Journal of Cleaner Production 296 (2021) 126412

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Challenges and opportunities in building circular-economy incubators: Stakeholder perspectives in Trinidad and Tobago

Clyde Eiríkur Hull [a, *], Sherwyn Millette [b], Eric Williams [b]

[a] Saunders College of Business, Rochester Institute of Technology, 108 Lomb Memorial Drive, Rochester, NY, 14623-5608, USA
[b] Golisano Institute for Sustainability, Rochester Institute of Technology, 190 Lomb Memorial Drive, Rochester, NY, 14623-5608, USA

ARTICLE INFO

Article history:
Received 14 May 2020
Received in revised form
12 February 2021
Accepted 14 February 2021
Available online 17 February 2021

Handling editor: Dr Sandra Caeiro

Keywords:
Circular economy
Incubator
Entrepreneurship
Stakeholder
Education
Government

ABSTRACT

What are the challenges and opportunities involved in the development of circular-economy incubators in a developing economy? A grounded theory approach is used to explore these challenges and opportunities in Trinidad and Tobago. Local stakeholders, including entrepreneurs, non-profits, academics and government agencies, are interviewed and the results are analyzed via axial coding to extract trends in attitudes and perceptions. Two principal results emerge from the analysis: First, while government involvement was viewed as part of the process, stakeholders do not trust the government to lead the development. Second, many stakeholders do not fully understand circular-economy strategies and opportunities, emphasizing traditional waste management approaches such as recycling over value-added conversion of waste. Different stakeholders demonstrate different knowledge gaps, e.g. entrepreneurs tend not to recognize the financial case for circular economy, a prerequisite to their motivation to participate in incubation. These results suggest that circular-economy incubators would help entrepreneurs find and pursue circular-economy opportunities with a limited role for government. Also, education about circular-economy approaches is needed to motivate and inform participation in a circular-economy incubator.

1. Introduction

Circular economy, a reframing of earlier ideas from industrial ecology and industrial symbiosis, is getting increasing attention in the academic literature (e.g., Aguilar-Hernandez et al., 2020; Geissdoerfer et al., 2017; Lewandowski, 2016). Circular-economy business strategies aim to close material loops, reduce raw material use, reuse or remanufacture products, and recycle products and material (Geng and Doberstein, 2008; Ghisellini et al., 2016; Saavedra et al., 2018). Moving to circular economy means redesigning products and processes so that raw material use and waste are eliminated or minimized in the production system and post-consumption. Circular consumption patterns can replace current linear ones, decoupling economic growth from environmental impact, with manufacturing companies refocusing on services rather than products (Domenech et al., 2019; Ghisellini et al., 2016). Ideally, circular economy benefits businesses and the natural environment (Aguilar-Hernandez et al., 2020; Chiappetta Jabbour et al., 2019; Velter et al., 2020).

To a degree, circular economy develops on its own without intervention. Coal plant operators, for example, have long sold gypsum "waste" from sulfur scrubbers to wallboard manufacturers (Townsend and Cochran, 2007). The economic benefit to both parties drove the circular-economy collaboration. But there are institutional, cultural, economic, and technical barriers to circular economy, which may lead to profitable opportunities being overlooked (Kirchherr et al., 2018; De Jesus and Mendonça, 2018). Given its potential environmental and economic benefits (c.f., Aguilar-Hernandez et al., 2020), governments often intervene to address barriers and promote circular economy. Some interventions are direct, top-down actions involving legislation and policies. Providing funding and structure for eco-industrial parks is a popular intervention. Eco-industrial parks co-locate industries that can utilize each other's waste. Other interventions are policies that shift the business environment to favor circular-economy solutions, such as a ban on landfilling plastics.

Whatever the intervention, it is important to recognize that circular economy does not occur in isolation. It is a localized

* Corresponding author.
E-mail addresses: chull@saunders.rit.edu (C.E. Hull), sm2004@rit.edu (S. Millette), exwgis@rit.edu (E. Williams).

https://doi.org/10.1016/j.jclepro.2021.126412
0959-6526/

interaction among stakeholders, including government, embedded in various network relationships (Baah et al., 2020; Marconatto et al., 2019; Millette et al., 2020). The social structure of the network is based on trust among network members (Ashton and Bain, 2012; Ghali et al., 2017; Mileva-Boshkoska et al., 2018). These networks develop and share knowledge, expertise, and norms and expectations, which influence members and give their actions legitimacy (Ashton and Bain, 2012; Jeong and Kim, 2019; Mortensen and Kørnøv, 2019). Networks can also help members get resources that would otherwise be outside their reach (Ahuja et al., 2011; Gulati et al., 2000; Mortensen and Kørnøv, 2019). But stakeholders have to see value in a venture in order to be willing to participate, and the more important their involvement, the more important it is to ensure that they want to participate (Barney, 2018).

The mix of interventions a country uses depends on its political and economic structure (Ghisellini et al., 2016; Lieder and Rashid, 2016). China favors direct interventions (McDowall et al., 2017; Yuan et al., 2008), while Europe and other more open economies use more indirect policies that create an environment conducive to circular economy, with government policy lagging behind informal institutional pressure (Kumar et al., 2019; McDowall et al., 2017). In addition, consumers play a role in circular economy by demonstrating preferences for goods with higher circularity (Kirchherr et al., 2018). Companies' pursuit of circular-economy opportunities can be seen as an attempt to gain legitimacy in the face of institutional pressure (Jeong and Kim, 2019; Meyer and Rowan, 1977; Scott, 2005).

Eco-industrial parks in particular have long been seen as a way to transition to circular economies (Chertow and Park, 2016; Geng et al., 2009). Eco-industrial parks integrate disparate companies into a system of networked firms and governmental bodies, where collaborative and innovative links reduce environmental impacts in a cost-efficient and profitable way (Aid et al., 2017; Lombardi and Laybourn, 2012). They are zoned for businesses sharing resources to reduce waste and increase profits, but planning and creating one is not simple (Hein et al., 2015). Eco-industrial parks require communication and trust to allow the information sharing needed to identify opportunities (Chertow and Ehrenfeld, 2012; Yu et al., 2015), and long-term success requires engaging top managers, government, and local community leaders (Hein et al., 2015). They also require institutionalizing norms and values that support circular-economy collaboration (Yu et al., 2015).

Despite many predictions that circular economy can create local jobs, boost the local economy, and reduce pollution (Aguilar-Hernandez et al., 2020), there is still progress to be made. Increasing attention is being given to finding new approaches. A business incubator focused on circular-economy opportunities may be an effective tool (Millette et al., 2020). In other domains, incubators have been effective at discovering and developing profitable technologies and business ideas. Circular-economy start-ups could focus on developing a new process to add value to waste, e.g. mixing in fly ash, silica fume and glass powder to improve the quality of cement (Jawad et al., 2020), or bring existing technologies to solve a waste problem, e.g. setting up logistics to use packaging plastic waste in an existing cement plant (Millette et al., 2019). If circular economy is indeed profitable but largely undiscovered, incubators could be key in the discovery process. Even if circular-economy opportunities are profitable, entrepreneurs acting alone might find it difficult to identify them and to rally stakeholders to support their pursuit. With weak support from government and society, circular-economy entrepreneurs might not see a way forward unless another mechanism, such as a circular-economy incubator, is put in place.

The field of circular-economy incubators is in early stages of development. We review the literature on sustainability incubators, a broader concept related to circular-economy incubators. Küçüksayraç et al. (2015) described how intermediaries, including incubators, could support sustainability innovation. They provided a framework describing the actors and functions of the different intermediaries. Bank et al. (2017) analyzed the Green Garage in Berlin to extract lessons for sustainability incubation, proposing that regional and inter-regional co-operation and well-planned, structured pre-incubation processes are important factors for success. Gliedt et al. (2018) laid out how the actions of Green Entrepreneurs and Champions, Innovation Intermediaries and Policy Entrepreneurs might combine to realize green economic development. Battistoni and Barbero (2019) proposed a set of services and related actors to bring together to realize a "Systemic incubator for local (eco)entrepreneurship". Tiba et al. (2020) conducted interviews with stakeholders to understand how to increase the sustainability orientation of an entrepreneurial ecosystem. They concluded that successful sustainability start-ups play an important guiding role as exemplar.

Millette et al. (2020) proposed a set of stakeholders and roles for a circular-economy incubator. The primary stakeholders in a traditional incubator are entrepreneurs, investors and incubator management. Millette et al. (2020) argue that identifying circular-economy opportunities can be hindered by lack of information and cognitive bias. For example, circular-economy innovation needs information on what wastes are available for value-added conversion, but this is often lacking. Addressing these barriers calls for expansion of the usual incubation network to include businesses that might sell their wastes as inputs or purchase the value-added converted waste. In addition, government can be involved to aid investment, motived by public benefits from circular economy. Academia can educate entrepreneurs and provide analyses addressing information barriers. For example, material flow analyses can inform circular-economy opportunities for incubators (Millette et al., 2019). Similarly, Omoloso et al. (2020) analyzed the leather industry to identify sustainability best practices. Both studies leveraged publicly available data to provide new and affordable information relevant to entrepreneurs. Multicriteria assessment of wastes can also be used to prioritize waste streams, e.g. from an environmental perspective (Pourahmadi et al., 2017). A key cognitive bias to overcome is a perception among entrepreneurs and other stakeholders that sustainability is not an opportunity but an expense (Hoogendoorn et al., 2019). The incubator design we draw on here (Millette et al., 2020) specifically draws entrepreneurs' attention to profitable opportunities that are sustainable.

This article contributes to an empirical understanding of perspectives of potential participants in a circular-economy incubator. Prior work asserts that new stakeholder collaborations are critical in realizing sustainability and circular-economy incubators. However, building new networks involves challenges. For example, there must be sufficient incentive for all parties to become involved. We interview potential collaborators, and analyze these interviews using qualitative and quantitative techniques in order to extract lessons for incubator design. The interviewed stakeholders had not yet engaged in circular-economy incubators. This study's purpose is not to identify best practices from prior activities, but to understand initial perceptions and barriers to participation. This is a useful perspective given that circular-economy incubators are still unknown in most of the world.

Trinidad and Tobago was chosen as the setting for the work. It is particularly important to explore cost-effective circular-economy solutions for nations with less to spend. Trinidad and Tobago is a developing country, if one on the higher end of income, with a GDP/capita of US$ 17,276 (World Bank 2020). As an island nation,

Trinidad and Tobago faces higher importation costs, increasing the benefits of circular solutions. Also, recent work identified profitable circular-economy opportunities in Trinidad and Tobago for plastics that have yet to be pursued (Millette et al., 2019). These opportunities were discovered through a material flow analysis using public data and data obtained directly from a government agency (Millette et al., 2019). Thus, while the current study does not focus on specific circular-economy opportunities, prior work has established that such opportunities exist in Trinidad and Tobago.

Trinidad and Tobago, like many developing countries, does not have strong institutional support for circular economy, but neither is there institutional opposition. Consideration for circular economy is nonexistent in current policy, but sustainability is an emerging priority. Trinidad and Tobago's macro planning Vision 2030 maps UN Sustainable Development Goals to specific strategic outcomes for the country, including sustainability in various forms (Government of Trinidad and Tobago, 2017). Environmental regulation in Trinidad and Tobago lacks robust development, implementation, and enforcement, but is gaining importance. The Environmental Management Authority (EMA) has developed a national environmental policy with a focus on greening the economy (Government of Trinidad and Tobago, 2018). While circular economy is not specifically discussed, the policy does recognize that the greening of the economy will *"strengthen the country's economic performance through the introduction of new value added economic activities, increased efficiency across all sectors, reduction of waste, and the generation of green jobs"* (Government of Trinidad and Tobago, 2018, p. 35). Collaborative systems in general are encouraged by the legal and policy environment. The country's pro-entrepreneurship policy, however, does not include supporting circularity or improving resource-use efficiency.

The contributions of the current study are new empirical information on the perspectives of potential collaborators in a circular-economy incubator and resulting lessons for incubator design. To distinguish these contributions from prior work, first note that Battistoni and Barbero (2019) and Millette et al. (2020) propose stakeholder functions for eco- and circular incubators, respectively. These proposals are rooted in conceptual arguments. Empirical exploration of participant perspectives is a natural follow-up to this work, supporting refining incubator design. Tiba et al. (2020) conduct stakeholder interviews to better understand how to increase sustainability entrepreneurship, but the unit of analysis is a set of regional activities, not the specific networking arrangements of an incubator. Kahupi et al. (2020) interview a variety of developed-nation stakeholders to understand building competitive advantage for sustainable products. Aid et al. (2017) interview public and private actors to identify challenges and opportunities in increasing circularity in waste management in Sweden. One finding is a need for business approaches/practices in waste management firms to shift towards less mixed waste and more partnership with waste suppliers and customers. Salmenperä et al. (2020) interview practitioners from 25 pilots in Finland promoting waste prevention and recycling, clarifying perceived economic, technological, information, institutional, regulatory, and sociocultural barriers. While these papers share commonalities with this article (discussed further in Section 4), the present study focuses on enhancing entrepreneurship and explores circular economy in a developing island nation.

To summarize the approach and structure in this article: This study examines the development of circular-economy incubators via interviews with potential stakeholders in Trinidad and Tobago and analysis of these interviews. A grounded theory approach is used to explore what it would take to get stakeholders to participate in such an incubator. Interviews were conducted with government, industry, entrepreneurial and academic stakeholders on obstacles and motivations for network formation (Liu et al., 2017). The interview transcripts are analyzed using an axial coding procedure (c.f., Güler, 2019; Liu et al., 2017), originally developed by Strauss and Corbin (1990), to group interview responses into organized codes, categories, and subcategories. To better compare and contrast, responses are normalized by stakeholder type. Section 2, below, explains the grounded theory methodology used, with separate subsections to explain how the data were collected (2.1) and a longer subsection to explain how it was analyzed (2.2). Section 3 presents the results, with a subsection for each principal result – government involvement (3.1) and information inputs (3.2). Discussions and conclusions based on these results follow in Section 4.

2. Methodology

Grounded theory aims to characterize the attitudes of people and organizations (Glaser and Strauss, 1967; Strauss and Corbin, 1990). Grounded theory is an approach to developing theory that is rooted in data that have been systematically gathered and analyzed (Patnaik and Bhowmick, 2020; Retamal, 2017; Strauss and Corbin, 1990). Grounded theory research does not ignore existing theory or call for a blank-slate approach, but builds on existing work (Glaser and Strauss, 1967; Suddaby, 2006). It rests in part on the interpretivist perspective that humans impose their internal conceptions on the external world to create new realities (Morgan and Smircich, 1980; Suddaby, 2006). Entrepreneurs, in turning their ideas into real businesses, are an example of this perspective in practice.

A study of current beliefs of potential circular-economy stakeholders can reveal challenges and possible motivations for deciding to become involved and to participate. To study beliefs, we draw on the grounded theory approach of Liu et al. (2017), used to explore the antecedents and formation of a collaborative infrastructure for open software development. The two situations are similar, as both circular economy and open source software develop infrastructure using a bottom-up, self-organized collaborative approach to a common challenge (Chertow and Ehrenfeld 2012).

This study lets the data determine the direction rather than trying to fit those data within an established theory, and lets themes emerge without overburdening them with preconceived theory (c.f., Güler, 2019). The specific approach discussed by Strauss and Corbin (1990) was used, which provides a natural, organic approach to coding activities. Coding here means the organization of participant responses under common conceptual themes. Grounded theory methodology should be as clear as possible (Aguinis and Solarino, 2019; Suddaby, 2006). To improve the transparency and replicability of this qualitative research process, the recommendations of Aguinis and Solarino (2019) were followed as closely as possible in writing the following section. Fig. 1 summarizes the methodological flow.

2.1. Data collection

Participants were selected based on an interest in sustainable entrepreneurship or closing the material loop for plastic. The participants were drawn from professional networks such as the Trinidad and Tobago Manufacturers' Association. Two additional participants were found through one author's personal and professional networks. The participants were selected to represent a wide range of stakeholders from the private, public, and non-profit sectors that could potentially impact the development of the circular-economy incubator and its network *(see Table 1)*. Prior to the interview, each participant received an invitation to participate, the study abstract, a consent form, a copy of questions that would

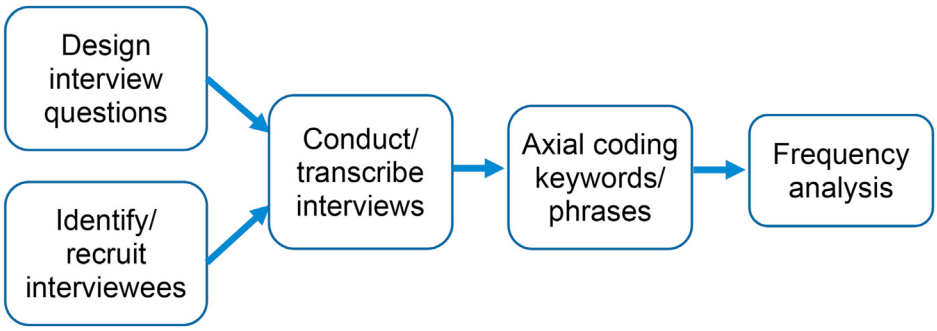

Fig. 1. Summary of methodology for formulating, conducting and analyzing interviews.

Table 1
Breakdown of stakeholders interviewed in Trinidad and Tobago to assess attitudes toward circular economy.

Stakeholder type	Description	Number of stakeholders interviewed
Financial Institution	A senior manager in corporate and investment banking	1
Entrepreneurs	CEOs, co-founders, solo entrepreneurs with an interest in environmentally sustainable business opportunities	5
Academic	A researcher with interest in environmental concerns	1
Government Agencies	Agencies involved in financing or managing the local environment	5
Non-Profit Organizations	Civil society organizations focused on the environment	2

be asked, and a statement confirming that the study was minimally invasive and would not result in any negative impacts for participation. Due to this commitment to the confidentiality of participation and responses, the raw data will not be made publicly available. Fourteen face-to-face, semi-structured interviews were conducted with the selected participants, at which point it was determined that new data were confirming what had already been learned. The interviews were conducted over a one-month period (December 14th, 2018–January 10th, 2019). They produced 13 h, 40 min of recorded interviews that translated to 211 pages of transcripts for analysis. Interview times ranged between 18 min and 1 h, 34 min long.

2.2. Data analysis

After being reviewed and edited for clarity and flow, the transcripts were uploaded into the Dedoose software for coding and analysis (c.f., Retamal, 2017). In exploring core topics across various stakeholders, constant comparison was used with an axial coding procedure and selective coding to establish global classification concepts that various stakeholders shared. Global themes, which linked different participants both individually and as a group, were consolidated to allow examination of how stakeholders across the spectrum viewed the themes, and, eventually, to start to build theory in a primarily inductive way. An example of the axial coding structure used is provided in Table 2, which shows global-level codes emerging from and applied to interview transcripts to recognize emerging themes.

Normalization of data – Tables 3–4 and Figs. 1–6 present normalized data to enable comparison across the different stakeholders. This was necessary because the categories had different numbers of participants. The number of times a code of interest was applied was divided by the number of stakeholders in the category to find an average response rate.

The data were analyzed to see how well participants understood the concept of circular economy. Because the small sample size introduces an element of statistical uncertainty, the first analysis considers all participants in one bin, followed by an analysis of

Table 2
Coding structure to match interview responses with key concepts. Global Code refers to a key encompassing concept.

Global Code	Description	Example Interview Response
Government Participation	• Government control recommended • Light government participation recommended • No government interaction recommended	"Definitely not management, I don't think government is well-equipped to manage something like this. I think that a private sector player needs to be the core driver of this with the government as a partner among several partners – a stakeholder."
Information Input	• Lack of data or information related to circular economy • Discussions center on access to or lack of knowledge and know how	"One of the challenges that we have in terms of information is the collection, collation, and analysis. We are lacking in information generally."
Network	• Discussion alluded to the need for a network to support circular economy • Discussion on the development of a network	"Stakeholders are a big part of the application (process); we have them write letters of interests or letters of participation. This determines the stakeholder participation up front, at least the initial stakeholders when the project is being implemented; you work with different stakeholders to maximize the value of the project."
Obstacles	• Circumstances, limitations, or challenges that will prevent participation in the incubator	"Right now, there's no advantage to be a green company. For instance, there's no preferential treatment to an entity for being a green company in Trinidad and Tobago currently"
Motivation	• Circumstances or benefits that would encourage or motivate participation	"To use ways to be inventive, there are some things we should not be importing, we want people to use local materials, along with plastic to try to make new products"

Table 3
Interview results on Government Participation: Number of mentions (raw and normalized) of Government Participation, specific mentions of degree of participation (Heavy versus Limited/None) and Lack of trust.

Stakeholder category (number of interviewees)	Topic: Government Participation				Topic: Lack of Trust	
	Total # Identified	Normalized Frequency	Normalized Frequency of Mentioning …		Totals # Identified	Average Mentions
			Heavy Participation	Limited/No participation		Trust
Financial Institution (1)	1	1	0	0	0	0
Non-Profit (2)	6	3	0.5	2	1	0.5
Government Agencies (5)	13	2.6	0.6	2	0	0
Academic Researcher (1)	0	0	0	0	0	0
Entrepreneurs (5)	7	1.4	0	1.2	5	1

Table 4
Interview results on Information Inputs: Number of mentions of need for Network Education and Public Education, and of the Prevalence of Rumor.

Stakeholder	Information Inputs				
	Total # Identified	Normalized Frequency	Normalized Frequency of Mentioning …		
			Need for Network Education	Need for Public Education	Prevalence of Rumor in Current Information
Financial Institution	10	10	10	0	0
Non-Profit	11	5.5	2	1.5	5
Government Agency	27	5.4	1.8	0.6	0
Academic Researcher	7	7	1	1	0
Entrepreneur	30	6	1.2	1.2	6

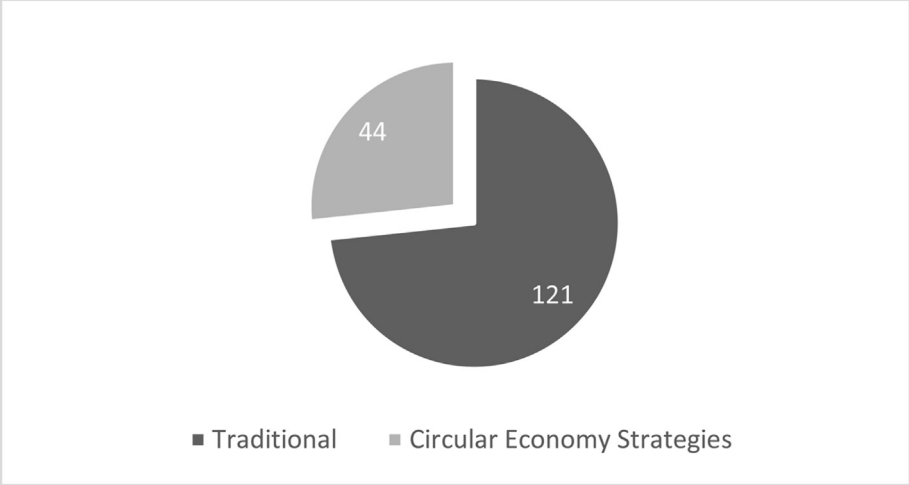

Fig. 2. Interview results: Total number of mentions of circular economy vs. traditional strategies, all stakeholders.

responses by stakeholder category. The latter is subject to larger statistical uncertainty due to the small number of stakeholders interviewed per category. Tables 3–4 and the graphs that are part of Figs. 3–5 were created by sorting data and media (uploaded transcripts) by stakeholders or theme.

3. Results

Based on initial interviewer impressions and the analysis of the interviews, two global themes become evident: government participation and information inputs. Both were raised multiple times by almost all the stakeholders interviewed, with remarkably high (though not complete) consistency across and within the different groups of stakeholders. Government participation, which received a total of 27 mentions in 14 interviews, is discussed first in section 3.1. Section 3.2 covers information inputs, which received a total of 85 mentions in the stakeholder interviews.

3.1. Government participation

Consistent with Millette and colleagues' (2020) circular-economy incubator model, most stakeholders indicated acceptance of the inclusion of government. However, most favored minimal government participation *(Table 3)*. Government agencies varied on how much government support would be required. One agency representative suggested the barest minimum of participation:

> "I think, the government's lack of participation would be an asset. The only thing you want from the government is for the government to give their OK to it." – Manager at a government agency

Another favored a more expansive role for the government:

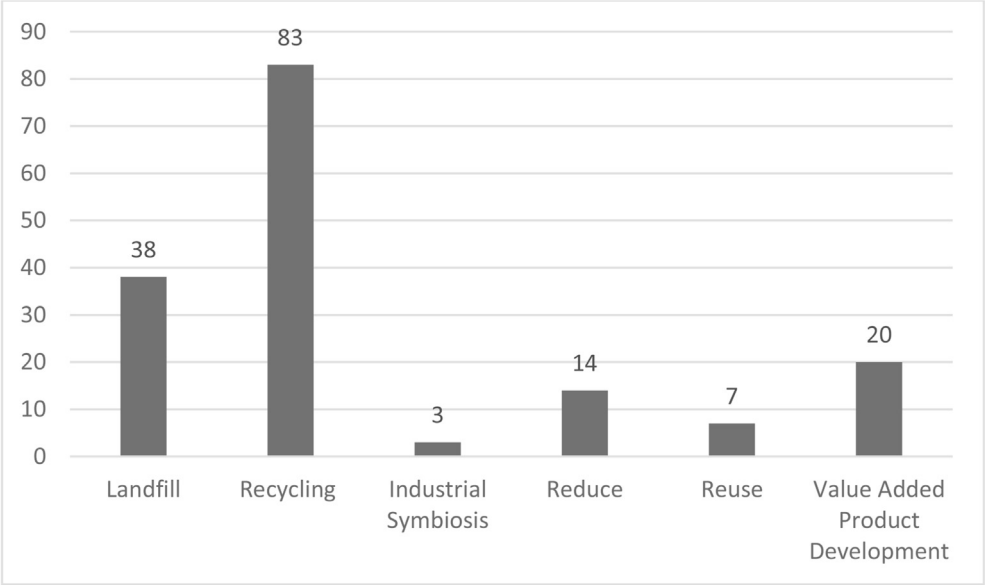

Fig. 3. Interview results: Total number of mentions of specific waste management strategies, all stakeholders.

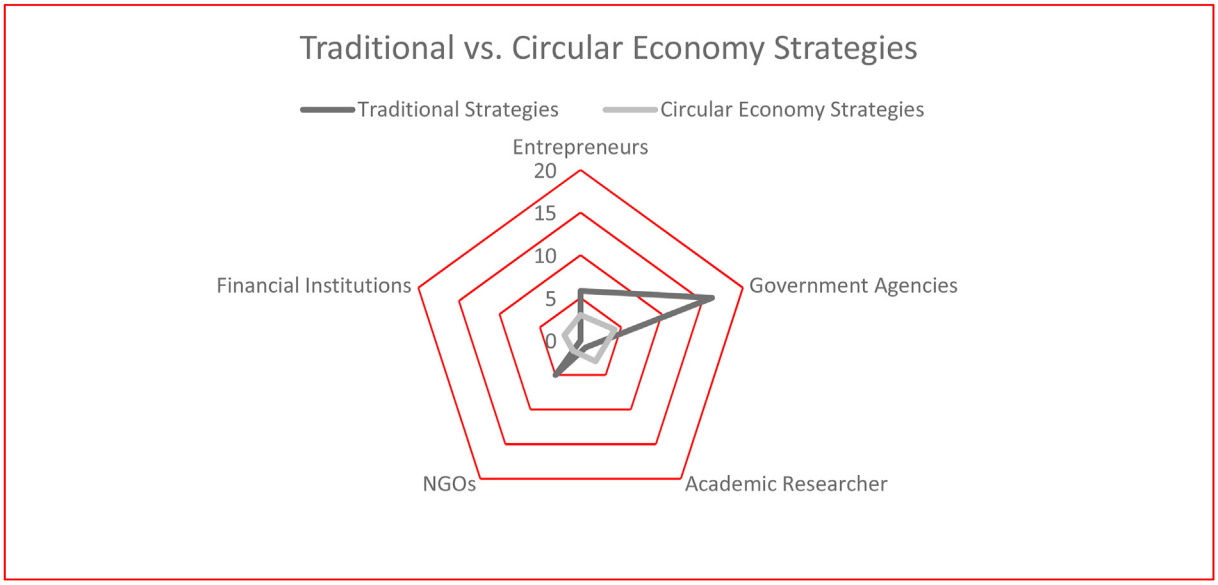

Fig. 4. Interview results: Normalized number of mentions of traditional vs. circular economy strategies, by stakeholder type.

"I think it's desirable given that you will need a lot of land space, access to communications and that sort of thing. It will also have to be in some type of zone because of the effluent, etc. You can't put a recycling incubator any and everywhere because it involves significant processing of waste, your physical location will not be in urban areas, and then when you get into that area, your communication, electrical lines, water connections that sort of thing [would require government support]. Typically, I think because of the nature of what you are doing, some level of government support might be desirable. Whether or not to give you some state lands, it may very well fit in with the government's development plan and if you are in alignment, then you have easy access, [especially] if you are closely related to what they want to do in terms of their overall intention for the economy and for development of particular areas of particular zones." – Senior manager at a government agency

But in general, government agencies seem to prefer a supporting or consulting role. They see themselves as regulatory bodies, responsible for oversight, and thus obliged to remain objective and not participate directly. For example, a government agency manager said:

"Certainly not managerial – [government should have] an advisory and/or participatory [role]. We may be able to bring ideas, provide considerations that are important which private sector companies may not see. For instance, trade agreements. The incubator might want to do something that is contrary to a trade agreement that we have with CARICOM (The Caribbean

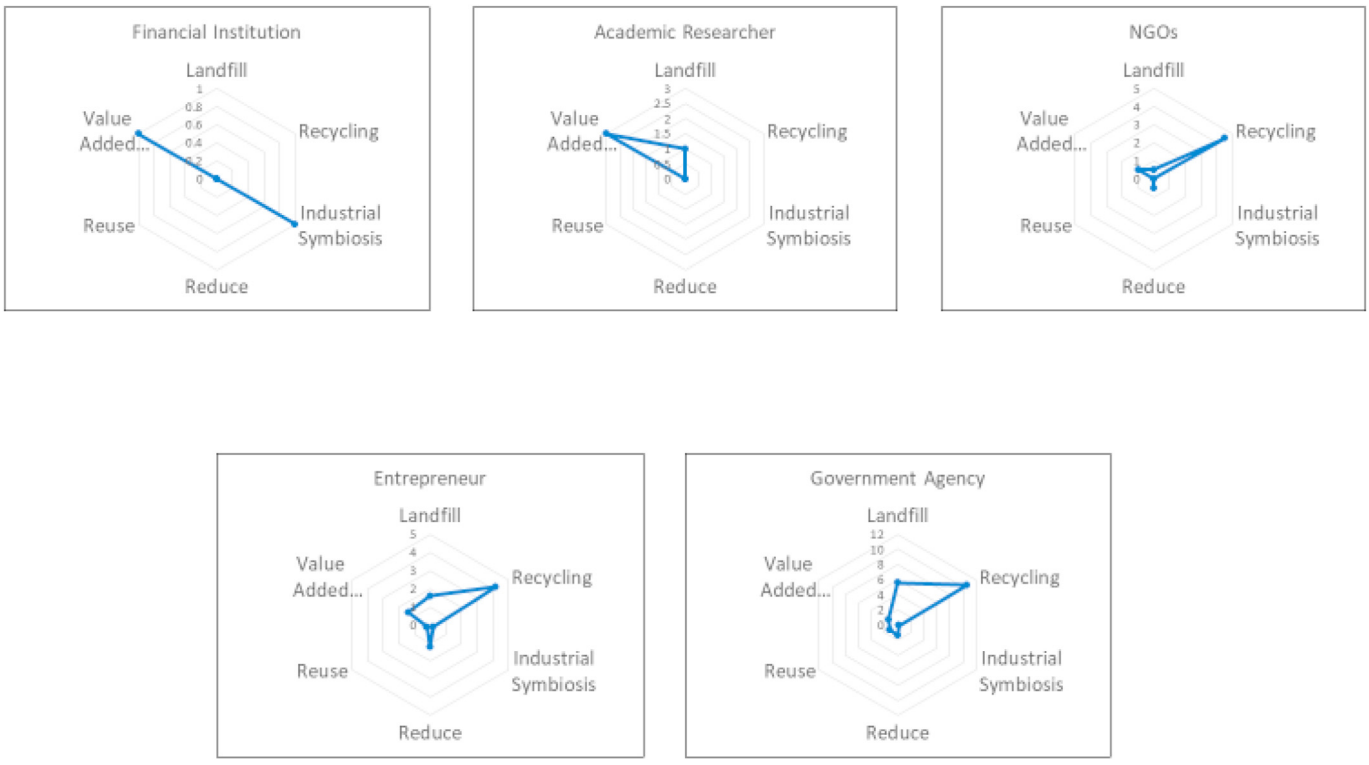

Fig. 5. Interview results: Normalized number of mentions of specific waste management strategies, by stakeholder type (note that diagram scale varies by stakeholder, being set by the maximum number of normalized mentions).

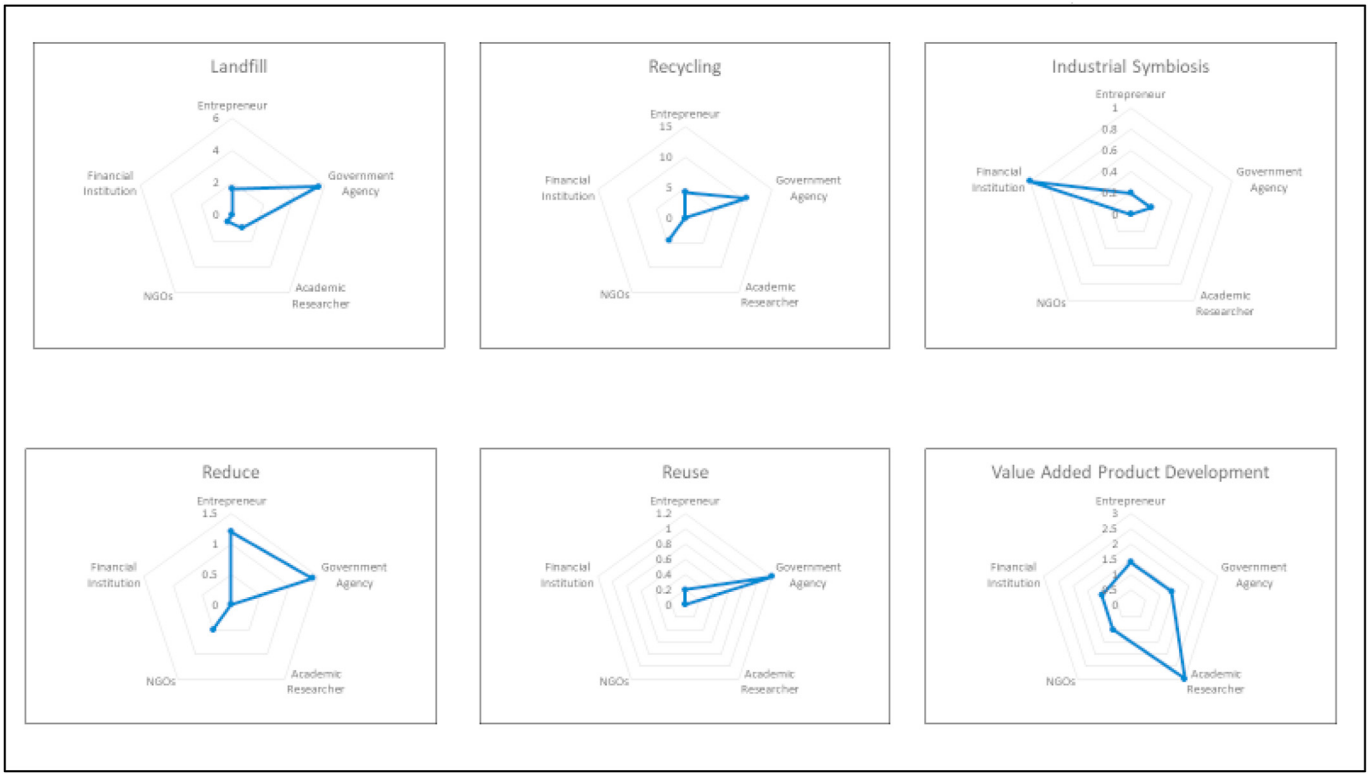

Fig. 6. Interview results: Normalized number of stakeholder mentions of specific waste management strategies mentions, by strategy type (note that diagram scale varies by stakeholder, being set by the maximum number of normalized mentions).

Community), so the government will provide that feedback." – Senior manager at a government agency

There was also discussion of financial support from the government. The Green Fund, a government program in Trinidad and Tobago that supports organizations for environmental projects (Velter et al., 2020) was mentioned frequently. The financial support question led to the need to clarify roles of different agencies and programs:

"For example, the Environmental Management Authority's current iCare recycling project is a grant of over TT$107 million [$15.8 million US], so, what does that mean to smaller community organizations coming in afterward that propose projects that the Green Fund can't say is a duplication of the EMA's activities. That becomes a challenge. Organizations are then challenged in how they fit within that framework." – Manager at a government agency

Entrepreneurs saw financial support from the government as desirable, but preferred little or no government control of the circular-economy incubator. In the words of one:

"If they are willing to finance [the incubator], partially or wholly, I don't think you would have a problem with them being involved. As far as how involved, I would not want them in a position of control. So an advisory role would be fine." -Entrepreneur

Entrepreneurs felt that significant government involvement would increase bureaucracy and cause the project to be less flexible in response to market changes. But participants did agree that government participation would help with access to feedstock, development of legislation, and advice on trade agreements. Some preferred the government representative's role to be that of board member. For example, one entrepreneur interviewee said:

"You should have an adviser [from the government] if you're ever looking at a board."

-Entrepreneur

Some participants went so far as to question government motivation and competence, as demonstrated in the quote below:

"You have to use measurables to determine whether [the circular-economy incubator] is successful or not. The measurables that are important in large part for something like this oftentimes don't align with what would be considered expedient politically, and so, you have a disconnect with operationalizing something like this when the government is heavily involved." – Manager of a local non-profit organization.

Table 3 shows the number of times interviewees discussed government participation, the average degree to which government participation is preferred, and the number of times distrust of the government was raised as an issue in these discussions. The number of stakeholders in each category is indicated in brackets. The response from entrepreneurs, distrust of government, is seen in the desire for minimal government participation. The financial institution indicated that government support would be useful in underwriting loans and assisting in mitigating risk, while the academic researcher interviewed did not express an opinion on government participation. Government agency managers, understandably, did not express distrust toward themselves or their agencies, but did generally favor limited rather than heavy participation. The two non-profit organization representatives mentioned government participation six times, with a lack of trust being mentioned once. The five entrepreneurs, meanwhile, mentioned trust as an issue in five of seven times they spoke about government participation.

Stakeholders in general, excluding the academic researcher but including government representatives, felt that government should, or perhaps inevitably would, be involved. But they also generally did not want the government to control the process, with light involvement rather than heavy involvement being strongly favored. That this theme emerged 27 times across the interviews indicates that it is reflective of a sentiment broadly shared across stakeholders, and thus is something that must be borne in mind by future researchers and practitioners as they try to understand and implement circular economy, particularly in developing economies.

Table 5
Distinguishing traditional waste management and circular economy strategies.

Traditional waste management strategies	Circular economy strategies
Landfilling	Industrial symbiosis
Recycling	Reduce
	Reuse
	Value-added product development

3.2. Information inputs

Information inputs, i.e. information sources that impact the formation and operation of a potential network, emerged as a major theme, with 85 mentions across 14 interviews. Stakeholders reported a need for education on circular economy, both within the incubator network and also of the public. Table 4 shows summary results from the axial coding analysis of how frequently participants mentioned information inputs. Table 4 also shows, of these mentions, how many indicated a need for network or public education. The average number of responses per sub-category of information inputs is also shown. The results indicate a common degree of perceived need for both network and public education, though the financial institution respondent did not mention public education. We interpret this to mean that potential stakeholders themselves recognize the need for more information.

To resolve what sort of information inputs might be important, the interviews are analyzed to understand how different stakeholders conceive of waste management. Traditional waste management focuses on landfills and recycling, while the modern circular economy view emphasizes strategies such as value-added product development and reuse. We interpret the strategies brought up by stakeholders when asked about waste management as an indicator of the lens through which they view the problem: Traditional versus circular economy. To quantify this idea, we bin strategies as either traditional or circular economy in type, as shown in Table 5. Note that while circular economy does include recycling, recycling is here grouped as traditional.

Axial coding is applied to the interview text to find the count of the number of times strategies were mentioned in interviews. Using the grouping in Table 5 to bin strategies into traditional versus circular economy, Fig. 2 shows that traditional waste management strategies were mentioned much more often than circular-economy strategies (121 vs. 44), suggesting greater familiarity with traditional approaches.

Fig. 3 shows how frequently all stakeholders mentioned specific waste management strategies. Of the traditional strategies, recycling and landfills, the former was mentioned more often (83 versus 38). Of the circular-economy approaches, value-added

product development and reduce garnered 20 and 14 mentions respectively, with lower attention given to industrial symbiosis and reuse. This suggests (though does not prove) that stakeholders view waste management with a more traditional lens, and may not be familiar with or apply more modern ideas such as industrial symbiosis.

The previous results in Figs. 2 and 3 aggregate all stakeholders. Differences between stakeholders in how the problem is conceived is also important. To address this, Fig. 4 shows the normalized mentions of traditional versus circular-economy strategies by stakeholder type. Note that the number of mentions is smaller per stakeholder (as opposed to the aggregate), leading to larger concerns regarding statistical significance. Taking the data at face value, the results show that financial stakeholders mention circular-economy-related strategies more frequently than other strategies. Traditional approaches to waste management dominated the discussion for non-profits, government agencies, and entrepreneurs, showing their greater familiarity with landfilling and recycling. These results also indicate the extent to which stakeholders responded to the waste management question. Government agencies show the highest number of mentions combined (20.2), and financial institutions the least (2). This is not surprising given the different missions (environmental versus economic) of the organizations.

Further disaggregating the results, Fig. 5 shows the normalized number of mentions of specific waste management strategies, categorized by stakeholder type. Note that the maximum scale varies by stakeholder, reflecting that some stakeholders responded at greater length when queried about waste management. Fig. 6 shows the same data, organized by each stakeholder type, categorized by waste management strategy. Note that the maximum scale varies by strategy, reflecting that some strategies were discussed more. The perception of waste management varies by stakeholder, reflecting their outlook. Financial institutions spoke to economic and industrial aspects (value-added product development and industrial symbiosis). Recycling was the most popular strategy among government agencies, NGOs and the entrepreneurs, while these same stakeholders spoke relatively less about circular-economy-related approaches. Landfilling and recycling were most frequently discussed among government agencies *(Fig. 6)*.

Another issue for information inputs is their source. One interview question asked what information sources are being used. In answering this question, a number of stakeholders identified "rumor" as a frequent source. The last column in Table 4 shows that entrepreneurs and non-profit organization representatives frequently identified rumors and word-of-mouth as primary sources of information, while government representatives did not mention rumors at all. This suggests a need for more formalized education and information related to circular economy.

Lack of information influences decisions, creating a challenge to circular economy. What stakeholders do not know about, they cannot encourage or support. For example, banks will not lend to emerging sectors that they do not understand:

> "Very often, the easiest option would be for the banks to say, 'We don't know enough about the sector," or, 'We don't know enough about the product.' I think this is where the entrepreneurs need to leverage the Trinidad and Tobago Manufacturer's Association or a similar entity to provide some level of education to the banks. To show from an operational perspective how the [circular-economy] business operates … how they generate revenue, what the inputs and outputs are, what margins are generated and how they would be able to repay financiers or providers of capital." – A senior manager at a commercial financial institution

In summary, the interviews suggest a need for education of stakeholders and the public. One of the objectives of this education is a common understanding of circular-economy strategies.

4. Discussion and conclusions

One important result of the study is consensus among stakeholders for a limited role for government in a circular-economy incubator. Lack of trust in the government appears to be a major factor in stakeholders taking this stance. The distrust of government among entrepreneurs identified here is not limited to Trinidad and Tobago, and has been found in other developing countries to discourage entrepreneurial interest in innovative strategies (Tang and Hull, 2012). Many governments have trust issues because of corruption, capability, or other causes. Government-run centrally-planned eco-industrial parks may be effective in China, but the Chinese government is exceptional – most developing countries do not have such powerful governments. It thus seems reasonable to suggest that this study's findings are generalizable to some other developing nations, and beyond: The role of government in circular-economy incubators ought to be limited, depending on the attitudes of stakeholders.

A second important finding is a lack of awareness among stakeholders of circular-economy strategies and how they differ from traditional waste management approaches. Participant awareness of circular-economy strategies *(Figs. 2–5)* seems largely limited to the production of products from waste materials and post-consumer products *(Fig. 3)*. The participants themselves identified a need for network education to better understand the circular-economy opportunities. There are a number of options to achieve this education. Outside the incubator, creating an educational institute focused on sustainability could help educate future participants. It is important that the institute both educate students and conduct outreach programs to build knowledge in the experienced workforce. Education can also be done within the incubator, e.g. by hiring consultants to train participants, in particular the managers who set up the incubator.

To compare and contrast this study's results with prior research: Other researchers have also proposed a role of government in sustainability incubators (Battistoni and Barbero, 2019). Tiba et al. (2020) found that stakeholders in Lagos felt that the government would actively interfere with start-ups, such as by stealing ideas from entrepreneurs or regulating the number of startups. Stakeholders in Trinidad and Tobago were far less negative about government involvement, but did argue for a limited role. This suggests the appropriate role for government in a circular-economy incubator depends on the local context.

The importance of stakeholder education for a sustainability incubator has been suggested elsewhere, e.g. Küçüksayraç et al. (2015). The findings of the current study inform the nature of education for circular-economy incubators first by identifying a general trend in stakeholders to frame waste management in terms of traditional approaches – landfilling and recycling – rather than the expanded set of ideas of circular economy. The results indicate a pattern in knowledge among stakeholders, e.g. government being most familiar with landfill and reduce, reuse recycle. Notably, entrepreneurs and financial institutions did not emphasize value-added product development, suggesting a lack of recognition of the economic potential of circular economy.

Stakeholder engagement is important to implementing circular-economy entrepreneurship, but the literature tends to focus on network development after initial recognition of its potential (Boons et al., 2017; Mortensen and Kørnøv, 2019). The present study explores individual perceptions before the circular-economy

Table 6
Summary proposal for stakeholder roles in a circular economy incubator.

Stakeholder	Circular economy incubator development		
	Role	Obstacles	Motivations
Trade Association	• Trusted 3rd party • Lobby government • Develop the circular-economy Incubator • Network education • Provide network access for circular-economy entrepreneurs	• Data collection	• Industry development
Government	• Support • Advisory Role • Feedstock access and logistic assistance	• Enforcement of regulation and policies • Trust issues	• Diversion from landfill • Economic development • Diversification
Circular Economy Incubator	• Acquire data • Recruit, support & develop entrepreneurs • Identify circular-economy opportunities	• Data Access	• Diversification • Expanded circular-economy activity • Development of eco-industrial park • Investment opportunities
Entrepreneurs	• Green champions • Identify & pursue circular-economy opportunities	• Trust issues • Information Inputs	• Revenue streams • Product development
Banking Sector	• Financial support for circular-economy ventures	• Risk exposure	• New market opportunities
Academia	• Conduct research to create useable data	• Data access • Research funding	• Publications • Sector development
Non-Profit	• Public trust • Identify environmental priorities • Promote circular-economy solutions	• Funding for activities	• More environmental awareness • Better environmental performance

incubator is founded, its members recruited, or its effects on institutions are felt. More work is needed in understanding such perceptions before and during the launch of a circular-economy incubator.

The results inform the design of a circular-economy incubator, in particular the roles of different stakeholders. We propose a set of roles for stakeholders in Table 6. Industry organizations were mentioned as a trusted third party. We suggest a central role for them in the organization of the incubator. Participants identified a local manufacturer association, the Trinidad and Tobago Manufacturers' Association, as a respected organization that could serve as a trusted third-party (Siskos and Van Wassenhove, 2017). The business association could quickly develop trust among the stakeholders – who appear open to being recruited if the government is not in charge. A circular-economy incubator originating from the association would be in a network, immediately able to span boundaries and spark the necessary communication and information interactions (Velter et al., 2020). We also propose a role for higher education in the circular-economy incubator (Mendoza et al., 2019). Although this role tends to be neglected in developing nations, academics can develop and transfer knowledge and even clearly identify circular-economy opportunities (Nsanzumuhire and Groot, 2020). Drawing on the business association's existing connections, the circular-economy incubator would be able to span the boundaries between university, innovators, government agencies, and financial institutions (Velter et al., 2020). We emphasize that the stakeholders and their roles in Table 6 are only one proposal. Our intent is to illustrate how to connect interaction with potential stakeholders with an incubator design that fits their perspectives.

In Trinidad and Tobago, stakeholder responses suggest a demand for circular-economy solutions and interest in incubators as a mechanism to achieve them. Among the stakeholders two organizations plan to implement circular-economy solutions. Both are involved in collecting and recycling plastics and other materials and are financed primarily from outside the Caribbean region. A third is aware of a potential product but needs a supportive network, such as a circular-economy incubator, to explore the concept and its market potential. All participants in the study expressed interest in participating in circular-economy activities at some level, with one entrepreneur expressing the need for support and guidance:

> "We would really need someone to champion the project and lead us, to guide us through. We wouldn't have a clue how to start – someone has to look at all waste and see what can be useful." – Co-founder of an entrepreneurial enterprise

This study's limitations include the small number of stakeholders interviewed in a single country, and that the questions asked varied somewhat by stakeholder type. Many open questions remain on the design of circular-economy incubators. Ultimately, trial and error in the field will be needed to find successful models. This said, research has potential to improve the chances of success of such trials. Interviewing stakeholders to understand obstacles and ways around them has shed light on circular-economy opportunities and incubators in the developing world. Collecting data from stakeholders in other countries besides Trinidad and Tobago, possibly through a survey, would be useful, as would further related large-data work (c.f., Chiappetta Jabbour et al., 2019).

Studies along the lines done here, querying the desired stakeholder network, constitute one way to inform effective incubator design. The promise of circular-economy incubators is tremendous: Harnessing innovation and the profit motive to realize a more sustainable society. The combination of analysis and action will hopefully lead to circular-economy incubators that capture economic value from reducing, reusing, and recycling.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Clyde Eiríkur Hull: Conceptualization, Writing – review & editing, Supervision. **Sherwyn Millette:** Conceptualization, Methodology, Writing – original draft. **Eric Williams:** Conceptualization, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Aguilar-Hernandez, G.A., Rodrigues, J.F.D., Tukker, A., 2020. Macroeconomic, social and environmental impacts of a circular economy up to 2050: a meta-analysis of prospective studies. J. Clean. Prod. 278, 123421. https://doi.org/10.1016/j.jclepro.2020.123421.

Aguinis, H., Solarino, A.M., 2019. Transparency and replicability in qualitative research: the case of interviews with elite informants. Strat. Manag. J. 40, 1291–1315. https://doi.org/10.1002/smj.3015.

Ahuja, G., Soda, G., Zaheer, A., 2011. The genesis and dynamics of organizational networks. Organ. Sci. 23, 434–448. https://doi.org/10.1287/orsc.1110.0695.

Aid, G., Eklund, M., Anderberg, S., Baas, L., 2017. Expanding roles for the Swedish waste management sector in inter-organizational resource management. Resour. Conserv. Recycl. 124, 85–97. https://doi.org/10.1016/j.resconrec.2017.04.007.

Ashton, W.S., Bain, A.C., 2012. Assessing the "short mental distance" in eco-industrial networks. J. Ind. Ecol. 16, 70–82. https://doi.org/10.1111/j.1530-9290.2011.00453.x.

Baah, C., Jin, Z., Tang, L., 2020. Organizational and regulatory stakeholder pressures friends or foes to green logistics practices and financial performance: investigating corporate reputation as a missing link. J. Clean. Prod. 247, 119125. https://doi.org/10.1016/j.jclepro.2019.119125.

Bank, N., Fichter, K., Klofsten, M., 2017. Sustainability-profiled incubators and securing the inflow of tenants—The case of Green Garage Berlin. J. Clean. Prod. 157, 76–83. https://doi.org/10.1016/j.jclepro.2017.04.123.

Barney, J.B., 2018. Why resource-based theory's model of profit appropriation must incorporate a stakeholder perspective. Strat. Manag. J. 39, 3305–3325. https://doi.org/10.1002/smj.2949.

Battistoni, C., Barbero, S., 2019. Systemic incubator for local ecoentrepreneurship to favour a sustainable local development: guidelines definition. Des. J. 22 (Suppl. 1), 65–83. https://doi.org/10.1080/14606925.2019.1595851.

Boons, F., Chertow, M., Park, J., Spekkink, W., Shi, H., 2017. Industrial symbiosis dynamics and the problem of equivalence: proposal for a comparative framework. J. Ind. Ecol. 21, 938–952. https://doi.org/10.1111/jiec.12468.

Chertow, M., Ehrenfeld, J., 2012. Organizing self-organizing systems. J. Ind. Ecol. 16, 13–27. https://doi.org/10.1111/j.1530-9290.2011.00450.x.

Chertow, M.R., Park, J., 2016. Scholarship and practice in industrial symbiosis: 1989–2014. In: Clift, R., Druckman, A. (Eds.), Taking Stock of Industrial Ecology. Springer, New York, pp. 87–116. https://doi.org/10.1007/978-3-319-20571-7_5.

Chiappetta Jabbour, C.J., de Sousa Jabbour, A.B.L., Sarkis, J., Godinho Filho, M., 2019. Unlocking the circular economy through new business models based on large-scale data: an integrative framework and research agenda. Technol. Forecast. Soc. Change 144, 546–552. https://doi.org/10.1016/j.techfore.2017.09.010.

De Jesus, A., Mendonça, S., 2018. Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. Ecol. Econ. 145, 75–89. https://doi.org/10.1016/j.ecolecon.2017.08.001.

Domenech, T., Bleischwitz, R., Doranova, A., Panayotopoulos, D., Roman, L., 2019. Mapping industrial symbiosis development in Europe - typologies of networks, characteristics, performance and contribution to the Circular Economy. Resour. Conserv. Recycl. 141, 76–98. https://doi.org/10.1016/j.resconrec.2018.09.016.

Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Hultink, E.J., 2017. The Circular Economy – a new sustainability paradigm? J. Clean. Prod. 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048.

Geng, Y., Doberstein, B., 2008. Developing the circular economy in China: challenges and opportunities for achieving 'leapfrog development. Int. J. Sustain. Dev. World Ecol. 15, 231–239. https://doi.org/10.3843/susdev.15.3:6.

Geng, Y., Zhu, Q., Doberstein, B., Fujita, T., 2009. Implementing China's circular economy concept at the regional level: a review of progress in Dalian, China. Waste Manag. 29, 996–1002. https://doi.org/10.1016/j.wasman.2008.06.036.

Ghali, M.R., Frayret, J.-M., Ahabchane, C., 2017. Agent-based model of self-organized industrial symbiosis. J. Clean. Prod. 161, 452–465. https://doi.org/10.1016/j.jclepro.2017.05.128.

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. J. Clean. Prod. 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007.

Glaser, B.G., Strauss, A.L., 1967. The Discovery of Grounded Theory: Strategies for Qualitative Research. Aldine Transaction, New York.

Gliedt, T., Hoicka, C.E., Jackson, N., 2018. Innovation intermediaries accelerating environmental sustainability transitions. J. Clean. Prod. 174, 1247–1261. https://doi.org/10.1016/j.jclepro.2017.11.054.

Government of Trinidad and Tobago, 2017. Vision 2030 national development strategy 2016 - 2030. https://doi.org/10.18356/d894ab6d-en.

Government of Trinidad and Tobago, 2018. National environmental policy of Trinidad and Tobago 2018. https://doi.org/10.30875/af560ee8-en.

Gulati, R., Nohria, N., Zaheer, A., 2000. Strategic networks. Strat. Manag. J. 21, 203–215. https://doi.org/10.1002/(sici)1097-0266(200003)21:3%3C203::aid-smj102%3E3.0.co;2-k.

Güler, K., 2019. Towards a Theory of Platform Firms: Introducing the Platform Firm as the Latest Organizational Innovation. Academy of Management Annual Conference. https://doi.org/10.5465/ambpp.2019.12549abstract. Boston, MA.

Hein, A.M., Jankovic, M., Farel, R., Yannou, B., 2015. A conceptual framework for eco-industrial parks. In: ASME 2015 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. American Society of Mechanical Engineers Digital Collection, ISBN 978-0-7918-5711-3. https://doi.org/10.1115/detc2015-46322.

Hoogendoorn, B., Van der Zwan, P., Thurik, R., 2019. Sustainable entrepreneurship: the role of perceived barriers. J. Bus. Ethics 157 (4), 1133–1154.

Jawad, Z.F., Ghayyib, R.J., Salman, A.J., 2020. Microstructural and compressive strength analysis for cement mortar with industrial waste materials. Civil Engineering Journal 6 (5), 1007–1016. https://doi.org/10.28991/cej-2020-03091524.

Jeong, Y.C., Kim, T.Y., 2019. Between legitimacy and efficiency: an institutional theory of corporate giving. Acad. Manag. J. 62, 1583–1608. https://doi.org/10.5465/amj.2016.0575.

Kahupi, I., Hull, C.E., Okorie, O., Millette, S., 2020. Building competitive advantage with sustainable products—A case study perspective of stakeholders. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2020.125699.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., Hekkert, M., 2018. Barriers to the circular economy: evidence from the European Union (EU). Ecol. Econ. 150, 264–272. https://doi.org/10.1016/j.ecolecon.2018.04.028.

Küçüksayraç, E., Keskin, D., Brezet, H., 2015. Intermediaries and innovation support in the design for sustainability field: cases from The Netherlands, Turkey and the United Kingdom. J. Clean. Prod. 101, 38–48. https://doi.org/10.1016/j.jclepro.2015.03.078.

Kumar, V., Sezersan, I., Garza-Reyes, J.A., Gonzalez, E.D.R.S., Al-Shboul, M.D.A., 2019. Circular economy in the manufacturing sector: benefits, opportunities and barriers. Manag. Decis. 57, 1067–1086. https://doi.org/10.1108/md-09-2018-1070.

Lewandowski, M., 2016. Designing the business models for circular economy—towards the conceptual framework. Sustainability 8, 43. https://doi.org/10.3390/su8010043.

Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. J. Clean. Prod. 115, 36–51. https://doi.org/10.1016/j.jclepro.2015.12.042.

Liu, M., Hull, C.E., Hung, Y.T.C., 2017. Starting open source collaborative innovation: the antecedents of network formation in community source. Inf. Syst. J. 27, 643–670. https://doi.org/10.1111/isj.12113.

Lombardi, D.R., Laybourn, P., 2012. Redefining industrial symbiosis. J. Ind. Ecol. 16, 28–37. https://doi.org/10.1111/j.1530-9290.2011.00444.x.

Marconatto, D., Ladeira, W.J., Wegner, D., 2019. The sustainability of solidarity economy organizations: an empirical investigation. J. Clean. Prod. 228, 1122–1130. https://doi.org/10.1016/j.jclepro.2019.04.352.

McDowall, W., Geng, Y.-J., Huang, B., Bartekova, E., Bleischwitz, R., Turkeli, S., Kemp, R., Doménech, T., 2017. Circular economy policies in China and Europe. J. Ind. Ecol. 21, 651–661. https://doi.org/10.1111/jiec.12597.

Mendoza, J.M.F., Gallego-Schmid, A., Azapagic, A., 2019. Building a business case for implementation of a circular economy in higher education institutions. J. Clean. Prod. 220, 553–567. https://doi.org/10.1016/j.jclepro.2019.02.045.

Meyer, J.W., Rowan, B., 1977. Institutionalized organizations: formal structure as myth and ceremony. Am. J. Sociol. 83, 340–363. https://doi.org/10.1086/226550.

Mileva-Boshkoska, B., Rončević, B., Uršič, D.E., 2018. Modeling and evaluation of the possibilities of forming a regional industrial symbiosis networks. Soc. Sci. 7 https://doi.org/10.3390/socsci7010013.

Millette, S., Hull, C.E., Williams, E., 2020. Business incubators as effective tools for driving circular economy. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2020.121999.

Millette, S., Williams, E., Hull, C.E., 2019. Materials flow analysis in support of circular economy development: plastics in Trinidad and Tobago. Resour. Conserv. Recycl. 150, 104436. https://doi.org/10.1016/j.resconrec.2019.104436.

Morgan, G., Smircich, L., 1980. The case for qualitative research. Acad. Manag. Rev. 5, 491–500. https://doi.org/10.5465/amr.1980.4288947.

Mortensen, L., Kørnøv, L., 2019. Critical factors for industrial symbiosis emergence process. J. Clean. Prod. 212, 56–69. https://doi.org/10.1016/j.jclepro.2018.11.222.

Nsanzumuhire, S.U., Groot, W., 2020. Context perspective on university-industry collaboration processes: a systematic review of literature. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2020.120861, 120861.

Omoloso, O., Wise, W.R., Mortimer, K., Jraisat, L., 2020. Corporate sustainability disclosure: a leather industry perspective. Emerging Science Journal 4 (1), 44–51. https://doi.org/10.28991/esj-2020-01209.

Patnaik, J., Bhowmick, B., 2020. Promise of inclusive innovation: a re-look into the opportunities at the grassroots. J. Clean. Prod. 121124 https://doi.org/10.1016/j.jclepro.2020.121124.

Pourahmadi, A., Ebadi, T., Nikazar, M., 2017. Industrial wastes risk ranking with TOPSIS, multi criteria decision making method. Civil Engineering Journal 3 (6), 372–381. https://doi.org/10.28991/cej-2017-00000098.

Retamal, M., 2017. Product-service systems in Southeast Asia: business practices and factors influencing environmental sustainability. J. Clean. Prod. 143, 894–903. https://doi.org/10.1016/j.jclepro.2016.12.032.

Saavedra, Y.M.B., Iritani, D.R., Pavan, A.L.R., Ometto, A.R., 2018. Theoretical

contribution of industrial ecology to circular economy. J. Clean. Prod. 170, 1514–1522. https://doi.org/10.1016/j.jclepro.2017.09.260.
Salmenperä, H., Pitkänen, K., Kautto, P., Saikku, L., 2020. Critical factors for enhancing the circular economy in waste management. J. Clean. Prod. 280, 124339. https://doi.org/10.1016/j.jclepro.2020.124339.
Scott, W.R., 2005. Institutional theory: contributing to a theoretical research program. In: Smith, K.G., Hitt, M.A. (Eds.), Great Minds in Management: the Process of Theory Development, vols. 460–485. Oxford University Press, London, UK.
Siskos, I., Van Wassenhove, L.N., 2017. Synergy management services companies: a new business model for industrial park operators. J. Ind. Ecol. 21, 802–814. https://doi.org/10.1111/jiec.12472.
Strauss, A., Corbin, J.M., 1990. Basics of Qualitative Research: Grounded Theory Procedures and Techniques. Sage, Thousand Oaks, CA, US. https://doi.org/10.1007/bf00988593.
Suddaby, R., 2006. From the editors: what grounded theory is not. Acad. Manag. J. 49, 633–642. https://doi.org/10.5465/amj.2006.22083020.
Tang, Z., Hull, C.E., 2012. An investigation of entrepreneurial orientation, perceived environmental hostility, and strategy application among Chinese SMEs. J. Small Bus. Manag. 50, 132–158. https://doi.org/10.1111/j.1540-627x.2011.00347.x.
Tiba, S., van Rijnsoever, F., Hekkert, M.P., 2020. The lighthouse effect: how successful entrepreneurs influence the sustainability-orientation of entrepreneurial ecosystems. J. Clean. Prod. 121616. https://doi.org/10.1016/j.jclepro.2020.121616.
Townsend, T., Cochran, K., 2007. Recycling gypsum drywall recovered from deconstruction projects: a technology and market overview. http://www.eurogypsum.org/wp-content/uploads/2015/05/N146.pdf. (Accessed 7 October 2020).
Velter, M.G.E., Bitzer, V., Bocken, N.M.P., Kemp, R., 2020. Sustainable business model innovation: the role of boundary work for multi-stakeholder alignment. J. Clean. Prod. 247, 119497. https://doi.org/10.1016/j.jclepro.2019.119497.
World Bank, 2020. World Bank Open Bank. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD.
Yu, F., Han, F., Cui, Z., 2015. Evolution of industrial symbiosis in an eco-industrial park in China. J. Clean. Prod. 87, 339–347. https://doi.org/10.1016/j.jclepro.2014.10.058.
Yuan, Z., Bi, J., Moriguichi, Y., 2008. The circular economy: a new development strategy in China. J. Ind. Ecol. 10, 4–8. https://doi.org/10.1162/108819806775545321.