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Disruptive Innovation that could sustain our existence: An analysis of interventions that have proved effective at developing the Circular Economy (CE) implementation capabilities of practitioners.

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Title

Disruptive Innovation that could sustain our existence: An analysis of interventions that have proved effective at developing the Circular Economy (CE) implementation capabilities of practitioners.

Track: Innovation. Eco-Innovation and the environmental challenge

Summary

The recent IPCC report advised: “*climate change is a grave and mounting threat to our wellbeing and a healthy planet*” (2022 p6) underlining the importance of organisations developing Circular Economy (McArthur, 2015) innovation strategies and operational plans. This paper provides insights for practitioners, academics and policymakers on the innovative and effective pedagogical approaches to enhancing the circular economy (CE) implementation capabilities of practitioners. The paper reviews published grey and academic literature on the circular economy (CE) development interventions (programmes, courses, workshops, networks, CoPs, etc.) that are available to practitioners in Wales, a region of the UK, and comments on their efficacy in terms of developing practitioner CE implementation capabilities. We focus on the pedagogy of the interventions identified and outline how they have successfully developed processes to implement CE principles within organisations. The paper will comment on empirical data collected through a survey and twenty-one semi structured interviews.

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Abstract

This paper begins to address the significant gap in the understanding of how organisations effectively develop CE understanding and innovation capability in terms implementing CE principles within their organisations (Goyal et al, 2021). The IPCC report advised: “*climate change is a grave and mounting threat to our wellbeing and a healthy planet*” (2022 p6) underlining the importance of organisations developing Circular Economy (MacArthur, 2015) innovation strategies and operational plans, to avert the existential threat humans face. The paper provides insights for practitioners, academics, and policymakers on the effective pedagogical approaches to enhancing the CE implementation capabilities of practitioners. The paper reviews published grey and academic literature circular economy (CE) development interventions (programmes, courses, workshops, networks, CoPs, etc.) that are available to practitioners in Wales, a region of the UK, and comments on their efficacy in terms of developing practitioner CE implementation capabilities. We focus on the pedagogy of the interventions identified and discuss the mechanisms employed that enable practitioners to understand and subsequently implement CE principles within their organisations. The paper presents empirical data collected through a survey to practitioners and twenty-one semi

structured interviews. This study reveals the complexity of new CE process implementation at the firm level and the processes adopted by organisations that have successfully implemented CE principles. Theoretical and practical implications are discussed.

Key Words: Circular Economy; Innovation; Regional innovation; Pedagogy; Development.

Introduction

The recent IPCC report advised: “*climate change is a grave and mounting threat to our wellbeing and a healthy planet*” (2022 p6) underlining the importance of organisations developing Circular Economy (McArthur, 2015) innovation strategies and operational plans. The Welsh Government clearly stated its aim of transitioning to a Circular Economy within their ‘Beyond Recycling’ strategy (Welsh Government, 2021). This paper analyses the approaches taken by organizations, predominantly SMEs, in adopting CE principles. The paper found a paucity of published literature that focuses on the implementation of CE principles (Goyal et al, 2021). The paper suggests that policymakers should better understand and promote the most effective pedagogical approaches and interventions that support CE implementation to avert the stark warning from the IPCC (2022).

The Ellen MacArthur Foundation defines the circular economy as ‘*an industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models*’ (MacArthur, 2013). The numerous academic definitions of the circular economy have not helped practitioners engage with the concept (Garcia-Barragan, Eyckmans & Rousseau, 2019) despite the theory being promoted as critical to organisational, regional and national economic sustainability. There is a paucity of published academic research and theory is needed to inform practice (Klein, Ramos & Deutz, 2021). Clifton & Walpole (2023) suggest very few SMEs fully understand the CE term and less than ten percent of SMEs have developed innovation plans to operationalise the term. Most papers written on the development of CE capabilities begin by placing it within the teaching of sustainable development and are associated with further and higher education, within schools of engineering, management, and urban geography (González-Domínguez et al., 2020; Sumter et al., 2021). Webster (2007) argued that most sustainable development education was teaching ecological modernisation, environmental management or the greening of current forms of production and consumption.

To address existing research gaps, this paper makes the following contributions. **Firstly**, the conceptual muddle suffered by firms is addressed by a review of published grey and academic literature to illuminate the dearth of available CE interventions and arrange them into a taxonomy or matrix that provides practitioners with a roadmap of available CE content

and resources. **Secondly**, the pedagogical approaches of existing interventions and resources are reviewed, and their efficacy is evaluated based on published reports to provide policymakers and practitioners with timely insights and to address the paucity of CE implementation (Kirchherr and van Santen, 2019). **Thirdly**, this study presents quantitative and qualitative data collected from practitioners to report on the pedagogical approaches employed to implement CE principles and the efficacy of available interventions designed to implement CE principles. This study offers a key contribution as the first study to present empirical data that reports on the implementation pedagogy of circular economy principles in organisations and presents a review of practitioner perspectives within a region of the UK, Wales, where a CE transition strategy has been published (Welsh Government, 2021). Moreover, we aim to answer the call for research that reviews the efficacy of approaches to implement CE within organisations Scalabrino et al. (2022). Therefore, the study presents two research questions: ‘What pedagogical methods have been employed by CE interventions that have proved effective at supporting practitioners to implement CE principles and what pedagogical methods have organisations employed to that have successfully implemented CE principles, where formal interventions have not been engaged?’

Literature

A structured literature review was conducted to identify, select and synthesise academic research relating to effective CE interventions and their associated pedagogical methods. The literature review also considered literature reporting on organisational approaches to implementing CE principles. This section provides context to the CE academic literature, exploring contemporary approaches to CE development and the contemporary learning theories (pedagogies) employed.

Academic research has grown considerably since the Ellen McArthur Foundation popularised the CE concept with seminal publications in 2013 and 2015. The literature highlights a proliferation of CE definitions and subsequent critique of the field (Kirchherr and Piscicelli, 2019; Kirchherr, Reike and Hekkert, 2017). Presently, the most common conceptualisation of CE is the ‘how to’ logic of combining a reduction of waste, re-use and recycling of materials and products (Ness and Xing, 2017). It is argued there is too much emphasis on generating wealth and jobs, especially in the developed world (Kirchherr, 2021) and too much emphasis on economic growth as measured by GVA (Raworth, 2017). There is less emphasis on slow economy and de-growth, synergistic with sustainable development. A ‘conceptual muddle’ exists (Kirchherr, Reike and Hekkert, 2017) and therefore ways of either imparting or creating new CE knowledge varies (Kirchherr and van Santen, 2019). As a result, there is a danger that the CE ‘concept’ may fail to cohere and may remain in a deadlock due to permanent conceptual contention, in research terms and in terms of CE practitioner understanding. This could be addressed by the analysis and description of effective CE interventions and approaches adopted by organisations that have successfully implemented CE principles.

Pedagogy Literature

The contemporary literature primarily focuses on how to develop the CE through the teaching of sustainable development principles to students and practitioners. However, contemporary authors argue sustainable development teaching is very unlikely to transform mindsets and achieve CE transition, it will require different teaching approaches (Kopnina, 2018). The literature suggests that in addition to moving on from *education as usual* and embedding systems and critical thinking, application of new pedagogies should be explored. Lange et al. (2022) in their article *Re-Organise* suggest that prevailing educational taxonomies, such as Bloom's (1956) taxonomy may not be sufficient to align with CE learning and development because it lacks a high-level focus on system thinking, self-organisation, emergent and self-directed learning. Lange et al. (2022) argued that CE requires working with a diverse group of people, worldviews, and technologies, and therefore a different taxonomy of learning is required.

Most papers written on the development of CE capabilities begin by placing it within the teaching of sustainable development and are associated with further and higher education, within schools of engineering, management, and urban geography (González-Domínguez et al., 2020; Sumter et al., 2021). Webster (2007) argued that most sustainable development education was teaching ecological modernisation, environmental management or the greening of current forms of production and consumption. However, contemporary commentators (Kirchherr and Piscicelli, 2019; Kirchherr, Reike and Hekkert, 2017; Kirchherr, 2019) argued for a clear conceptualisation of the CE to ensure CE policy and curricula are developed with common goals.

All education programmes and interventions are underpinned by theories of learning (pedagogies) to achieve learning outcomes. Research on the application of contemporary pedagogies in teaching CE suggests systems thinking, critical thinking skills, collaborative problem solving, decision making, and teamwork have all featured in contemporary CE curriculum (Scalabrino et al, 2022). Critical thinking and systems thinking are crucial to transition from unsustainable business models and lifestyles to a functioning circular economy (Kirchherr and Santen, 2019). Scalabrino et al. (2022) highlights the need for critical thinking and disruptive innovation in many global consumer-based and production-focused organisations. Research suggests that 'tier one producers' can influence and encourage transition to a circular economy if they can develop more critical and reflective leadership throughout their organisations to support the transition to a circular economy (Huckle 2012; Kopnina, 2018).

Peer to peer interaction, individual feelings, human values, systems perspectives and the need for reflective and critical thinking are crucial parts of contemporary CE pedagogy (Walpole et al., 2022; Scalabrino et al., 2022; Bugallo-Rodríguez and Vega-Marcote, 2020; Kopnina, 2018). Constant re-evaluation and re-assessment of both personal and organisational behaviours are vital for successful CE implementation. It is argued CE pedagogical development should embrace workplace and life contexts and embrace lifelong learning

principles (Schumacher, 1997). It should seek to empower a person or organisation to make informed choices and changes that help transform self, organisation and society as a whole. CE pedagogy needs to offer in-depth CE experiences that stimulate transformative, high level learning experiences (Sterling, 2011; Liu et al, 2022). Scalabrino et al. (2022) suggests pedagogies that engage students in applying models and embed reflective learning are often both inspirational and challenging, as they ask learners to question organisational and personal assumptions as well as existing strategic priorities. Walpole et al (2022) suggest interventions that embed Social Learning theory (Bandura, 1977) and reflective practice (Gibbs, 1988) within a programme that formally creates and supports ‘networks of change makers’ (Hanna et al., 2018), can bridge the gap between national and regional development, in the form of Communities of Practice (Lave & Wenger, 1991). Communities of Practice offer an established foundation for connecting practitioners with a shared interest (domain), hitherto primarily used to facilitate knowledge transfer across expert communities which enables practitioners to improve their reactions to uncertain and complex situations (Agrifoglio et al., 2021). Existing research suggests further exploration of collaborative innovation, using case studies, to substantiate claims and evaluate benefits of collaborative versus bureaucratic innovation (Torfing, 2018).

Marouli (2016) reviewed the different educational approaches to developing CE capability and suggested the transition to a CE requires a significant systemic transformation that requires changes at the social, structural and the individual level. She argues the transition requires a change in basic assumptions (paradigm shift) with more focus on the big picture (systemic change) and empowerment of people across society. Marouli (2016) suggests education that supports leading individual and organisational change, innovation processes, social transformation and collaborative working is required.

The published research on the diffusion of innovation suggests that systems thinking methodologies (ISO standards, Lean thinking, Six Sigma), that positions firms within supply chains and sectors, present similar challenge to CE learning (Marouli, 2016). The sustainability impact of CE practices is typically addressed through the environmental dimension, neglecting the social and economic dimensions. The prevalence of narrow approaches to sustainability in manufacturing leads to a risk that circular economy implementation efforts will fail to provide solutions that are socially, environmentally, and economically beneficial. Therefore, an integrated approach to understanding CE that positions organisations within their region and their supply chains is required to support the transition to a CE effectively. Some authors suggest the diffusion of CE knowledge to organisations can be achieved through greater collaboration with business advisers and supply chain partners so that platforms for collaboration and learning can lead to enhanced inter-organisation collaborations (Ritzén and Sandström, 2017; Dora, 2019). Mishra et al. (2021) suggests this could be through company interaction, within a supply chain, a sector or a region and collaborative working could allow experimentation, creating a structured process to new service solution development that could be augmented with better use of data to enhances learning and the potential of new CE ventures.

Contemporary Executive Education and Work-based Learning pedagogy

To provide context for the reader an analysis of the contemporary pedagogical approaches to Executive Education and Work based learning (WBL) or practitioner development is provided. This section will provide more details on the different pedagogical approaches, models and frameworks for CE practitioners. This section will also provide a critical analysis of high-level learning pedagogies which support practitioners, namely executive education, continuous professional development (CPD) and work-based learning (WBL). It focuses on pedagogies which are participative, underpinned by contemporary learning theory and shown to be effective in support the translation of CE learning into practice.

Helyer (2015) suggests work-based learning (WBL) offers a deeper, broader and '*lived experience*' focal point to its teaching pedagogy and research structure. Such an approach is underpinned by social learning theories which support participation, reflection, and application of knowledge. This postmodern approach, challenges views of learning as a simple, structured activity and recognises work-based learning as something more dynamic and uncertain that happens over time, in any situation, and not just to '*self*' but to, and with, other '*key actors*' (Costley et.al, 2010; Smith and Smith, 2015; Helyer, 2015).

Education in general is dominated by an approach to learning which sees knowledge as something to be acquired. Freire's (1970) '*banking*' concept of education whereby education is an act of depositing knowledge, in which the students are the depositories, and the teacher is the depositor. This has been the dominant '*didactic*' approach across UK education sectors until recently, reducing learning to a simple form of transfer, tending to miss the socio-cultural environment the learner operates in, whether that be at school or in the workplace. Social learning approaches underplay the '*sage on the stage*' role and recognise that knowledge is socially constructed where learning is hopefully more *self-paced and self-directed* with the tutor, in time acting as a '*guide on the side*' (Jones and Steeples, 2002). All learners need knowledge, that tends to come from '*experts*' and yet too much emphasis is placed on expert knowledge. Exploiting practitioners' workplace experience is seen as valuable for learning within a work-based learning context (Smith and Smith, 2015). Social learning approaches and social constructivism suggest that knowledge development occurs because of social interaction and that learning is a shared experience, resulting from multiple social processes and interactions (Vygotsky, 1978). Within socio-cultural theory, learning takes place with engagement in everyday activities such as *practice* in the workplace. Rogoff and Lave (1984) propose that workplace *activity* structures cognition and learning. Rogoff's (1991) research focuses on participation and processes of *guided participation* which involves *building bridges* between learner and facilitator through collaborative working and '*learning their way forward*' (Rogoff and Lave, 1984). Postmodern learning approaches place greater emphasis on the varieties of constructed experience and beliefs and regard knowledge and learning as far less uniform and pre-determined, but more social, disparate, discursive, and varied (Talbot, 2010; Leontiev, 1978; Engeström, 1987; Helyer, 2015). Social learning theories, therefore, see learning as '*situated*' and embedded within activity. Learning arises from participation in a community and gaining

recognised membership within that community (Lave and Wenger, 1991). Therefore, learning designed to impact learner's workplace practices should consider and engage the learner's work practices and work environment.

Contemporary learning interventions promote participative approaches to learning (Hodgson and Reynolds, 2005) where learners co-construct the 'curriculum' and learning to enable a greater impact on what they are seeking to achieve in terms of applied learning outcomes. This dialogical approach to the creation of knowledge encourages transformative learning via critical questioning that enables the learner to challenge underlying assumptions and restructure their perspective and the way they act (Hodgson and Watland, 2004). In turn, this extends learner capabilities and aids the development of '*co-created*' solutions to the learners' workplace challenges providing opportunities for positive impact on their practice, their organisation and in their locality (Howorth et al. 2012). These approaches offer an *applied* learning through the development of workplace solutions and new practices.

Work-based learning and research tends to be *process rich, individualised, self-paced* and *self-directed*. It is invariably identified as '*practitioner-led*' research (Costley, Elliott and Gibbs, 2010), focusing on developing professional and organisational learning and, particularly, on enhancing worker '*effectiveness*'. A small number of UK universities have established research infrastructure for work-based learning, which focuses on 'real time', 'real world' projects that develop practitioner knowledge, skills and understanding that contribute to organisational learning, culture and effectiveness. The research applies situational analysis using reflective practices (Costley and Armsby, 2007), led by practitioners as '*insider-researchers*,' utilising their unique knowledge of work-based projects to produce 'insider-research' (Costley, Elliott and Gibbs 2010).

Work-based research is carried out inside the researcher's own workplace, thus containing a powerful element of social '*situatedness*,' fuelled by behavioural and cultural issues (Vygotsky, 1962; Lave and Wenger, 1991). This *situatedness* arises from the interplay between researcher (their position/role), the people they interact with, the organisational environment in which they operate (issues of hierarchy, power and influence) and the wider business and 'political' contexts in which their organisation operates. 'Insider-researchers' are in a unique position to study a particular issue in depth and, together with their specialist knowledge, skills and understanding and easy access to key people, they can positively change organisational processes and practices. Work-based research is often small scale, specific, improvement oriented and can offer insights to an existing 'community of practice' or community network (Costley, Elliott and Gibbs, 2010).

Contemporary CE interventions

This section outlines some examples of contemporary pedagogical approaches applied to formal university delivered programmes that develop CE knowledge and skills. The CEIC programme for public service practitioners (Walpole et al., 2022) develops innovation knowledge and skills and enhances understanding of CE principles to support implementation

of CE principles within practitioners' workplaces. Participants engage with ten workshops (11 contact days and 11 workplace days) over a ten-month period to enable them to develop and prototype robust CE new service solutions. The programme was developed from a critical realist epistemology and therefore avoids advocating normative models and encourages participants to adopt an abductive approach to their NSS development. In addition, the CEIC pedagogy is informed by Social Learning theory (Bandura, 1977) and addresses the 'Knowing Doing Gap' (Pfeffer & Sutton, 2000) that practitioners face, by supporting practitioners to apply contemporary innovation tools and techniques to the challenges taken into the programme. The participants engage in multiple exercises throughout a two-day residential to develop trust and 'critical friend' relationships. The participants are introduced to Community of Practice (Wenger-Trayner and Wenger-Trayner, 2019) elements and roles to cede agency and to provide the participants with self-governing mechanisms. The programme aims to support the development of a regional CE innovation 'ecosystem' by connecting the CE communities of practice across the Swansea Bay and Cardiff Capital regions (Liu et al, 2022).

Summerton et al. (2019) created a series of CE workshops that foster systems thinking among chemical engineering PhD students. The methods used were a mix of guest speakers, analysis of secondary publications and reports, development of a strategic report and marketing plans for a potential new CE service solution. The assessment also included business case proposals to existing businesses and solving real workplace problems, all within teams. The reported benefits were better communication, greater understanding of a problem from a holistic or 'system' perspective and shared dialogue between academia and industry through the co-design of the workshops.

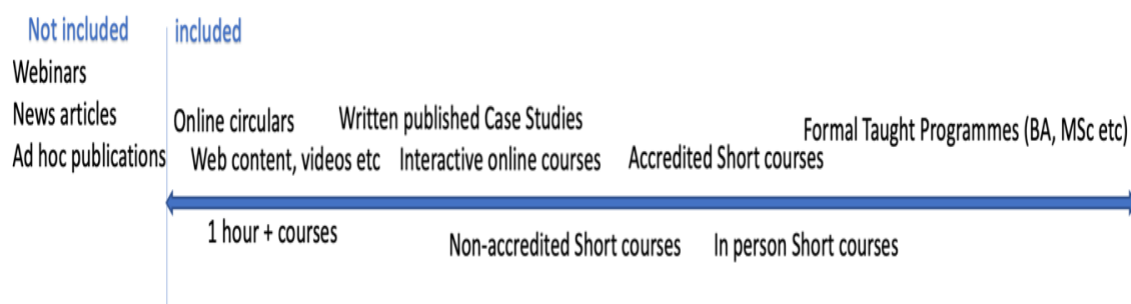
Kircherr and Piscicelli (2019) adopted a similar approach and incorporated gamification, site-visits, and experiments to teach CE principles and used leading papers on CE to design the programme. They engaged their students with the '*Drill Game*,' a group exercise that encourages students to reflect on the main promise of the circular economy. They also offered group exercises that encouraged students to relate the circular economy to industrial symbiosis, sustainability, green economy and biomimicry inspired innovation. Feedback from students was positive, yet students asked for more information at the end of each class. Kircherr (2018) reported on a programme that took students from vocational colleges to work directly with SMEs to support them to develop CE strategies. The students encountered resistance to suggested changes initially as CE futures planning was not on the agenda of SME leaders. Kircherr (2018) also asked university students to reflect on ways in which four selected companies presented their circular products using reflective essay writing and building student critical evaluation skills on CE delivery.

This small group of innovative CE programmes, within higher education show that attempts at applying contemporary pedagogies are being made to foster creativity, critical thinking and apply CE principles. However, the challenge to implement CE principles within organisations and across regions requires leaders within organisations to understand CE principles and requires tangible support for programmes that engage organisations. The nascent research

into effective CE pedagogy suggests CE practitioners should engage with contemporary pedagogical approaches. Showcasing CE case studies and enhancing student workplace engagement is important. There would be value in CE agencies, such as the Ellen MacArthur Foundation, facilitating CE pedagogical partnerships that support transition. There would also be value in policymakers investing in research into effective CE implementation pedagogy and supporting interventions that apply proven contemporary pedagogies. The literature on CE implementation suggests critical thinking, partnership approaches and co-production enable transformative learning. However, there are also challenges of implementing CE learning.

A review of the grey literature was conducted to outline the CE learning landscape in Wales, from publicly available CE content including case studies and videographic content through to accredited and non-accredited short courses and structured programmes. A short review of the wider UK and global picture of the CE learning landscape is also offered, including a critique of ways of implementing CE principles or creating a strategic focus on CE which, over time, can embed CE principles within an organisation's processes and culture. The range of CE interventions assessed is outlined in Figure 1.

Figure 1: Range of interventions considered.



The paper found hundreds of interventions when searching using the parameters outlined in figure 1. The search was part of a separate study funded by [WIN](#), to provide practitioners with a 'road map' to CE resources and interventions (see Figure 2 below). The [CE Capability Development Matrix](#), developed by the researchers, provides a taxonomy to organise the interventions and provide practitioners with an accessible matrix to access CE resources and interventions against their articulated search questions. The capability development matrix was designed based on interviews with thirty practitioners who had searched and access CE interventions. The practitioners advised they wanted a taxonomy or matrix that enabled them to access content and interventions easily and answered the questions 'who is it for, how long does it take, what level of knowledge or skills will it develop and how much is it'.

Figure 2: CE Capability Development Matrix

Capability Level Required	Appropriate interventions for each level (indicative)	intervention type (on-demand or live/in-person attendance)	All organisation members	Groups which require knowledge on circular economy (managers and leader)	Groups which require knowledge and skills to implement circular economy principles
1	poster campaign, newsletter article, awareness raising comms	on demand	X	X	X
2	short videos (5-60 minutes), recorded webinars, podcasts	on demand	X	X	X
3	1 - 3 hours interactive courses, Learn & Share webinars, web content, workplace case studies (adapt & adopt)	on demand or live		X	X
4	1/2 and 1-day training events (not accredited)	live		X	X
5	short courses of 1 to 5 days with interactive content (formal assessed and accredited)	on demand and live, blended		X	X
6	a term/semester couple of weeks or years Further Education & Higher Education modules, ILM, CMI Courses	on demand and live, blended			X
7	weeks or months-long programmes. Challenge-led, Programme Community of Practice (PCoP), peer-based interactive learning, action-learning	live and blended			X

The CE content and interventions are organised into seven levels. The levels are indicative, not prescriptive, and designed to outline what resources are available to help practitioners develop basic knowledge of CE at level 1 and robust knowledge and implementation skills at level 7.

Analysis of the grey literature, which focused primarily on CE case studies and intervention reports in Wales, suggests some organisations and sectors have reacted to funding opportunities and the call from the Welsh Government to move ‘Beyond Recycling’ and implement CE principles or offer CE products or services. The UK and global CE reports analysed highlight the complexity of implementing CE principles and developing CE business models. The emerging pedagogical methods and themes that have facilitated CE implementation are summarised below:

- The CE projects in Wales were innovative in their focus on new product or new process development and implementation.
- A systems-thinking approach and readiness to co-produce solutions is helpful.
- Personal and organizational relationships support CE implementation in local communities (place-based approaches), interventions that develop and mobilize CE lead influencers within regions would accelerate the transition to a CE.
- The development of regional CE eco-systems of businesses, third sector, public sector, and academia (connected nationally) would accelerate the CE transition.
- Informative CE knowledge platforms for CE practitioners, learners, and innovators would accelerate the development of CE knowledge and skills.

- Nascent research suggests inter-organisational challenge-led programmes that support co-production of CE solutions, exchange knowledge and enhance regional capabilities are more effective than traditional programmes
- Existing regional and global supply chains must be challenged to transition to a CE; an interdisciplinary multi-organisational approach with policymakers, academics and business involved would accelerate impact.
- The Welsh Government CE Fund, administered by WRAP Cymru, created numerous valuable CE projects and interventions in Wales.

The grey literature review outlines the nascent pedagogies and interventions that are supporting the transition to a CE. This report will now present the findings from the empirical data collected.

Methodology

To address the research questions a multi-stage methodology was developed and the data analysed with the theoretical framework of Interpretative Phenomenological Analysis (IPA). Quantitative data was obtained via an online survey distributed by employer representative bodies across Wales to their members, the data was anonymised and is presented as summary data below. The questionnaire was accessed by 81 organisations, unfortunately only 27 respondents fully completed the survey. Whilst there is an inevitable danger in verifying the ‘truth’ of such virtual feedback to on-line survey questioning, Hookway suggests the replies *“tell us something about the manner in which specific social and cultural ideas are constructed”* (Hookway, 2008).

An ‘instrumental’ case study approach was utilised to allow the research team to study and analyse emergent general CE principles and phenomena (Stake, 1995; Barbour, 2014). Twenty organisations from across Wales were investigated. The thin case studies varied in their organisational sector, size and approach to CE implementation. The researchers used a semi-structured questionnaire to compile a three page ‘thin case study’ and the interviews were transcribed for thematic analysis. The written thin case studies were complemented by short video clips. Visual materials are a powerful tool for stimulating thinking and generating creative approaches to learning (Barbour, 2014). There was value in capturing evidence of ‘place of work’ video material, which acted as a stimulus for post-project reporting as well as providing material for organisational climate analysis and greater contextual understanding (Mondada, 2012).

The thin academic case studies were drafted to give practitioners insight into existing CE processes and practices and described as case studies for a separate practitioner [report](#). They were developed and written from semi-structured interviews with the organisation leader and obtained from a site visit to obtain video footage, captured by a professional videographer, as well as ethnographic data from the film footage of the sixteen that agreed to be filmed. The twenty-one practitioner case studies were heterogenous, coming from twenty organisations. The organisations varied in their size, structure, and core purpose. Thirteen of the case studies

were businesses, six were social enterprises and one is a public service organisation. Three of the organisations were large (employing more than two hundred and fifty people), four were medium sized organisations and thirteen were small (employing less than 50 FTEs).

Quantitative Data

The report received 81 surveys, only 27 were fully completed and so the data presented below is a summary of the fully completed surveys. The thematic analysis of the interview data is presented in the next section. The survey was sent to employer representative bodies across Wales for distribution to their members. The breakdown of respondents by size and sector is shown below in Figures 4 and 5, it is presented to provide context to the summary data that will be outlined below.

Figure 1: Respondents' Organisations by Size

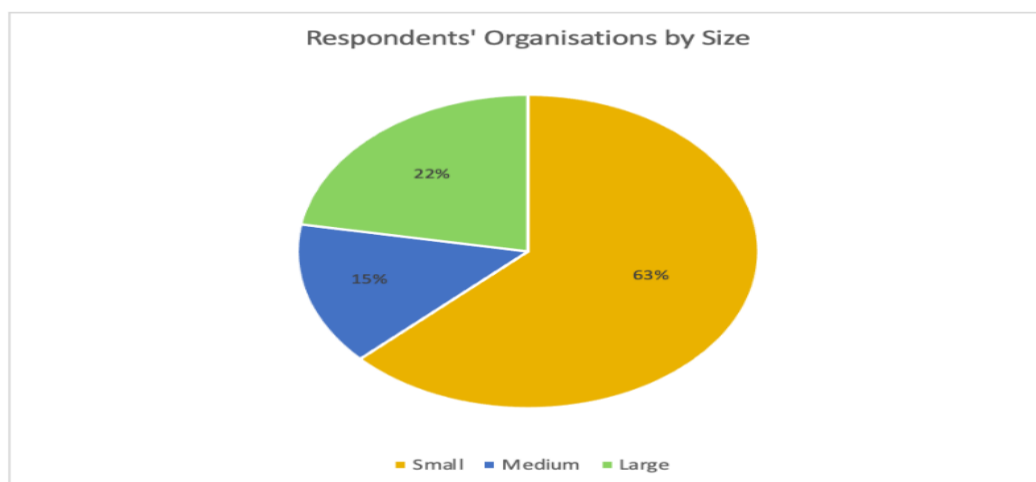
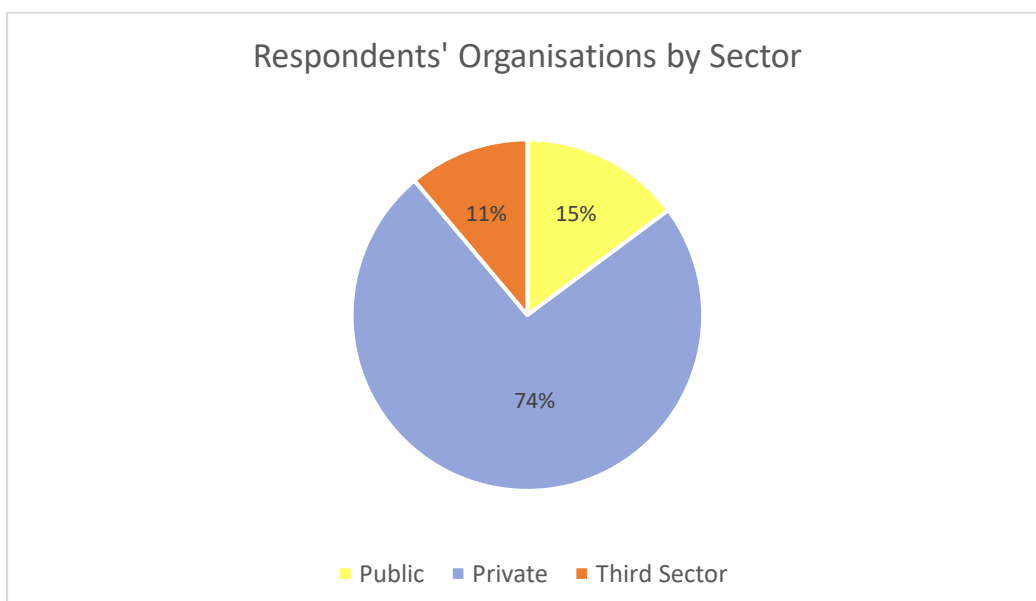
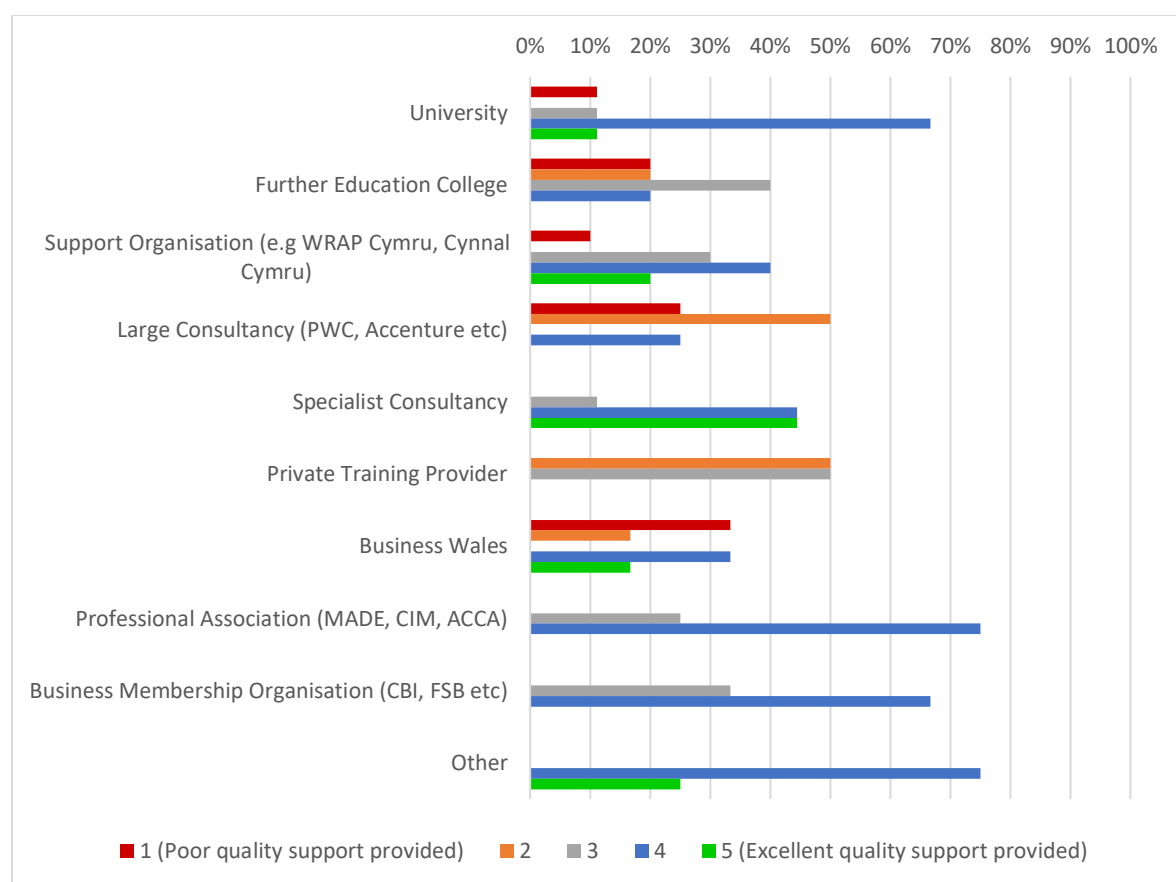


Figure 2: Respondents' Organisations by Sector



The data obtained suggests that awareness of CE principles is low across all organisational sizes and sectors. A minority of organisations have CE principles embedded within their strategy documents and very few have CE related key performance indicators. Most organisations do not have a detailed CE implementation plan. In terms of the pedagogical approach of the organisations that have implemented CE principles with support figure 5 is interesting as it details the view of the support practitioners obtained from various providers in Wales. The data suggests that universities, specialist consultancies, professional associations and business membership organisations have provided effective support.

Figure 53: Which organisation supported you with Circular Economy or Sustainability implementation?



The survey data suggests that wide-ranging CE awareness-raising initiatives and CE development interventions should be prioritised by policymakers if Wales is to transition to a circular economy. The survey data also suggests, based on differing responses across public and private sectors, that tailored circular economy interventions should be developed based on the size and sector of organisations.

Qualitative Data

This report adopted thematic analysis (Spradley, 1979; Flick, Kardoff and Steinke, 2004) to analyse the qualitative data obtained from the twenty semi-structured interviews and video

interviews, to develop key themes. The key findings from the thematic analysis are summarised in the tables 1, 2, and 3 below. The tables outline themes and a classification as they emerged from an analysis of the data related to the pedagogical approach of the organisations. The themes are separated into individual and organisational '*key processes and practices*' and are subsequently analysed against the emergent conceptual themes arising from the literature review.

The organisational learning and development themes identified are outlined in Table 1 below. Many of the organisational leaders have built CE awareness into their internal organisational learning to embed an understanding of innovation aims and engage staff. They advised this enhanced their ability to innovate and embed CE principles within their organisational culture. Approximately 70% of the CE case study leaders referred to the importance of building collective CE insight, facilitated by harvesting local knowledge from colleagues and key project stakeholders which helped build local and regional CE networks and sustainable collaboration. The emphasises on the importance of emergent discourses inside CE organisations and the significance of 'place,' often led to the development of a tangible community engagement in CE activity. Most of the CE case study leaders advised that they regularly accessed reports on UK or global CE projects and initiatives that they could learn from. The Ellen MacArthur Foundation and WRAP UK were repeatedly referred to as helpful CE knowledge platforms. Additionally, the WRAP Cymru website was regarded as particularly useful for innovative ideas, promising practices and funding opportunities. Two thirds of the case study leaders interviewed had a '*Trailblazer*' mindset (UK Government, 2017), which created a learning dynamic within their organisations in turn facilitating the iterative development of CE processes or products.

Table 1: Common Themes: Organisational Learning and Development

Organisational Processes	Organisational learning and development
Management structure	Formal Divisional leads; informal CoPs; Appreciative Inquiry/Task & Finish groups
Organisational culture	Learning culture, CE embedded in daily thoughts and action; intuitive CE 'routines'
Processes and Practices	CE hindsight and foresight in standard workplace processes, internal and external knowledge gathering, collective CE insight
Organisational impact	Robust processes and 'Trailblazer' approach
Networking	Informal learning activity; learning through connecting to peers; CoPs
OD Pedagogy	Internally driven learning approach; organic & holistic CE understanding

The organisational pedagogy themes identified within the data are outlined in Table 2 below. The leaders developed formal and informal processes that encouraged workers to suggest new processes and practices and engage in external knowledge acquisition which enabled iterative knowledge acquisition. Seventy percent of the case study organisations invested in CE knowledge and skills development by supporting workers to engage with CE content. Approximately thirty five percent had developed CE development partnerships with UK universities, which resulted in an iterative and varied approach to CE strategy and operational plans. Leaders encouraged and empowered workers to 'self-organise' and 'critically reflect', to identify diverse ways to develop the organisation, creating innovative processes for constant product and service development. Approximately sixty percent adopted some form of action learning, where workers were encouraged to discuss challenges and develop solutions. The use of situated action learning mechanisms enabled challenges to be discussed and addressed. Approximately sixty percent of the leaders of the organisations employed coaching or mentoring to support staff and enhance individual performance, suggesting coaching and mentoring enhanced productivity.

Table 2: Organisational Pedagogy methods

Summary of Organisational Pedagogy methods
Advanced CE knowledge & skills development through in person and on-line interventions
Learning support processes – coaching and mentoring
Support for ‘test and learn’ and CE process iteration
Appreciative Inquiry ‘strengths based’ approaches
Support for Situated Learning
Communities of Practice internal and networked developments

The individual pedagogy themes identified are outlined in Table 3, below. Seventy percent suggested that finding time to reflect with colleagues on progress and challenges was important, enabling individual and organisational performance review. Fifty five percent put regular feedback sessions in place to reflect on practice and engage in organisational problem-solving. Most suggesting performance discussion mechanisms facilitated learning and making incremental gains in their implementation of CE principles.

Table 3: Individual Pedagogy methods

Summary of Individual Pedagogy methods
Reflective practice
Work-based Learning
Social Learning approach
Growth mind-set
Social purpose
‘Sense-making’ and meta cognition

The data analysis revealed that most CE service/product providers have been set up by values-based individuals with a social purpose that are passionate about contributing to the

CE transition. Their sense of identity and alignment to place facilitated a strong social purpose within the organisational culture. This clear social purpose featured within a workplace culture that encouraged innovative thinking and action. Invariably, this creative workplace culture encouraged learning through an insider researcher approach.

Discussion

The survey results suggest there is a paucity of understanding and implementation of CE principles, within organisations in Wales, consistent with recent assertions made by Clifton & Walpole (2023) and Kirchherr & van Santen (2019). This finding was echoed in the interview data, suggesting a wide range of content and interventions are required to raise CE awareness and develop innovation capabilities. The findings support Mishra et al. (2021) assertion that interventions which support inter-organisation interaction, within a supply chain, a sector or a region are more likely to accelerate CE principles adoption. The data supports nascent research that suggests inter-organisational challenge-led programmes that support co-production of CE solutions are more effective than traditional didactic programmes (Walpole et al, 2022, Liu et al, 2022).

Interviewees advised the proliferation of terms is not helping organisations implement CE, consistent with Kirchherr and Piscicelli (2019) findings. This ‘conceptual muddle’ (Kirchherr, Reike and Hekkert, 2017) could be addressed with concerted and consistent messaging from policy makers as suggested by Kirchherr and Piscicelli (2019) and through interventions that support inter-organisation interaction that develop shared narratives. Many of the organisational leaders have built CE awareness into organisational learning, helping embed CE principles and enhancing innovate capability. This reflective commentary highlights the importance of an ‘on-going narrative’ in organisations (Brown et al., 2005; Boje, 2008) supporting reflective practice and social learning where the individual and the group develop a shared narrative. The data analysis suggests that many of the CE case study organisational leaders are ‘*CE Trailblazers*’ (WEF, 2021), intuitively taking this approach.

The pedagogical approaches of most of the CE case study organisations could be described as social learning (Wenger, 2000) experiences that built processes of mutual, shared knowledge and recognition between workers. The organic elements in their pedagogical approaches were often routes to novel and innovative ideas for new CE processes and products, enabled by leadership that empowered workers to self-organise and critically reflect. These processes enhanced organisational innovation capability and development of new CE products and services, consistent with the processes of innovative, successful organisations like Toyota (Spear, 2009). A consistent theme discovered was the ‘insider researcher’ (Costley, Elliott and Gibbs 2010) approach which built collective knowledge by harvesting local, tacit knowledge from colleagues and key stakeholders which, over time, helped develop regional CE networks and collaborative projects. The interviewees spoke of an awareness of thinking and acting with a CE approach, which helped develop a mutual responsiveness in their work to support local communities and their sense of place and personal identity. This emphasis on the power of diverse thinking and action (Stacey, 2010), was evident in most of the small CE

case study organisations. It aligns with the black box thinking of organisational interaction (Marion, 2008; Mowles, 2011; Syed, 2015), which suggests that success often hinges on powerful counter-intuitive thinking and action borne out of an iterative approach. The learning mechanisms and processes, including in person and on-line communities of practice participation (Wenger, 2000), peer to peer learning, network attendance, coaching and mentoring which help develop a learning organisational culture (Senge, 1990). These social learning processes, via mutual account giving (Mowles, 2011), enabled high levels of understanding and knowledge sharing.

The study findings were consistent what Griffin (2002) described as processes of *organisational improvisation* and *communicative interaction*. Griffin (2002) argues that effective leadership involves influencing the attitudes of others and using work-based learning to enhance worker connectivity and interaction. That occurred in our CE Circular Trailblazers, where pedagogical approaches to CE development were often experiential, pragmatic and action based. The emphasis on the importance of leading learning within an organisation encourages followers to emulate leaders' actions, as suggested by Yukl (2012).

Interviewees described an understanding of their organisation and the CE as a part system, both regional and sectoral (Katz & Khan, 1978). The interviewees described the importance of engaging with local and regional supply chains as well as the imperative of embedding CE principles across the organisation. The interviewees described material flows into and out of their organisation and partnerships that enable by-products to be reused or remanufactured. Kempster and Cope (2010) advised the leadership of SMEs can be idiosyncratic and firm context is an important consideration, suggesting a "*dynamic state between entrepreneur and her or his organisation and the niche market*" (p337) exists. The data gathered supports the assertion that CE is a systems theory and the suggestion of Kempster and Cope (2010) of the relationship between the CE leaders and their context.

Limitations and future research

The study engaged with organisation leaders that have implement CE principles and organisations that offer CE products or services. The findings are grounded upon an analysis of their perceptions, which could be judged subjective. Future research could replicate this study at a larger scale by obtaining greater survey returns and by interviewing more SME leaders. The data would be enhanced by interviewing numerous individuals within each organisation to obtain more robust data on organisational processes and practices. A comparison of different UK regions could also be undertaken to identify similarities and differences within the data.

Conclusions

This study provides useful insights on the pedagogical approaches' organisations have adopted to implement CE principles, within Wales, a region of the UK. If policymakers and

practitioners are to heed the stark warnings of the IPCC (2022) and transition to a CE, this study should be the first of many. The study highlighted the challenges of implementing CE within organisations and the various pedagogical processes and practices that have proved effective. There is a paucity of CE information and content, therefore informative *CE knowledge platforms* for practitioners, learners and innovators would accelerate the development of CE implementation capability. The academic literature reviewed exposed ambiguity in the understanding of how CE innovation is diffused and how organisations effectively develop CE understanding and implementation capability (Goyal et al, 2021). CE education is often taught within sustainable development programmes and so a wider adoption of CE teaching across all subject areas is likely to broaden understanding and increase implementation. Most existing CE development is designed to develop basic knowledge or enhance knowledge and few interventions develop the skills of practitioners to implement CE principles within their context. Cognitive pedagogies dominate current teaching and yet contemporary literature suggests the transition to a CE will require different pedagogical approaches. Therefore, research that further explores the key learning processes and pedagogies that develop practitioners new service solution development skills would be valuable.

The empirical data obtained is consistent with nascent literature on CE organisational development, which suggests ‘self-organisation’ and ‘critical reflection’ are key behavioural elements in the development and sustainability of CE initiatives. Effective CPD/work-based learning mechanisms are required to develop organisational dynamic capabilities that enable implementation of CE principles. The study suggests that social learning (Wenger, 2000) pedagogical practices are effective at developing internal knowledge. An appreciation of systems thinking is required and capabilities that seek out CE ‘disruptive innovation’ are urgently needed across all sectors, which could be developed through inter-organisational programmes and mechanisms like ‘knowledge exchange networks’ or ‘communities of practice’. An organizational ability to develop regional and community partnerships to support a place-based approach is key as the transition to a CE.

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