

Towards developing a digital platform for a systemic shift to a circular economy: progress report number 2

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1. Introduction

This is a progress report for Milestone 4 due on 31st August 2022, for the Victoria Circular Activator (VCA) Grant ID RVInnovation036, by the Swinburne University of Technology research team. Specifically, this report describes the progress relating to the conceptual development of a data platform that has the potential to support Victoria's transition to a circular economy (CE) by 2030. We refer to this data platform as a Virtual Intermediary, intended to assist businesses in their transition to circularity.

A conceptual framework for CE transitions and the role of intermediaries in assisting transformative processes were discussed in the Milestone 3 report. After the conceptual development, and summarised in this report, the subsequent phase of the research focused on:

- Grounding the conceptual framework and transformative processes mapping through a series of key actor interviews; and,
- Generating insights relating to barriers and opportunities for specified waste streams.

1.1 Project context

The project is funded by the Victorian Government's Recycling Victoria Innovation Fund and is part of the Circular Economy Business Innovation Centre (CEBIC). A key CEBIC aim is to support Victoria's CE policy and action plan "Recycling Victoria - A new economy" (DELWP 2020). This is a 10-year policy and action plan for waste and recycling.

Within this project, the research team at Swinburne's Centre for Urban Transitions is providing a conceptualisation of how data collection can support a digital infrastructure and solution space, via a virtual intermediary. This report provides a summary of recent progress on this activity.

1.2 Victoria's circular transition: Goals and metrics

Victoria's goals in the transition to a CE are four-fold (DELWP 2020):

- Goal 1 - Design to last, repair, and recycle
- Goal 2 - Use products to create more value
- Goal 3 - Recycle more resources
- Goal 4 - Reduce harm from waste and pollution

The metrics to evaluate progress against these goals are:

- Divert 80% of waste from landfill by 2030, and an interim target of 72% by 2025.
- Cut total waste generation by 15% per capita by 2030.
- Halve the volume of organic material landfills landfill between 2020 and 2030, with an interim target of a 20% reduction by 2025.
- Ensure every Victorian household has access to food and garden organic waste recycling services or local composting by 2030.

The project team acknowledges these goals set by the Victorian government, but is hoping for a more ambitious transition towards sustainability and circularity, especially concerning waste streams with a high carbon footprint.

In Australia, key sector stakeholders in construction and demolition highlight the need for market incentives and investment in technology and infrastructure, sustainable procurement, and landfill levies. Others note the need for better institutional arrangements toward better adaptive governance to improve current waste management and a lack of political momentum to promote regulatory interventions (Jones 2020). Overall, this more ambitious transition, consistent with the systemic change in design, production, consumption, and resource use, as described by Schandl et al (2021), is implicit in the four goals listed,

but also requires a move from the dominant linear model towards a sustainable circular society (Melles 2021). Such a reformist socio-technical agenda has already been identified by several scholars as the fourth stage in a process toward a sustainable circular society (Jaeger-Erben et al. 2021). Figure 1 exemplifies these four stages that also, broadly, encompass different understandings of what a circular economy is. Our reference to a CE theory of change is ultimately aimed at a sustainable circular economy transition.

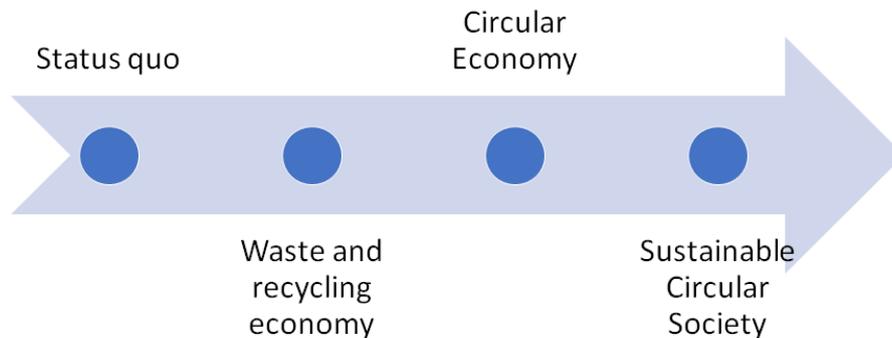


Figure 1: Imagined progression from status quote to a Sustainable Circular Society

In Figure 1:

- Status quo is the currently dominant approach to consumption and production based on market environmentalism strategies of greenwashing and voluntary business and consumer commitments. Resource scarcity and relative prices will also, in a linear economy, generate a degree of recycling, reuse, and re-purposing, but wholly technical and institutional solutions aligned to current linear business practices.
- The Waste and Recycling Economy is an economy based on higher recycling rates and waste reduction through adopting R-strategies and through policy and regulation and greater investment in infrastructure. The current situation in Australia is an emergent version of this practice.
- A Circular Economy is based on investment in higher level R-strategies of re-use and repair with concomitant business models. Investment also in market creation of new circular services, e.g., sharing economy and sustainable supply chains, with an overall commitment to green growth through such strategies. (The current policy narrative).
- A Sustainable Circular Society is an integrated consideration of social inclusion in job creation and other benefits of a systemic circular economy and society approach. Such an approach matches political etc narratives of inclusion, e.g., affordable housing, education etc., at state and federal levels. E.g., Doughnut Economics and other models of new economic thinking already circulating in the C40 cities initiative and Amsterdam in particular.

2. Methodology and thinking

2.1 How we develop a CE Theory of Change

Here we present the key premises of the study, key boundary objects that we develop to support the study, as well as the data that we collect. A boundary object is a conceptual representation, such as a diagram, that represents multiple disciplinary, social, or professional perspectives in a single artefact.

Acknowledging prior efforts to define the transition to a CE (Velenturf and Purnell 2021; Desing et al. 2020; Friant, Vermeulen and Salomone 2020), the key premise of the study is (our definition):

The transition to a CE requires the imagination of a new economy that is circular; as well as a fundamental transformation of social, business, governance, and material systems to help realise this imaginary.

As set out in Figure 1, transitioning to a circular economy represents a systemic realignment of how the economy operates. It goes well beyond the downstream management of waste or reducing resource intensity of economic activity to upstream envisioning resource consumption a priori for circularity. Hence, consumers and producers have a significant part to play in such a realignment, as does public policy and regulation, which frames the incentive structures under which consumers and producers operate. A common mantra from business leaders is that 'business requires predictability' to operate effectively. In transitioning to a circular economy, predictability, amongst other things, relates to consumer demand; taxation and regulatory settings; and the behaviour of competitors and business partners within and outside firm-specific supply chains. Business also wants to know how to strategize for the short and long term and this requires the ability to 'predict' the likely impact of circularity in the future. Predictability, then, is central to reducing the transaction costs of CE product and business model development.¹

Based on these premises, we employ systems thinking to:

- Develop a holistic understanding of the CE transitions process of the Victorian economy to circular economy principles (Milestone 3 and 4), in order to
- Co-design an intermediation agent (the Virtual Intermediary, or data platform) facilitating the development of businesses' actionable pathways to circularity.

We have chosen a Theory of Change (ToC) as a boundary object (see Star and Griesemer 1989) that is intended to help to facilitate these two tasks. Whilst the definition and use of a ToC vary, here we consider a ToC to be a description, i.e., a set of assumptions on cause and effect, of how a system can transform to achieve a given objective. In the words of Schneider and colleagues (2019):

A theory of change outlines an intervention's working hypotheses about how its activities might trigger changes and continuously refines it through cycles of action and reflection.

The concept has been widely used in development studies (Biggs et al. 2017, Douthwaite and Hoffecker 2017), especially for programme monitoring and evaluation, where it operationalises indicators, identifies assumptions and monitors the progress of projects.

¹ Transaction costs are the costs associated with transacting (or exchange) within organisations and across markets. As such they incorporate behavioural as well as institutional (regulatory, monitoring and enforcement of contracts) costs. Transaction costs is one of the reasons that the price mechanism of market economies frequently do not operate efficiently. Transaction costs considerations are particularly pertinent when markets are thin (few suppliers or buyers) and transactions are non-standard/complex (Williamson 2005).

Importantly, ToCs can identify problem causes and remedial actions used in strategic planning (~backcasting). In sustainability science, the result of such activity is often referred to as ‘adaptation pathways’ within which “decisions and measures are sequenced in time to achieve future goals” (Werners et al. 2021, p. 268). A ToC is the first step in developing decisions and measures to achieve goals, as well as creating a framework for monitoring and evaluation that supports adaptive governance, as described by Butler et al. (2016) and Colloff et al. (2021). Adaptive governance is a key mechanism for achieving transformational change in a setting characterised by high levels of complexity (Cosens et al., 2021). In particular, adaptive governance creates a coalition of actors to manage change and innovation as required by the changing circumstances. As such, this is the ToC that provides the conceptual framing for achieving transformation.

A ToC is the basis both of adaptation pathways as well as adaptive governance (see Figure 2) through a data framework. This is developed to inform how a Virtual Intermediary can operate in a way that facilitates a transformation of Victoria’s economy to a CE.



Figure 2: ToC as a basis for adaptive governance of a transition.

Figure 3 is a description of the step-by-step process we aim to follow to develop the ToC for CE transition in Victoria. Insights derived from the first stage were detailed in our first progress report. This second progress report addresses stage 2 and presents the emerging findings from interviews about the current CE context in Victoria. Stage three involves developing a statement that expresses the long-term CE change in Victoria which will be based on Victoria’s CE targets detailed in Section 1.2.

At stage four, we will map a sequence of events to achieve CE transition in Victoria based on the conceptual framework presented in Figure 4. The sequence of events will be further refined through an iterative process of consulting project stakeholders. Thereafter, we will outline the assumptions and contextual conditions underlying the CE ToC activities and outputs at stage 5 before capturing the final diagram and narrative summary at stage 6. This then informs later project activities, i.e., the innovation challenge that will aim to co-design a VI that supports the transformation.

Meanwhile, Figure 4 shows a high-level conceptual framework for adopting CE practices to guide the development of the ToC. The framework and sub-frameworks for each category were further described in our first progress report. Section 4 presents emerging (i.e., still developing) insights from the interviews to refine the framework in Figure 4. It should be noted that the boundaries between the sub-frameworks are not rigid and based on specific contexts with some factors appearing in multiple sub-frameworks (e.g., mainstreaming sustainability in enabling environment in Figure 6 and market creation in Figure 7).

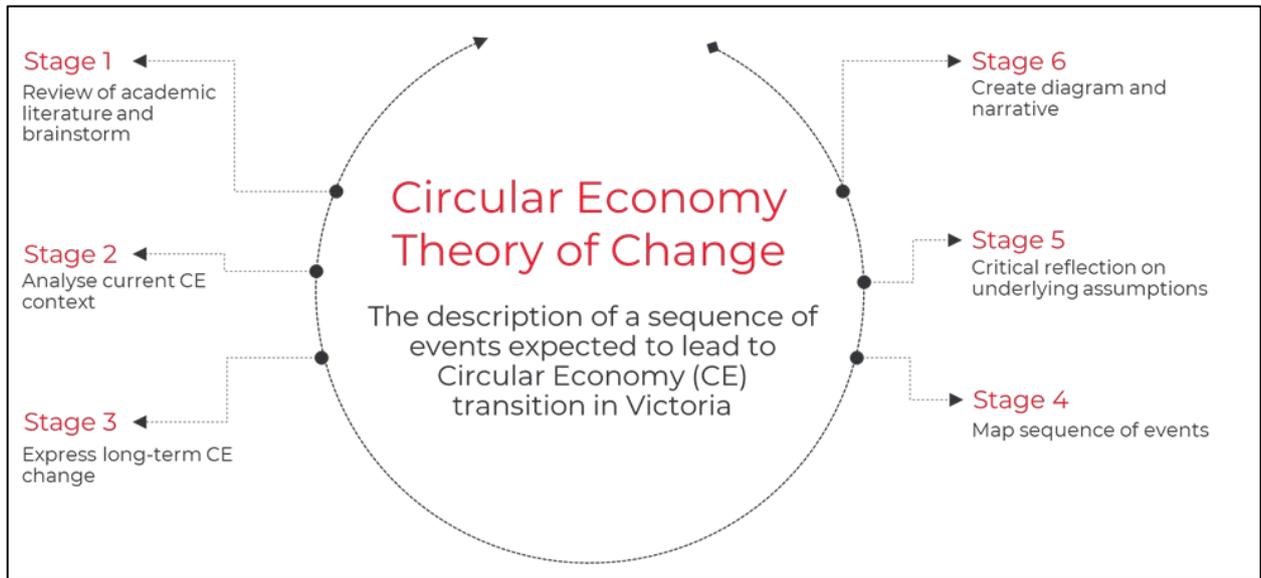


Figure 3: Stages of CE ToC analysis

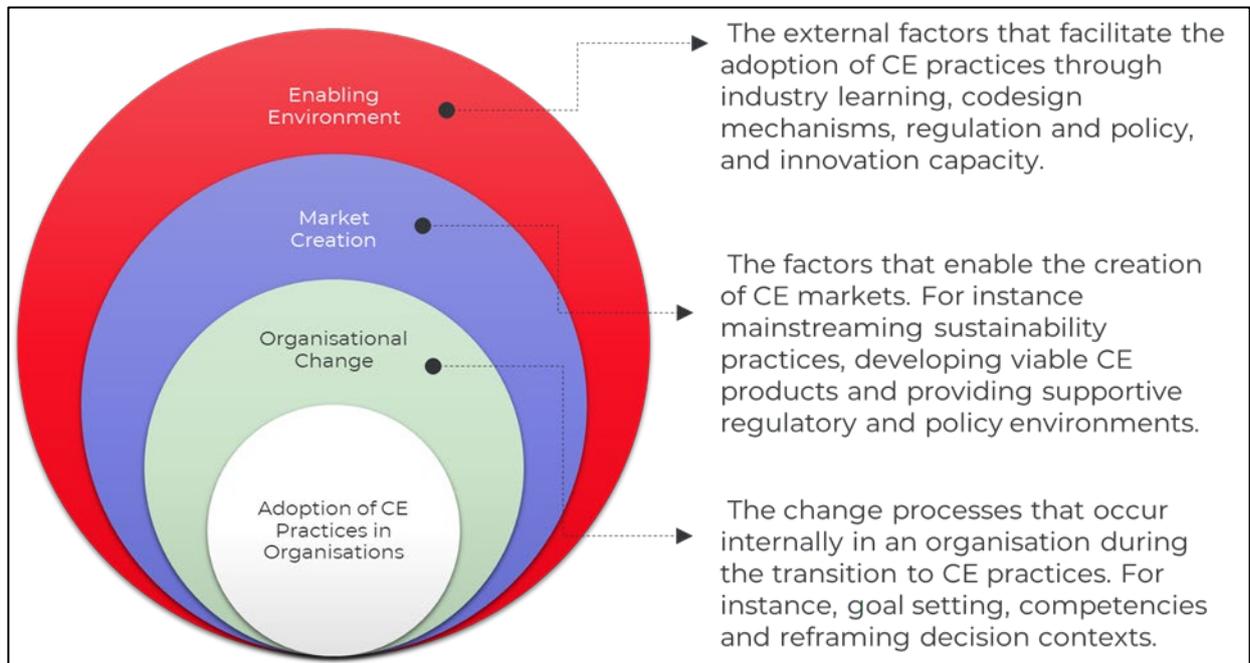


Figure 4: High-level representation of the framework for adopting CE practices describing nested and interacting systems domains that need to be aligned to support transformation

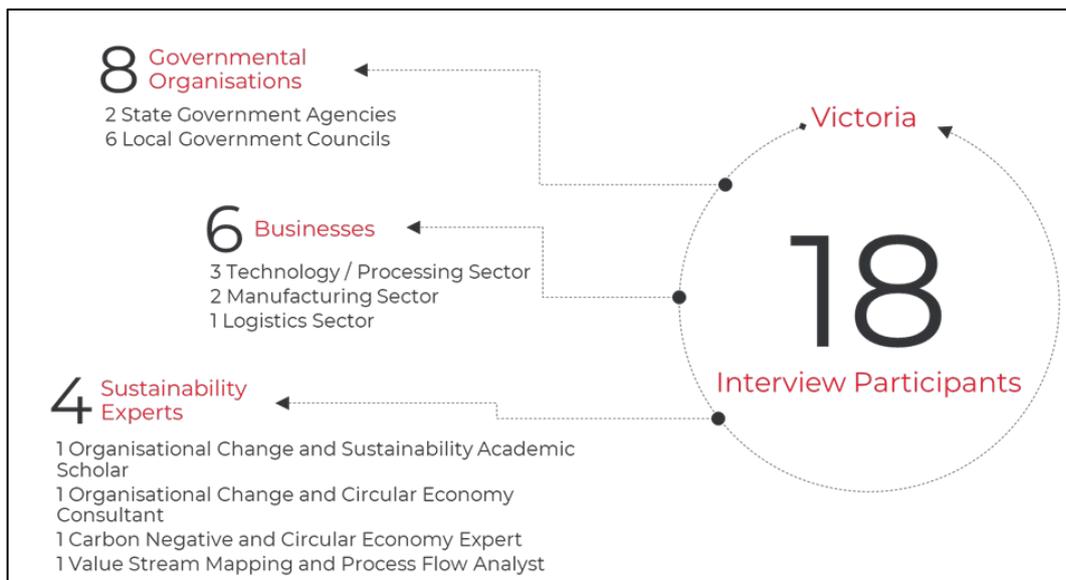


Figure 5: Demographics of interview participants

2.2 Method of data collection and analysis

In this progress report, we further refine the draft sub-frameworks for adopting CE practices in Victoria (see Section 4) which is based on a set of interviews with CE stakeholders in Victoria. In this progress report, we present emerging findings from the interview with the goal to:

- Identify specific barriers and opportunities associated with waste streams, acknowledging the importance of context and materials in the transition.
- Provide further grounding of the CE framework as a basis for developing a ToC for CE transitions.
- Use our insights to start to define the possible roles of a data-enabled Virtual Intermediary to support the transition.

The CE stakeholders that have so far been interviewed represent 8 government agencies, 6 businesses with operations in Victoria and 4 sustainability experts. The in-depth interviews went for an average of one-hour duration. Figure 5 provides a further demographic breakdown of the interview participants. The interview process strictly adheres to the ethical requirements approved by Swinburne University's Human Research Ethics Committee (SUHREC 20216144-8820).

The in-depth interviews covered topics such as:

- The operations of participating organisations in Victoria's CE landscape.
- The category participating organisations belong to, based on a beta taxonomy of CE actors (this was explained in the first progress report).
- The strategies and models participating organisations adopt to create viable CE offerings and become competitive in the CE market.
- The opportunities, challenges, enablers, and barriers to adopting CE practices in Victoria.
- Other factors that are vital to enabling the enabling environment, market creation and organisational change for CE transitions in Victoria.

The interview data were imported into NVivo to undertake qualitative analysis. The research team is now analysing the interview data using inductive and deductive techniques to create themes around the study objectives. Further interviews are also underway.

3. Opportunities, barriers, ToC and intermediary roles

To inform the potential roles and designs of a VI (data platform) to assist Victorian businesses transitioning to circular principles, solutions need to be generated to *some* of the barriers and challenges in achieving the CE transition in Victoria. The VI is intended to enable actionable pathways to circularity for users. These pathways will depend on the business and regulatory ecosystem in Victoria, Australia as well as globally. As a step towards developing a VI that can operate in accordance with an envisaged transition process, the research team consulted a series of key actors engaged in promoting or enacting circular economy principles in Victoria.

This grounding exercise is part of preparing the framework for conducting the Innovation Challenge that will form the co-production stage. Section 3 reports findings from the key actor interviews in relation to the three components of systemic realignment discussed in the Milestone 3 report: market creation, organisational change, and the enabling environment.

3.1 Opportunities and challenges for achieving a CE transition in Victoria

Transitioning to a circular economy entails a systematic realignment of how a business operates. However, in practical terms what this looks like at the individual business level will be very different. Just as business-as-usual encompasses a myriad of products, production processes and associated business models, businesses in a circular economy will vary. Thus for some businesses the CE product or technical challenge is one of designing products for disassembly and reuse, for others it involves convincing consumers about the quality, hygiene, or material integrity of CE products, and for others again it may be about the economic viability of resource re-extraction versus virgin resources use. For some businesses circular economy might be something that characterises their product or service portfolio from beginning to end, other businesses may simply be part of a supply chain or material loop that, as a totality, constitutes circularity.

A key insight from the Milestone 3 report was that in transitioning to circular economy principles business models need to evolve that stretch – from the viewpoint of business-as-usual – the technical as well as institutional and/or organisational capabilities of a business. The technical and institutional challenges may differ across economic sectors and material loops. Following discussions at the project's Steering Committee level, it was agreed that the research would not be focused on a specific waste stream (see CSIRO Roadmap), but instead adopts a generic approach to better capture intersectoral transition factors. Before proceeding to report on the grounding exercise, Table 1 maps out a series of circular economy expressions (such as reuse, extended producer responsibilities and take-back programs) against opportunities and challenges, and in relation to relevant material streams.

Table 1: Waste-stream specific barriers and opportunities for transformation

S/N	CE Business Practice / Model	Opportunities	Challenges	Waste streams
1.	Reduce	<p>Save the cost of production and address environmental consequences from the source</p> <p>Smart design for durability and multiple application</p>	<p>Overproduction in the fashion industry</p> <p>Inability to avoid certain materials and organics for households</p> <p>Increased focus of businesses on economic considerations above environmental and social concerns</p>	<p>Textiles, Plastics Organics</p>
2.	Reuse, repair, resale, refurbish, repurpose, and remanufacture	<p>Explore more downstream CE solutions/opportunities for products across the supply chain</p> <p>Educate businesses on higher-order CE practices</p> <p>Leverage on existing infrastructure (e.g., brand stores) to enable faster resale channel</p> <p>Repurpose plastic as infrastructure in public spaces</p>	<p>Significant loss of opportunity and value at end-of-life</p> <p>Difficulty faced by consumers to navigate resale channels</p> <p>Lack of easy access to quality second-hand clothing</p>	<p>Plastics Textiles E-waste</p>
3.	Sustainable packaging	<p>Increase recycled content in packaging</p> <p>Increasing investment in research and innovation for sustainable alternative packaging materials (e.g., pumps for cosmetic products)</p> <p>Increased use of product tracing and blockchain technology</p>	<p>Difficulty to make changes to packaging due to local and international standards in the food and pharmaceutical industries</p> <p>Degradation of material quality after multiple recycling may lead to packaging rejects</p> <p>Some products cannot move out of plastic packaging</p> <p>Difficulty in proper sorting of materials for recycling and insufficient quality recycled materials</p>	<p>Plastics</p>
4.	Product stewardship / Extended producer responsibility	<p>Explore more mutually beneficial partnerships to drive industry-wide initiatives (e.g., piloting take-back programmes)</p>	<p>Lack of product stewardship in the clothing industry</p> <p>Most businesses focus on recycling solutions for end-of-life products</p>	<p>Textiles Plastics</p>
5.	Take-back programme / Container deposit scheme	<p>Collaborate with other businesses and government agencies to establish take-back centres</p> <p>Adopt backloading to improve efficiency in reverse logistics</p> <p>Capitalise on COVID-19-induced behaviour changes to implement innovative programmes (e.g., home collection service)</p>	<p>High cost and capital expenditure associated with running a take-back programme</p> <p>High level of manual sorting of recovered materials</p> <p>Difficulty in making customers bring out their unused material (e.g., clothing)</p> <p>Tyranny of distance and infrastructural barrier for consumers to perform CE practices</p> <p>Short-term breakdown of partnerships</p>	<p>Textiles Plastics Metal Glass E-waste</p>

S/N	CE Business Practice / Model	Opportunities	Challenges	Waste streams
		<p>Expand container despite scheme to other materials difficult to recycle (e.g., e-waste)</p> <p>Leverage on existing infrastructure (e.g., brand stores) to reduce the cost of reverse logistics</p> <p>Provide bin as a service to communities, schools, and other public spaces</p>		
6.	Behaviour change	<p>Provide adequate CE information about product and service</p> <p>Build lasting relationships between brands and customers for customer retention and loyalty</p> <p>Run more inclusive community action campaigns</p> <p>Establish CE hubs that provide a one-stop shop of CE solutions for consumers</p> <p>Provide material/emotional reward to the consumer after performing CE practices</p>	<p>High level of greenwashing among manufacturers and a lack of authentic messaging in the marketplace</p> <p>Sustainability campaigns exist as an eco-chamber among stakeholders (e.g., sustainability-inclined businesses and households)</p>	Textiles Plastics
7.	Recycling	<p>Use of advanced recycling machines and technology (e.g., optical, and multi-factor sorting using machine learning and robotic arms)</p> <p>Ban single-use plastics to reduce contamination</p>	<p>Difficulty to pull components of products apart</p> <p>Diversion of household waste to landfill due to high contamination rate</p> <p>Exportation ban and less developed local CE market (inadequate demand meeting supply) could lead to unintended environmental consequences</p>	Paper Metal Plastics

3.2 Intermediaries can play a vital role in CE ecosystems

The ToC and systemic conceptualisation of a transition to a Victorian CE will form the conceptual framing for the co-design phase of a Virtual Intermediary (data platform) to facilitate the development of actionable pathways to circularity for Victorian businesses.

Findings from the interviews highlight several potential roles for transition intermediaries in furthering both organisational change, market creation and enabling environment adjustments for circularity.

At a general level, the roles discussed reflect findings from the *transition intermediary* literature where intermediaries:

- Act as '*agents who connect diverse groups of actors involved in transition processes and their skills, resources, and expectations*' (Sovacool et al. 2020, p. 1).
- Catalyse sustainability transitions and are an area of increasing research focus (Kivimaa et al. 2019).
- Enable knowledge aggregation and learning; networking; interest and financial brokering; innovation and diffusion of knowledge and technology; visioning and joint vision articulation; and institutional advocacy, implementation, and legitimisation (Sovacool et al. 2020).

(ARCHE-)TYPES OF INTERMEDIARY ROLES

We note that in our prior research, we have identified four archetypical roles for intermediaries in each main part of the ToC, i.e., to:

- I. **Facilitate reduced transaction costs** – thereby supporting market creation for businesses wanting to shift to a CE business model. This relates to the Market Creation ToC.
- II. **Overcome inertia by shifting decision-making-contexts and/or fast-tracking growth of networks** – especially by connecting and empowering actors that want to move to a CE. This relates to the Organisational change ToC.
- III. **Streamline i.e., provide accreditation and standardisation:** by providing processes, and enabling benchmarking of performance, which helps in scaling up and building the capacities for the CE transition. This relates to the Enabling environment CE.
- IV. **Facilitate systemic learning:** by creating a monitoring and evaluation (M&E) framework that allows ongoing learning should allow for sharing of knowledge and insights and therefore should enable a much faster transition; and this is also in line with the principles of the sharing economy which is closely related to the CE economy.

The following three sub-sections provide further details relevant to the development of a VI (data platform).

3.2.1 Existing intermediaries enable material cycling and lifecycle extension

Several intermediaries already operate and enable circular economy development. These provide business-to-business, business-to-customer, or customer-to-customer opportunities to easily access CE products and services while generating income.

Advisory Stream for Process Innovation and Resource Exchange (ASPIRE) is one such online platform that connects businesses with waste outputs to other businesses that use such as resource input through remanufacturing or recycling processes (i.e., intermediary Type 2: Overcome inertia). While this platform assists businesses to reduce the cost of disposing of waste in landfill (intermediary Type 1: Reduce

transaction costs), it also provides local councils with an innovative approach to addressing waste management issues (intermediary Type 3: Streamlining). Councils such as the City of Kingston, the City of Ballarat, the City of Greater Dandenong, and the City of Knox are current partners in developing and operating the ASPIRE platform.

Meanwhile, Fixable is an online platform that matches 'fixees' or people who require repair services for household items such as clothing, electronics and furniture with 'fixers' or people who offer such repair services (intermediary Type 2: overcome inertia). The platform also plans to enable other CE services such as lending and hiring tools and equipment and selling repaired, repurposed, and upcycled items.

In both these cases intermediation focuses on creating material loops in order to reuse waste as a resource as well as extend the life or repurpose goods. Creating material loops or extending the lifecycle of material loops is central to the emergence of a circular economy paradigm. While organisational change necessarily follows from adaptations in how businesses source material inputs or manage the lifecycle of goods and services, material looping frequently reflects 'technical fit and conform'. That is organisationally, firms are faced with familiar technical problems such as material quality and integrity. Institutionally, firms are faced with familiar societal and regulatory preferences and criteria such as prices and brand creation, or financial reporting standards.²

3.2.2 Local councils as key champions in the enabling environment

In the enabling environment, interview findings show that there is now an opportunity to intensify CE efforts among local stakeholders such as communities and businesses. Local governments are frequently responsible for services, such as waste management, that directly operationalises aspects of circular economy aspects within the day-to-day activities of households. However, findings of RMIT University's CE ecosystem mapping in Victoria (Iyer-Raniga et al. 2022) also highlight the importance of policies and strategies, especially at the State level, to better reflect the CE realities of local stakeholders. Building on this finding, our interview insights specifically identify local councils as key actors because they can act as an intermediary between the broader policy landscape and local stakeholders/businesses. This is because out of all levels of government, local councils are better positioned to identify, contextualise, and leverage specific CE enablers and drivers within their local areas.

Interview findings specifically revealed that local councils play central roles in the adoption and enhancement of CE practices and capabilities of local businesses and communities. Some of the current strategies adopted by local councils include (here linked to the intermediary role archetypes as above):

- *Intermediary role type I: Reduce Transaction Costs*
 - Enable access to online platforms to connect businesses and drive waste-as-a-resource services.
- *Intermediary role type II: Overcome inertia:*
 - Organising workshops and seminars on adopting CE practices and business models.
- *Intermediary role type III: Streamline:*
 - Embedding CE-related specifications in procurement policies and tenders.
- *Intermediary role type IV: Facilitate learning*
 - Establishing CE hubs for knowledge sharing, networking, and collaboration.
 - Disseminating information to local stakeholders on CE processes, guidelines, and opportunities.

² A number of additional intermediaries, such as Circular Economy Victoria (CEV) and Australian Circular Economy Hub (ACE Hub), are important agents for information and knowledge sharing. These intermediaries also target the institutional challenges of CE business model transition.

However, the Victorian economy operates within a national and global economic and financial context. Notwithstanding the role that local councils might have in furthering a 'recycling economy', for instance through municipal waste management, interview findings also reveal limitations in the roles that local councils can currently play. Examples of key challenges experienced by participating local councils include:

- *Regulation unsuited for local challenges*: a lack of adequate regulatory instruments to drive standardisation, as well as economies of scale and de-risking of circular economy business practices to directly develop regulations for CE practices and operations specifically suited to their regions. Instead, local councils largely rely on and adapt standards and regulations from the Department of Environment, Land, Water and Planning (DELWP). This may create difficulties for local councils when addressing unique local challenges within their regions. This indicates the importance of multi-level governance.
- *Not enough funds*: difficulties in sourcing or generating adequate funds to implement their CE initiatives, for instance, relating to community and waste prevention initiatives, innovation trials, and programs that build local capacity.
- *Not enough staffing*: limited competence, capacity, and numbers of staff dedicated to CE-related tasks. This can significantly reduce the capacity of local councils to take on and implement CE initiatives.

Interview findings further indicate that these challenges create a level of risk aversion amongst local councils in relation to adopting more ambitious CE strategies and targets. This highlights a common challenge for local councils associated with their smaller scale, and we note that this shows the opportunity for creating economies of scale through collaboration and pooling of resources; potentially facilitated by an intermediary.

3.2.3 Intermediaries can play a key role in market creation

Furthermore, emerging findings from the interviews point to the critical need for intermediaries in creating, consolidating, and expanding domestic markets around CE models in Victoria. In this respect, intermediaries could be businesses, government agencies, non-governmental organisations, or other industry associations. Some of these CE market opportunities for intermediaries identified in interviews include (here linked back to the intermediary role archetypes defined above):

- *Intermediary type I*: Reduce Transaction Costs
 - Providing infrastructure and services for reverse logistics, for instance, in textiles.
 - Circulating recyclable materials within and among sectors.
- *Intermediary type II*: Overcome inertia:
 - Deepening the relationship and trust between customers and CE brands.
 - Promoting community acceptance of CE practices.
- *Intermediary type IV*: Facilitate learning
 - Driving and demonstrating the viability of technological and business model innovation and development.
 - Driving ongoing collaboration, intersectoral partnership, and industry learning among organisations.

Interview findings reveal that implementing circular business models and creating markets for CE products and services is frequently a daunting task for an individual business (high transaction costs). Collaboration that creates economies of scale, facilitates collective learning, and reduces risks, has been emphasised as the major factor in driving and consolidating CE transitions, for instance, through industry learning, co-design mechanisms and building innovation capacities. In this case, intermediaries are actors that could provide industry-wide and intersectoral connections that facilitate the CE enabling environment

and market. An interview participant explained the opportunity for intermediation in the textiles sector as follows:

The brands pour millions of dollars into their relationship with their customers. They have connected with people and that relationship is well invested in and can run deep. And that is the seed of a more circular economy that that relationship already exists. And if we can get a more circular relationship happening between people and the brands they love, then we can start to see that spiral.

Despite the preceding opportunities, there are currently some barriers to the successful function of intermediaries to help support the creation of CE markets in Victoria. One of the most mentioned difficulties is the limited and inadequate amount of funding to provide intermediary services within an industry. While intermediaries rely largely on partnerships to drive their operations, businesses may initially appear reluctant to take the risk in the emerging CE market.

For instance, interview findings reveal that businesses may experience difficulty or inertia in balancing the long-term strategy of developing a competitive advantage in the CE market and the short-to-medium term collaboration with competitors. For most existing businesses this reflects familiar institutional challenges when operating in a market economy. Also, although the CE regulatory framework in Victoria is broadening, for instance with the establishment of Recycling Victoria, interview findings show that intermediary actors report that there are still gaps in developing policies and regulations that provide an increase in minimum standards for CE practices within the State. Given the preceding factors, intermediary actors may experience drawn-out and costly periods of developing partnerships and building collaborative relationships with businesses in the CE market.

3.3 Adopt a more visionary target: higher-order CE strategies

Interviews have highlighted that there is a common lack of imagination and ambition in the adoption of CE strategies, perhaps due to limited knowledge. Specifically, there was a lack of higher-order CE strategies being adopted.

Higher-order CE strategies (also referred to as the *R principles*) are approaches to smartly use and manufacture products and extend the lifespan of products and their parts (Potting et al. 2017). These strategies include *refusing, rethinking, reducing, reusing, repairing, refurbishing, remanufacturing, and repurposing*. These *R principles* are considered higher-order to recycling and energy recovery which are low-order strategies to redeem the remaining value of materials after use.

Interview findings reveal that there are growing opportunities for expanding and consolidating higher-order CE strategies in Victoria such as:

- Designing for reuse and compostability in pharmaceutical and food and beverage packaging.
- Designing for product-as-service in pharmaceuticals and food and beverage.
- Using more recycled materials as input in production processes.
- Sharing of facilities and technology in manufacturing and construction (i.e., reducing transaction costs).
- Repairing and refurbishing in electronics, construction, and furnishing.

We note that intermediaries of types I-IV can support and promote all these activities.

While these higher-order CE strategies are mostly adopted by businesses looking to lead the way in Victoria's CE transition, they still carry a economic risk for other businesses to embed into their

organisational strategy. Examples of risks in this instance include the possibility of higher-order CE business model innovations becoming unsuccessful and failing to capture a substantial share of the CE market for higher-order products and services. From a new product development point of view, these are not unfamiliar challenges. However, from a CE transition perspective, these challenges are exacerbated by a lack of technical and institutional standardisation geared towards systemic realignment. Instead, CE practices continue to compete (technically and institutionally) with conventional business-as-usual practices.

Interview findings have highlighted the following as barriers to adopting higher-order CE strategies in Victoria:

- The regulatory framework and standards to enable the adoption of CE practices among stakeholders (e.g., businesses and communities) based on higher-order strategies are largely non-existent.
- There is a lack of adequate infrastructure to support the widespread adoption of these higher-order CE strategies which reduces the accessibility of businesses into the burgeoning CE market (an opportunity for reducing transaction costs as an enabler of change).
- Unlike recycling and recovering processes that have long been embedded into waste management systems, higher-order CE principles such as reducing resource use and designing for reuse were not considered to be feasible or economically viable for widespread adoption (there are clear examples internationally of how they can be viable, so this is an issue about learning and organisational inertia).

To the extent that the CE transition can support a decoupling of economic growth from resource use and environmental degradation, it is important to prioritise higher-order CE principles in organisational practices and CE markets. However, interview findings show that the emerging CE business models in Victoria are mostly targeting lower-order principles such as resale, recycling and recovering that include:

- Take-back programme and reverse logistics for clothing and textiles.
- Container deposit scheme for packaging and electronic waste.
- Recycling recovered plastics and reselling them to packaging manufacturers.

Such strategies, however, correspond with the targets of the recently established Recycling Victoria which largely focus on achieving end-of-life CE targets including waste diversion, recycling, and composting by 2030.

3.4 Innovative strategies driving the transition

Mainstreaming business models that are based on circular economy principles requires business models that, from the viewpoint of business-as-usual, embrace and overcome unfamiliar technical as well as cultural, social, and institutional challenges. Insights from interviews revealed a number of strategies and initiatives utilised by CE stakeholders such as government agencies, businesses, and households that have helped to facilitate the adoption of CE practices in Victoria. A key role for governments, as institutional actors and as intermediaries, lies in de-risking, in particular, institutional innovation at business levels, as well as enabling infrastructure and regulatory provision that can crowd in CE innovation, facilitate standardisation, and drive economies of scale.

3.4.1 Enabling resale channels

Resale channels are avenues employed by businesses to resell recovered products to end-users. Interview participants noted that resale channels provide an opportunity for businesses to deepen relationships with existing customers and attract new ones who may otherwise not be able to afford new and premium branded products. This process requires the implementation of elaborate reverse logistics processes but

as earlier mentioned, such a model may present a high economic cost for an individual business (we note that here is an opportunity for an intermediary of *Archetype I: Reduce transaction costs*).

Therefore, new businesses such as Ownershift are emerging in the CE market to provide clothing brands with holistic resale channel services including initiating take-back programs, implementing reverse logistics, processing recovered items, creating digital sales platforms, and providing customer services. We note that the development of such complex new processes could benefit from an intermediary of *type IV: Facilitate learning*. An interview participant explained how learning is incorporated into their market strategy in the textiles sector thus:

But the proposition I have for brands is let's learn together. So, let's do a trial. Let's run a campaign and do a takeback on certain items. See what comes back, assess the conditions, gather the data [and] then run a similar campaign but for resale. Sell those items and let's see [if there is] a market for second-hand items in your brand. And from those two campaigns, I get the economics that I need to understand in order to get investment and they get the business case to scale this channel.

3.4.2 Developing mutually beneficial partnerships

The previous quote is an instance of interview findings that have highlighted the importance of having constructive collaboration to drive the consolidation of the CE market. In this sense, there is a growing number of businesses engaging in mutual business-as-customer intersectoral partnerships. Intersectoral partnerships are critical to facilitating CE-oriented supply chains as well as fostering shared visions of what a CE economy is. Consolidation of the CE market, then, also implies standardisation that allows for predictability and economies of scale.

An example of this is a design and technology company that developed advanced machines to create products from waste for another business but later purchase the innovative product from the latter. In another instance, a company responding to a tender from a local council to provide bin services to communities also offers to provide additional pro bono educational workshops on sustainability to residents. This activity could be supported by an intermediary of *type II: Overcome organisational inertia*.

3.4.3 Experimentation is an essential tool for learning about CE market opportunities

Interview findings indicate that with the nascent CE market in Victoria, businesses are confronted with the dilemma of either introducing novel CE products and services into the market and hoping that they are accepted by customers or waiting to understand customer needs and develop products and services to address them. These two approaches are accompanied by substantial risks – the first instance could result in a market failure if rejected by customers while the second scenario could lead to a late entry into the market and the loss of a competitive edge. However, interview participants, particularly manufacturing companies, have noted that one strategy they adopt to reduce the risk associated with entry into the CE market is to introduce innovative products and services in small quantities to measure consumer interest and acceptance. Examples of this include using completely recyclable plastic packaging and compostable packaging for cosmetic products. This activity could benefit from an intermediary of *type IV: Facilitate learning*.

Experimentation is not without some challenges, for instance as detailed by this interview participant in the pharmaceutical sector:

The need for certification and registration of the material [and] the stability testing required to prove that that material can still do the same job as a plastic material take a

long time... The experimentation required outweighs the benefit. It costs money to do assay testing. And you need to weigh up what's more important for the medical sector [which is] very plastic reliant... Most [companies] will go only as far as sustainably sourced versions of the plastics that they are currently using. And for some of them, the clearest thing that they can do is that if it is for medical reasons, the safety of the patients will only trump the need for sustainability requirements.

To some extent, these CE product development challenges reflect familiar technical as well as institutional challenges – for instance, compatibility of recyclable inputs with existing production capital and product profitability over the product lifecycle. Unsurprisingly, entirely market-driven CE transitions are then likely to be a long-term proposition and, in competition with business-as-usual processes, one that is disadvantaged by lower economies of scale as well as the short-term requirements of many shareholder-value-driven businesses. Experimentation remains critical to stretching businesses technically and institutionally but will also require ‘protected spaces and environments’ and a supportive enabling environment to accelerate CE market creation.

4. Emerging insights on the Theory of Change

As mentioned in Section 2, we developed a high-level representation of the framework for adopting CE practices (see Figure 4) in the first stage of this project (see Figure 3). The high-level framework includes three major factors that we identify as central to transitioning Victoria to a CE which are enabling environment, market creation and organisation change. A comprehensive list of definitions for all the factors in the frameworks is presented in Appendix I.

We further developed sub-frameworks for each of these high-level factors as presented in Figures 6, 7 and 8 corresponding to enabling environment, market creation and organisational change respectively. The figures also represent the draft versions presented to interview participants during the data collection process. In this section, we present emerging insights from the interviews to guide us in refining the sub-frameworks toward developing a ToC for CE transition in Victoria.

4.1 Refining our understanding of what is an enabling environment

Figure 6 shows the four-level draft sub-framework for the enabling environment presented to interview participants.

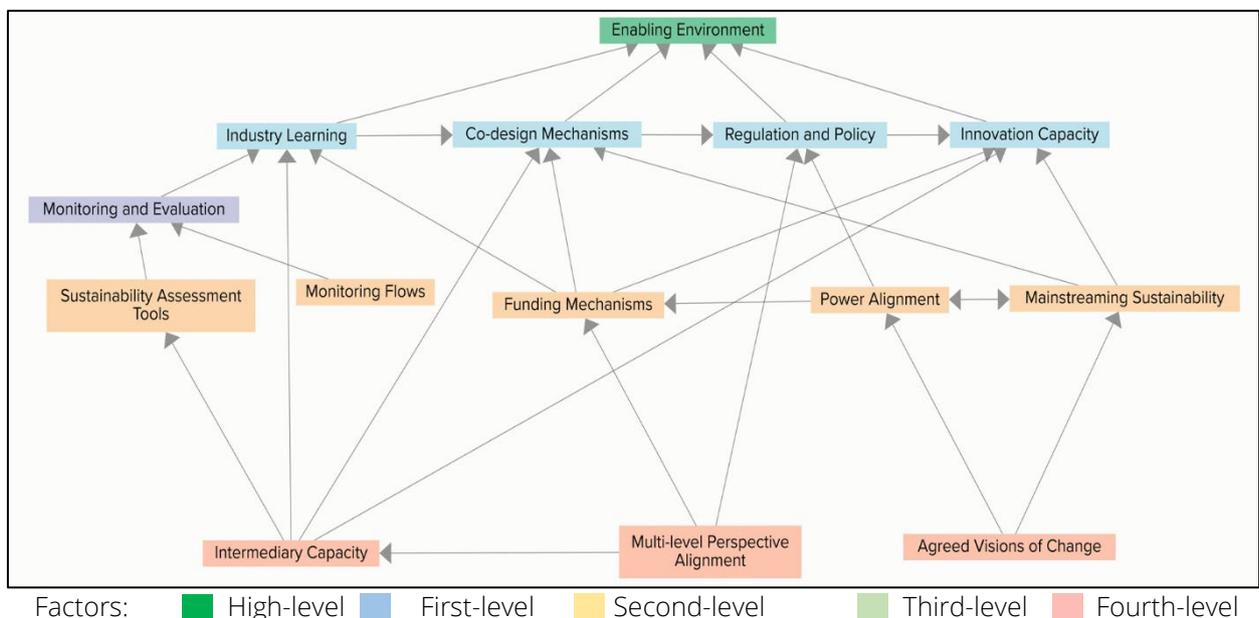


Figure 6: Draft sub-framework for enabling environment

We identified four potential improvements relating to the (initially categorised) first-level factors composing a CE enabling environment, as described in the paragraphs below.

- **Industry learning:** This involves the creation and exchange of sustainability knowledge, skills, and training among organisations to achieve CE transitions. Industry learning is realised through the combination of three main factors: accumulation of financial resources through various funding mechanisms; utilisation of intermediary tools, and consistent monitoring and evaluation assessments.
- **Co-design mechanisms:** These are tools and processes that utilise creative methods to engage sustainability stakeholders (e.g., communities, government agencies, organisations) in designing solutions and practices that achieve societal transformations. The co-design process must be

participatory, gender-sensitive, address unbalanced power relations and identify key partnerships that are required to achieve impact (Maru et al. 2018).

- **Regulation and policy:** These are external factors and instruments such as legal frameworks, fiscal policies, and tax implications that could encourage the adoption of circular models by businesses. They could be local or international mechanisms that promote cleaner production, end-of-life material management and sustainability strategies among businesses (Wastling, Charnley and Moreno 2018).
- **Innovation capacity:** This refers to “the capabilities and resources of firms for discovering opportunities to engage in new product development” (Tajvidi and Karami 2015: 125). Circular innovations could be in terms of designing new products and services, transforming production and delivery processes or the methods of performing business practices (OECD 2005).

Additional insights from the interviews to refine Figure 6 relate to two points regarding (initially categorised) lower-level factors: Mainstreaming sustainability, as well as regulation and policy, as below.

- **Mainstreaming sustainability as a first-level factor:** Mainstreaming sustainability refers to the process of embedding sustainability concepts, principles or approaches into the routine and practices of a society. This also includes institutionalizing new sustainability approaches into the business environment (Maru et al. 2018; McCarthy 2010; Squires 2005). As shown in Figure 6, we considered mainstreaming sustainability to be a third-level factor in the enabling environment directly influencing innovation capacity, co-design mechanisms and power alignment. However, interview findings indicate that mainstreaming sustainability should have a more prominent role as a first-level factor in the enabling environment. In particular, interview participants consider mainstreaming sustainability as a factor that elevates consumers and communities as stakeholders alongside industries and governments in the enabling environment. As further explained in Section 4.2, we consider mainstreaming sustainability to be a first-level factor in the market creation sub-framework. Nonetheless, this does not preclude the possibility of having a factor as central to CE transition as mainstreaming sustainability to reflect as a first-level factor in multiple sub-frameworks.
- **Regulation and policy directly influence funding mechanisms:** In the context of this project, regulation and policy refer to external factors and instruments such as legal frameworks, fiscal policies, and tax implications that could encourage the adoption of circular models by businesses. They could be local or international mechanisms that promote cleaner production, end-of-life material management and sustainability strategies among businesses (Wastling, Charnley and Moreno 2018). Meanwhile, we define funding mechanisms as the financial resources that are provided to organisations to implement programmes and strategies related to circular economy transitions. Examples include subsidies, loans, grants, investments, and donations. As Figure 6 reveals, we consider regulation and policy, and funding mechanisms to be indirectly connected through power alignment. We define power alignment as the positioning of CE/sustainability capacities, goals, systems and commitment among stakeholders and actors. However, interview findings reveal that regulation and policy often directly inform government funding, especially through the establishment of government agencies and their functions.

4.2 Refining our understanding of what supports market creation

Figure 7 presents the 3-level sub-framework for market creation utilised during the interview process. The three first-level factors are mainstreaming sustainability (defined in Section 4.1), government support and viable CE product. The two latter factors are defined as follows:

- **Government support:** This suggests guidelines, regulations, finance, and other socio-political resources that could boost the CE market or aid the adoption of CE practices among businesses and consumers (Trindade, Antunes and Partidário 2017; Rossing et al. 2021).
- **Viable CE product:** A viable CE product or service possesses circularity features that attract customers and improves the profitability of the business. Presenting a viable CE product or service to the market requires measuring and improving capacity across supply, production, transportation, and distribution networks (Reuter et al. 2019; Lewandowski 2016).

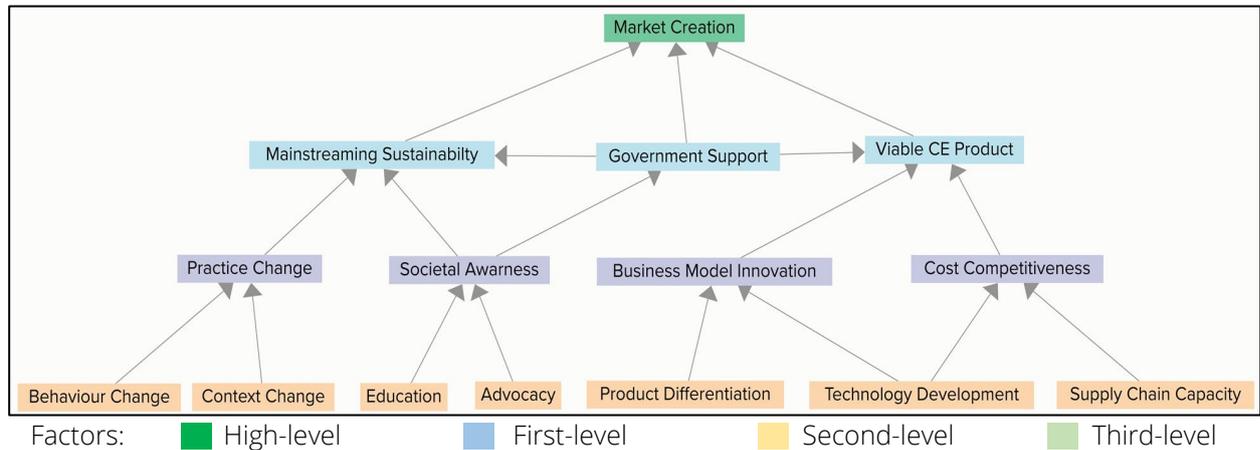


Figure 7: Draft sub-framework for market creation

The following are the key insights to refine the market creation sub-framework as derived from the interviews:

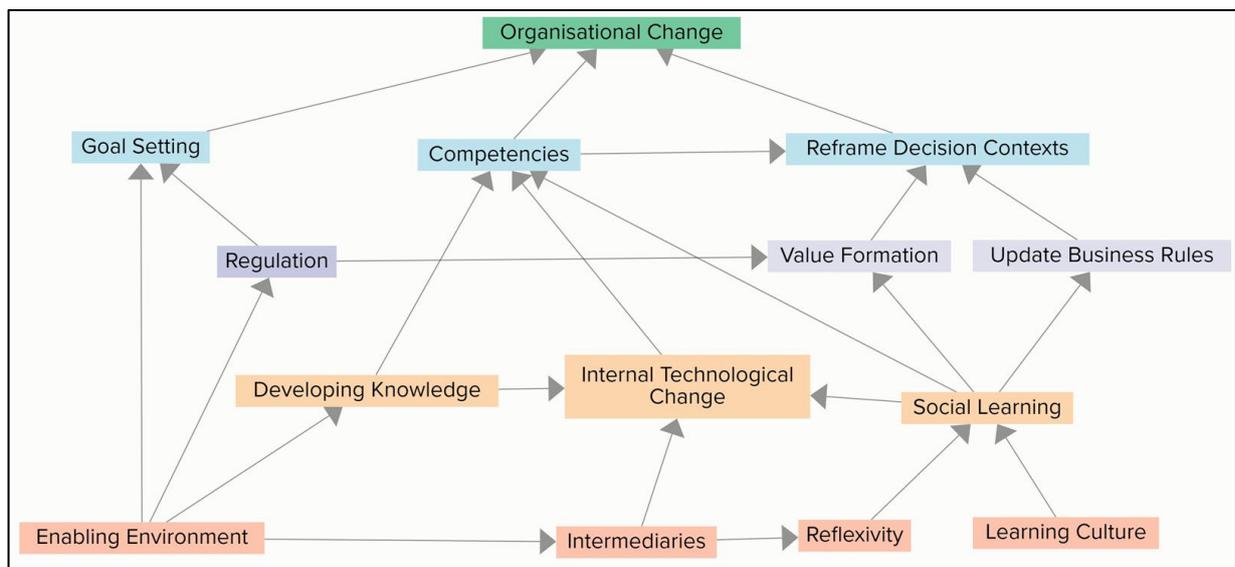
- **Importance of a risk profile for market and supply chain volatility:** In the preceding sections, we have identified the risks associated with entering the CE market in Victoria such as the inability to attract customers. Stemming from this, interview participants emphasised the importance of developing a good risk profile to anticipate any volatility in the CE market and supply chain. Concerning the CE market, a risk profile can be understood as an assessment of the threats existing in the market with the capacity of the organisation to tolerate or take risks to achieve set goals. Interview findings consider developing a risk profile as a second-level factor that directly feeds into the creation of viable CE products and services.
- **Technology development as a first-level factor:** This is defined as “the systematic use of scientific, technical, economic and commercial knowledge to meet specific business objectives or requirements” (Solleiro, Castañón and Gaona 2016). In Figure 7, we conceptualised technology development as a third-level factor directly influencing business model innovation and cost competitiveness. However, interview participants consider technology development to be significant as a first-level factor in creating CE markets.

4.3 Refining our understanding of what supports organisational change

Figure 8 illustrates the 4-level draft sub-framework for organisational change presented to interview participants. We define the first-level factors as follows:

- **Goal setting:** This implies the steps and decisions the organisation needs to take or is planning to take at different stages to adopt circular economy principles, embedding circularity-related goals into Key Performance Indicators or in other ways making sure it is a key part of the goals of the organisation. Depending on the context, an organisation’s CE goal setting should be relevant across all temporal timescales, i.e., from the current to the short-term aspects (e.g., retrieval of product packaging after consumption) or future and long-term aspirations (e.g., redesigning products as services) of the business.

- **Competencies:** These are the sustainability skills, knowledge, and behaviours of all levels of an organisation's workforce. Enhancing sustainability competencies not only helps to sustainably transform business practices but also increases the competitiveness of the organisation in the CE market. While sustainability competencies aid the organisation in reframing its decision contexts, they in turn are a result of complex interactions between social learning, external knowledge development and internal technological change (Pavel 2018).
- **Reframe decision contexts:** Reframing the decision contexts of the organisation involves forming CE values and updating business rules. Reassessing the decision contexts of an organisation largely depends on implementing the social learning process of incorporating a learning culture into business practices and constantly engaging in a reflective process of analysing the methods and goals of circular economy transitions (Stein and Valters 2012; Wastling, Charnley and Moreno 2018).



Factors: ■ High-level ■ First-level ■ Second-level ■ Third-level ■ Fourth-level

Figure 8: Draft sub-framework for organisational change

Here are some emerging insights from the interviews to refine the organisational change sub-framework, regarding leadership and internal champions as well as people management.

Leadership and internal champions: Interview participants reiterated the importance of organisational leadership and internal champions in triggering and galvanising the momentum needed for change within organisations. Regarding the sub-framework, leadership (internal champions) is considered a third-level factor that directly influences competencies (first-level factor).

People management and reaction to change: Interview participants raised the issue of finding a way to factor into the sub-framework the reaction of an organisation's stakeholders to the (mostly unprecedented) consequences that accompany changes to the internal processes of an organisation. Stakeholders (including the workforce) may display different reactions and emotions during the different transition phases of an organisation. Therefore, people management has been identified as a first-level factor to synergise the effort of stakeholders.

5. Emerging interview insights on virtual intermediaries

As discussed throughout this progress report, emerging findings from the interview have pointed to the importance of intermediaries in driving CE transitions in Victoria. Key intermediary actors in each high-level factor identified in this research are local councils in the enabling environment (see Section 3.1.1.1), other businesses in market creation (see Section 3.1.1.2) and internal champions in organisational change (see Section 4.3).

These emerging findings from the interviews further lend credence to one of this project's aims of developing an online platform that offers intermediary functions (i.e., a virtual intermediary) between multiple high-level and sub-framework factors. Section 3.2.2 highlights some online intermediary platforms (e.g., ASPIRE) currently operational in Victoria. However, interview findings identify the need for intermediary platforms and actors to accelerate Victoria's transition to the CE.

Some of the roles they perform in the CE market are listed in Section 3.1.1.2 (e.g., driving intersectoral partnerships and enabling the adoption of CE models). In addition to those, we further identify the following as the potential roles our virtual intermediary could play:

- **Source of credibility for CE actors:** A virtual intermediary could provide a database of information on CE models, processes, barriers, and opportunities. This could serve as a platform where new entrants into the CE seek to validate the perhaps incomplete and confusing information that they encounter on adopting CE practices. On the other hand, existing CE actors seeking to recruit new customers or broker new partnerships could utilise the platform to provide credibility to their operations.
- **Showcase and connect CE organisations:** A virtual intermediary could be a platform that showcases innovative CE practices across all CE frameworks. This could be:
 - Government agencies implementing CE policies and initiatives
 - Local businesses demonstrating CE products, services, or technologies
 - Organisations adopting CE internal processes and strategies

There is a strong potential for a virtual intermediary to connect actors within and across sectors including other intermediaries with operations in specific waste streams or supply chain processes.

- **Circular economy transition modelling:** A virtual intermediary could be a platform where organisations about to start or those who have started their transition journey could input their data to develop multiple scenarios and outcomes resulting from the adoption of different CE practices.
- **One-stop shop of CE solutions:** A virtual intermediary could help organisations to identify various transition pathways or CE models with associated risks, opportunities, and challenges. In addition, the virtual intermediary could provide information on other organisations adopting such a CE model, the transition time, potential partners, available support, and goal-setting approaches for short, medium, and long-term targets.

6. Summary

This report has provided an update on the progress for Milestone 4 for the Victoria Circular Activator (VCA) Grant ID RVInnovation036, by the Swinburne University of Technology research team.

In the previous progress report, we described a Theory of Change that will help with the conceptual development, and in this report, we primarily report on insights from interviews that have been carried out so far. Specifically, we report on:

- Barriers and opportunities associated with waste streams
- Further grounding of our ToC to enable the exploration of pathways for CE transitions.
- Explorations of the possible roles of a data-enabled Virtual Intermediary to support the transition.

In terms of opportunities, we have identified (as per Table 1), a set of commonly reported opportunities and challenges associated with different types of CE business practices. At a high level, some opportunities would arise from more collaboration and partnerships and more effective community engagement. Key challenges are associated with not enough coordination, inadequate standards and regulations, and uncertainties about the demand for recycled materials.

Another important finding is that there is a common lack of imagination and ambition in the adoption of CE strategies. Therefore, there is an opportunity to adopt higher-order CE strategies which are also referred to as the R principles.

We have also outlined a set of archetypical roles that an intermediary can play in the transition to a CE and explored what this may specifically look like in the context of Victoria. Key findings in relation to the potential roles of intermediaries are that:

- Local councils are key champions in the transition to a CE, although they are often hamstrung by limitations and lack of resources, and there is an important opportunity for a virtual intermediary to support them to overcome such challenges.
- Intermediaries may help reduce transaction costs, for example by facilitating the co-investment of infrastructure and services for reverse logistics; or enabling access to online platforms to connect businesses and drive waste-as-a-resource services.
- Intermediaries may help overcome inertia, for example by promoting community acceptance of CE practices, as well as organising workshops and seminars on adopting CE practices and business models.
- Intermediaries may support ongoing learning by streamlining and standardising data collection as well as driving ongoing collaboration, intersectoral partnership, and industry learning among organisations.

Overall, there are opportunities for a virtual intermediary to create economies of scale, reduce risk, and fast-track cross-ecosystem learning that can be boosted by intermediaries.

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