilities are underperforming for any type of material, which includes waste, an investment would ideally improve those capabilities from an ecosystem-wide perspective where appropriate.

Figure 11 highlights important information concepts required by these and other capabilities. The role of information concepts extends beyond providing information to capabilities over the life of a trip. Real-time data, captured over the life of the trip, serves as the basis for ongoing analytical assessment that is used to improve the customer experience, resource utilization, mileage, vehicle performance, maintenance scheduling, and other sustainability improvements. These information concepts, which for purposes of automation would need to be formalized in an automotive company’s data model, are essential to the effective deployment of the aforementioned capabilities.

Figure 11 also depicts the products that customers may leverage at each stage of a trip. For example, a driver would leverage mapping, navigation, and fuel access products while passengers would leverage entertainment products. Consider an example where a question or issue arises while the customer is preparing for a trip or is in transit. In-vehicle technology provides help, connects to an automated or human advisor, and requests emergency services.

By framing a formal, holistic view of how value is delivered to customers and other stakeholders, along with enabling capabilities, corresponding information concepts, engaged stakeholders, and key products, business architecture creates the basis for envisioning and executing business model innovation and strategy execution. A well-defined business model lays the groundwork for business model optimization and innovation, but a clearly defined strategy, broken down into well-articulated business objectives and courses of action is essential to execution. Most important is that business architecture enables a set of coordinated investment targets to improve the customer experience, drive revenue creation, and optimize asset and resource utilization. These overall goals may be augmented and synchronized with transitioning to the circular economy. Goals may include, for example:

1. Optimizing vehicle and fuel utilization through trip and route optimization
2. Extending vehicle life through proactive maintenance, dealer and customer incentives, and other means
3. Improving vehicle design based on statistical analysis of an aggregation of trip, vehicle, route, and other data
4. Enabling a car sharing service, where *Take a Trip* frames a customer accessing a vehicle via a car share agreement, completing a journey, and relinquishing the vehicle at a given destination
5. Preventing, eliminating, or reusing waste, by optimizing vehicle afterlife through material reuse and ultimate disposal
Consider goal #3 for example, which focuses initially on two value streams; *Take a Trip* and *Disseminate Information*. Objectives targeting the first value stream, which is called *Take a Trip*, would involve real time data capture while the vehicle is in use, where that data covers every aspect of a trip, routes, customer, network usage, material utilization, the vehicle itself, and product usage. Drilling down on a stage-by-stage basis, the organization would target information concept-specified data model specification and corresponding capability-specified software services and microservices to meet detailed objectives.

While data capture is important, assimilating that data and developing analytical analysis is required as input to future vehicle design. The *Disseminate Information* value stream becomes the target for a second set of objectives, courses of action, and corresponding investments. In other words, a formal strategy to improve and optimize future vehicle design for purposes of improved sustainability and customer satisfaction requires focusing on the *Take a Trip* and *Disseminate Information* value streams as well as the shared capabilities and information concepts used across those values streams.

The automotive industry example demonstrates how an organization can leverage business architecture to optimize existing business models and deploy new innovative business models to improve the customer experience, drive revenue requirements, optimize resource utilization, and achieve sustainability goals associated with the circular economy. One important consideration is that there is one integrated business architecture that represents a business ecosystem and that can enable multiple existing and new business models. That business architecture serves as the basis for coordinated, ecosystem-wide strategic planning and execution, ensuring that organizations improve and expedite program and project deliver while optimizing corresponding investments.

The car sharing point in goal #4 highlights the widely adoptable nature of business architecture across a business model. Value streams and capabilities play multiple roles whether a customer owns, leases, rents, or accesses the vehicle under a car sharing agreement. All other benefits accrue, including vehicle usage tracking, data analytics capture, and tracking of maintenance requirements. The most notable aspect of the business architecture approach for business model innovation is that the same perspective may be used for strategic planning and execution for a car sharing service regardless of that service being a subsidiary or a third-party partner, where the uniqueness between these two are the stakeholders being engaged.

### 5. Aligning the Circular Economy and Business Architecture Disciplines

Existing business model evolution and new business model innovation enable organizations to transition to the circular economy while delivering bottom line benefits. Business architecture’s role in end-to-end strategy execution provides a roadmap and blueprints articulated through mapping of a few fundamental concepts. Leveraging business architecture in the context of a circular economy transition requires aligning or cross-mapping value, stakeholder, capability, and information perspectives in business architecture with corresponding concepts in the circular economy pattern.

#### 5.1. Value Mapping

Value cycles as defined within the circular economy represent and align to a collection of value streams that share common value carriers and therefore influence each other. Due to such mutual influence and interdependence, the analysis of one or more value streams must be complemented by an analysis of the overall value cycle that aligns to those value streams.

The example discussed in section 4.3 identifies a car sharing cycle, where the value carrier, in this case the vehicle, is a common business object shared across multiple value streams. The vehicle is used, maintained,
and reused over an indefinite period of time. By following value carrier exchanges along the value cycle, we can identify the value streams that align to value proposition delivery within the circular economy for a given ecosystem along with dependencies and relevant stakeholders. Consequently, organizations would invest in the discovery, analysis, and equalization of the capabilities that enable those value streams. Figure 12 highlights a value cycle for car sharing along with selected value streams that align to this cycle.

Figure 12: Value Streams in a Value Cycle: Car Sharing Example

In the car sharing example in Figure 12, the value streams *Maintain Vehicle* and *Take a Trip* are incorporated into the same value cycle, but remain distinct being independently triggered by different stakeholders, each of which may be pursuing distinct value propositions. The vehicle is the common object characterized within the value cycle. In order for such cycle to sustain, the aligned value streams, value propositions, and enabling capabilities must match. For example, even if the value stream *Maintain Vehicle* were perfectly implemented, ineffective vehicle defect detection and message related capabilities within the *Take a Trip* value stream would negatively impact the overall value cycle.

**Iterative Nature**

Iteration through cycles constitutes the economic attractiveness of the circular economy: each loop can run multiple times, delivering value repetitively while involving only incremental cost. It is essential that transaction costs occurring at each iteration are kept to a minimum. This is the reason why digitalization is a powerful catalyst of circular economies; it minimizes transaction costs, but does require upfront investment. Therefore, the identification of iterative paths through value cycles via value stream analysis requires continual capability optimization for those capabilities that are iteratively invoked the most.

**Location Criteria**

Value cycles are often characterized geographically, where smaller, geographically distributed cycles are more likely to succeed than centralized, larger ones. Migration from linear to circular economy tends to move resources from production to maintenance activities. This implies a move of labor and corresponding demand from manufacturing sites, which are often centralized in low-cost economies, to the place where users are located, requiring a decentralized approach.

**Dynamics Criteria**

Latency must be taken into account in the prediction of success factors of circular economy implementations. For example, recycling of a product may happen years after its production, exposing technological obsolescence risks. By extending the service life of materials, assets, and related business objects, the circular
economy should reduce the speed of external resource inflow, while the stock of value carrier stored within the system is preserved. Therefore, a dynamic analysis of value streams is recommended; techniques exist for dynamic analysis of value maps, such as **system dynamics** and **discrete elements**.

**5.2. Capability Mapping**

“Capabilities enable laser-like business investment focus [...] serve as a baseline for strategic planning, change management and impact analysis” (Business Architecture Guild®, 2020). Mapping capabilities in a circular economy context reveals gaps and allows organizations to define actions, relevant investments, and responsibilities. The circular economy brings some peculiar perspectives on capabilities as described below.

**Balancing within the Cycle**

Stakeholders participating in the same value cycle should have balanced capability profiles. In the same cycle, if one member has limited capabilities, it will "choke" the whole cycle. That is why organizations like Airbnb invest in making “matching capabilities” available to single users, who, otherwise, on their own, would miss them.

**Mapping in Geography**

Capabilities that extend the life of manufactured objects, such as those that facilitate service brokering, vehicle repair, and material traceability, should be available locally. For example: "**Patagonia operates mobile repair workshops, which travel to skiing or mountaineering events**" (Stahel, 2019). It is, therefore, important that availability of these capabilities be mapped geographically. Commonly employed capabilities that accommodate geographic mapping and distribution of work include Location Management and Geographic Space Management, which collectively match to various business objects such as vehicle, material, asset, facility, partner, customer, and work items.

**Capability Information Requirements**

In the circular economy, capabilities "to undo" are particularly important and have specific information requirements, which in turn are essential for optimizing circular economy execution. Information related to vehicle assembly, configuration, tracking, control, repair, and disassembly enable a fully functioning set of optimized capabilities. Formal information maps, which are based on holistic information views required by capabilities, serve as a baseline for deriving and validating data architectures that are critical to digital transformation and most other technology optimization and transformation efforts.

**Capability Evolution**

As described above, the benefits of circular economy may need several iterations of each cycle to be realized. One possible mistake when attempting to establish a circular economy is to focus on the capabilities needed by an organization in its final state. However, initiating a loop may require specific capabilities and investment, such as the allocation of working capital along the loop to activate each part. Business architecture roadmaps address this requirement by defining intermediate states in a journey from current to future state, defining subsequent targets for capability configuration of the ecosystem.

**5.3. Stakeholder Mapping**

“A critical capacity of business architecture is to represent key stakeholders within a business” (Business Architecture Guild®, 2020) along with their relationships, value perspectives, and dependencies. Rationalization and categorization techniques within business architecture stakeholder mapping provides an ecosystem-wide mapping of internal and external stakeholders that enable, for example, customer segmentation or partner delineation, and needs determination.
Orchestrating Independent Triggers

In a circular economy ecosystem, each stakeholder triggers its own value stream but all together they depict a common value cycle. The value cycle has not one single triggering stakeholder but rather has multiple triggering and participating stakeholders engaged in multiple value streams that align to a given value cycle.

Business architecture specifies the value stream scenarios where different stakeholders extract value propositions across a value cycle, which enables the cycle to start and be sustained. For example, if the circular economy were only based on regulatory constraints and lacking clear stakeholder value perspectives, stakeholders would miss incentives and the overall value cycle loop would likely break up. Analysis of motivation and “stakeholder experience” is key to ensure a healthy circular economy implementation.

Multiple Ecosystem Roles

Besides those directly involved in value cycles, organizations must also identify other stakeholders with complementary roles (Traverso, 2018). These include:

- Service enablers, who facilitate the implementation of specific technologies
- Integrators, who provide a digital technology platform as needed
- Anchors, who may serve as promoter of the original vision, initiator of its implementation, or advocate of circular economy
- Regulators, who ensure consistency with existing policies, regulations, compliance criteria, and certifications, such as may be required to certify recovered material purity and traceability, and legal agreements

Stewardship, Ownership, and Liability

In the linear economy, creation and disposal happen across different ownerships, so that the manufacturer is not liable for the disposal. Organizations must map and distinguish stewardship and liability from ownership. Figure 13 describes stewardship mapping in the previously discussed car sharing example.

Figure 13: Stewardship Mapping for the Car Sharing Example
Figure 13 highlights various stages within the value cycle and corresponding stakeholders’ liabilities. When considering a circular economy, the boundary of liability among stakeholders needs to be discerned between the manufacturer and the buyer and also between the owner and the custodian of the value object.

Consider for example, manufacturer and buyer liability differentiation. Lacking end-to-end stewardship, the manufacturer or producer will typically sell the hardware but not the software associated with the product, making it impossible to repair or remanufacture that product. Similarly, the producer will not be motivated to design the product for easy disassembly to recycle basic materials. Consider the example of the Extended Producers Responsibility (EPR) law, introduced by the EU in 2003. This law aimed to incentivize the reuse and recovery of materials at the end of a product life by its producer, while the actual end of life servicing could be delegated to third parties. However, such third parties, having “no access to producer knowledge and lack the expertise [...] to exploit the highest value conservation option of reusing components or materials, they aim for the cheapest recycling or disposal methods, thus waiving the opportunities” (Stahel, 2019).

Further consider liability differentiation between the owner and asset custodian for assets shared within a reuse value cycle where the lack of clarity can determine failure of a circular economy initiative. Consider the following the example where “Mobike, a Chinese company renting bicycles [...] which can be left anywhere and used spontaneously where they are (free float principle), has been banned in a number of cities (Zurich, Singapore, China) because of chaotic user behavior” (Stahel, 2019).

6. **Summarizing Circular Economy and Business Architecture Alignment**

Business architecture and the circular economy each have extended perspectives; the details of each have not been discussed in this white paper. The important takeaway, however, is having clarity and formality as to where the disciplines intersect to deliver corresponding benefits; in particular, which aspects of business architecture can the circular economy leverage to expedite and smooth the overall transition. Formality is typically conveyed in models.

Figure 14 summarizes the relationships between business architecture domains and circular economy domains, with the main circular economy focal points being the value cycle and value carrier, along with the two categories shared with business architecture, business object and stakeholder. Note that various domains are represented with different color schemes. For example, capability and its outcome are shown in blue.
Figure 14: Summary of Business Architecture and Circular Economy Domain Relationships

The essential takeaway from the Figure 14 model is that the circular economy aligns very effectively to business architecture and that business architecture, when viewed through the full set of domains, provides the means for a formal, robust transitioning approach to the circular economy. For example, business architecture provides a much more robust view of stakeholder value delivery and contribution, the underlying capabilities that deliver value, and the information required by those capabilities for them to work effectively. Figure 14 may be expanded to include other business architecture domains, including strategy, policy, organization (business unit), product, and initiative. These business architecture mappings may in turn be extended to depict investment and related actions in data and application architectures and software designs (Ulrich, 2020).

7. Call to Action

Organizations seeking to invest in the circular economy and lacking a roadmap or motivation should leverage the strategy execution pathway to align strategic objectives up front and then synchronize those objectives through coordinated business design efforts, rationalized initiatives, related investments, and coordinated data and software architecture deployments. The starting point depends on what an organization has adopted to date but involves several factors as summarized below.

- Identify circular strategy’s role and value proposition for the organization
- Evaluate how that strategy aligns to near- and long-term goals and objectives
- Establish a baseline business architecture, leveraging industry reference models (Guild, 2021)
- Leverage the strategy execution path to deliver a coordinated set of goals and objectives based on a long-term evolutionary view of the transition to a circular economy

There are many places to begin the journey towards a circular economy, as long as all of the right pieces are in place as organizations begin their transition.
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References


