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Prifysgol Abertawe
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Circular Economy practices of Small to Medium Enterprises in South Wales

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Circular Economy practices of Small to Medium Enterprises in South Wales

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1. Introduction

1.1 Context

This research aimed to gain a better understanding of the Circular Economy (CE) practices of Small to Medium Enterprises (SMEs) in Wales in order to give policy makers a clearer understanding of the challenges of encouraging businesses to incorporate CE practices. Therefore, this report sets out to understand the innovation practices and capabilities of SMEs and their incorporation of CE principles into their continuous improvement (CI) and new product and service development (NPD/SS) processes. Nascent research suggests that SMEs are more likely to adopt CE practices into their NPD/SS processes if they appear to add value for their goods and services[1]. It would therefore appear beneficial to develop the innovative capacity of business in Wales if we are to see business incorporate CE principles into their products and services.

The survey described in this report aimed to provide information to the CESME project, an Interreg Europe project. The CESME project aims to address and improve the effectiveness and impact of policy instruments, stimulating SMEs to overcome years of conventional production methods and shift towards green innovation – and circular economy at best. Specifically, the project aims to provide policy makers with the knowledge and understanding of the potentials within the green economy, and make them aware of the challenges and barriers that SMEs face in this regard. The Wales partner in the CESME project undertook a small research project to understand better the CE practices of SMEs in Wales and the extent of their innovation capabilities and so identify which sectors and size businesses might be more receptive to policy instruments

1.2 Importance of SMEs

The small business sector has become increasingly important to the UK and Welsh economy. The importance of small firms or Small to Medium Enterprises to the UK has increased in recent years. There are currently approximately 5.2 million SMEs in the UK, a record number, which represents 48% of private sector employment in the UK. Between 2003 and 2013, the proportion of employment within SMEs increased by 2.2% in Wales and by 1.8% in the UK. More than 60% of private sector employment in Wales is within SMEs. The majority of active enterprises in Wales are SMEs and account for 99.3% of all enterprises, of which micro enterprises (0-9 employees) account for 94.5% of enterprises[2].

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[1] Janssen, K., L., Stel & Frans. (2017). "Orchestrating partnerships in a circular economy -- a working method for SMEs." Proceedings of ISPIM Conferences.

[2] Watkins, K. (2016). "UK business; activity, size and location: 2016." Office for National Statistics.: 1-10.

The Department of Trade and Industry established a large initiative called 'living innovation' to "encourage UK companies to develop new and improved added value products and services"[3] as policy makers in the UK see an important link between innovation and business and economic growth.   Despite the launch of successive initiatives over the last decade to encourage SMEs to become more innovative only 53% of businesses are 'innovation active'[4].

A UK Government report[5] on innovation in the UK asked businesses to rank constraining factors on their innovation activities and from this identified barriers to innovation. The report highlighted the innovation challenges that SMEs face and suggested this 'market failure' presents policy makers in the UK (in particular Wales) with a productivity challenge. The European Innovation Scoreboard (published by the EU) suggests that the UK lags other countries in terms of its innovation score and the innovation performance of Wales, as a region of the UK, is comparatively poor. The recently published Well-being of Future Generations (Wales) Act (2015) underlined the importance of innovation, its link to productivity and in turn economic performance by allocating a specific 'national indicator' to innovation.

The dearth of research on leadership of innovation and innovation management in SMEs[6] [7] suggests the majority of research on innovation relates to SME performance and economic growth. However, Oke et al (2007) concluded that 'growth pursuant' SMEs, in their study, had a greater focus on incremental or exploitative innovation and that there is a link between incremental innovation and sales turnover growth in SMEs. This study therefore aims to obtain a greater understanding of innovation practices of SMEs, from the data collected, in order to inform potential policy on encouraging the adoption of CE thinking into innovation practices.

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[3] DTI (2004). "A Government Action Plan for Small Business." Small Business Service: 38.

[4] Hooker, H. A., J. (2016). "Headline Findings From the UK Innovation Survey 2015." Department for Business Innovation & Skills.

[5] Hooker, H. A., J. (2016). "Headline Findings From the UK Innovation Survey 2015." Department for Business Innovation & Skills.

[6] McAdam, R., Moffett, S., Hazlett, S. & Shevlin, M. (2010). "Developing a model of innovation implementation for UK SMEs: A path analysis and explanatory case analysis." International Small Business Journal 28(3): 195-214.

[7] Oke, D. A., et al. (2007). "Innovation types and performance in growing UK SMEs." International Journal of Operations & Production Management 27(7): 735-753.

The size or number of employees of SMEs sets them apart from the study of large organisations. The study of SMEs is often separated by their size in terms of employees. The standard classification is *micro* organisations employ less than ten employees, *small* organisations employ more than ten and less than fifty and *medium* sized organisations employ more than fifty and less than two hundred and fifty. The size difference manifests itself in the formality of processes and practices in SMEs as extant research suggests that the level of formality increases with size and therefore micro-organisations have few formal procedures (Storey and Westhead, 1997[8]; Kitching and Blackburn; 2002)[9]. The personality and behavioural characteristics of leaders in small and micro organisations can have a much greater effect than in medium and large organisations as small firms are social entities that revolve around personal relationships[10]. Gibb (2000)[11] suggests that allocation of managerial tasks is often a function of an owner's personal preference and their leadership style. It therefore appears important to engage owners of SMEs in the value of CE innovation.

Small firms also tend to have less capital and so their business decision-making is often short term, small firms are more likely to operate in a limited range of markets, which often reduces their customer base (Burns, 2001). However, the relative size of small firms can lead to behavioural advantages in shorter decision-making cycles, internal flexibility and organisational flexibility (Burns, 2016). Storey and Westhead (1994)[12] suggest that the SME sector in the UK should not be considered as a homogenous entity and managerial practices can vary widely dependent on size and sector characteristics of firms. More recent research from Sullivan-Taylor et al[13] and Battisti & Perry[14] also asserts that the SME sector is heterogeneous.

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[8] Westhead, P. a. D. J. S. (1997). Training Provision and the Development of Small - and Medium-sized Enterprises. Norwich, HMSO.

[9] Kitching, J. a. R. B. (2002). The Nature of Training and Motivation to Train in Small Firms. London, Kingston University.

[10] Burns, P. (2016). Entrepreneurship and Small Business: Start-up, Growth and Maturity. Hampshire, Palgrave.

[11] Gibb, A. A. (2000). "SME Policy, Academic Research and the Growth of Ignorance, Mythical Concepts, Myth, Assumptions, Rituals and Confusion." International Small Business Journal **18**.

[12] Storey, D. J. a. P. W. (1994). "Management Training and Small Firm Performance." International Small Business Journal.

[13] Sullivan-Taylor, B. B., L. (2011). "Creating resilient SMEs: why one size might not fit all." International Journal of Production Research. **49**(18).

[14] Battisi, M. P., M. (2011). "Walking the Talk? Environmental Responsibility from the Perspective of Small-Business Owners." Corporate Social Responsibility and Environmental Management **18**: 172–185

The Storey and Westhead (1994) study also suggests that skills and competencies vary significantly between business sizes. The extant research appears to report heterogeneity in terms of the leadership and innovation practices of SMEs.

1.3 Survey details

The CESME survey comprised a short online questionnaire (27 mostly closed questions) developed using Qualtrics, distributed via email to a purchased distribution list of 4854 SMEs in South Wales (with Swansea, Cardiff and Newport postcodes). Promotion of the survey via LinkedIn provided further access. Follow-up to boost responses comprised two reminders sent by email to this distribution list, and some telephone calls to those participants who had begun the survey but not progressed beyond the opening questions. At survey closure 128 had accessed the survey link. Of these 53 had fully completed the survey and a further nine had completed the majority of the survey questions. This provided 62 substantive responses on which to base analysis.

This gives a response rate of 1.3%. This is a small response rate, however difficulties in engaging SMEs in surveys is known and acknowledged, such as is described by Rasmussen and Thimm[15].

1.4 Respondent information

. Coding of the positions provided indicate a majority of respondents at Director or above as Table 1 below indicates.

Table 1 – Position of respondents

	Number	Percent
Chief Executive	8	12.9%
Partner	4	6.5%
Director	33	53.2%
Manager	9	14.5%
Technical	2	3.2%
Financial	4	6.5%
Not Given	2	3.2%
Total	62	100.0%

Positions of respondents

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[15] Rasmussen, Karsten Boye and Thimm, Heiko (2009): Fact-Based Understanding of Business Survey Non-Response. *Electronic Journal of Business Research Methods Volume 7 Issue 1 (83 - 92)*

The survey asked for the business sector in which their company operates. For the purposes of the analysis, these open responses are coded against some categories used in the BIS Economic Paper No. 18 – Industrial Strategy: UK Sector Analysis[16] with Construction replacing "Other Production" and Retail sector firms split out from "Other Services". This was to provide a useable grouping of respondents into larger sector groups to allow for analysis amongst a small cohort. Table 2 shows the high level categories used and the sectors covered.

Table 2 –Sector categories

Category	Sectors covered
Low-Med-Tech Manufacturing	Food, Beverages and Tobacco Metal, plastic and non-metal mineral products Other manufacturing Shipbuilding
Med-High-Tech Manufacturing	Chemicals ICT & Precision instruments Automotive Aerospace Machinery, Electrical & Transport equipment Pharmaceuticals
Construction	Construction
Knowledge Services	Communications Digital, Creative & Information Services Financial Services Business Services Research & Development Education
Retail	Retail
Other Services	Hotels & Restaurants Transport, Storage & Distribution Real Estate Administrative & Support Services Public Administration & Defence Health & Social Care Community, Social & Personal Services

Based on this categorisation, there are respondents from each group with Med-High-Tech Manufacturing, Knowledge Services and Construction particularly well represented.

Table 3 – Business sectors in which companies operate

	Number	Percent
Low-Med-Tech-Manufacture	6	9.7%
Med-Hi-Tech-Manufacture	17	27.4%
Knowledge Services	20	32.3%
Construction	9	14.5%
Retail	7	11.3%
Other Services	2	3.2%
Not Given	1	1.6%
Total	62	100.0%

Sectors (%)

- Low-med-tech Manuf
- Med-Hi-Tech Manuf
- Construction
- Knowledge Services
- Other Services
- Retail
- Not Given

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[16] https://www.gov.uk/government/publications/industrial-strategy-uk-sector-analysis

The survey asked for company turnover for 2016, 2015 and 2014. The main purpose was to identify any *High Growth Firms[17]* (HGF). Based on the definition in the footnote, only one enterprise could be categorised in this way. This small enterprise (size based on FTE) has introduced two new products or services in the last 12 months but does not have a formal new product or service process. It has also introduced new working practices in the last 12 months, but in this case, it does have a formal process improvement / continuous improvement policy. Unfortunately, the respondent did not answer the questions on the Circular Economy. Of the remaining respondents, where turnover was provided for these years, a further 25 of the 56 answering the question had increased their turnover year by year, but not to the extent to qualify as high growth firms.

The survey also asked for number of full time equivalent employees. Coding the responses into the following bands (based on the categorisation used in the Welsh Government Statistical First Release of 29 November 2016 on the *Size Analysis of Welsh Business 2016* SFR 158/2016[18]) gives the following breakdown.

Table 4 – Size by FTE

	Number	Percent
Micro	15	24.2%
Small	34	54.8%
Medium	13	21.0%
Total	62	100.0%
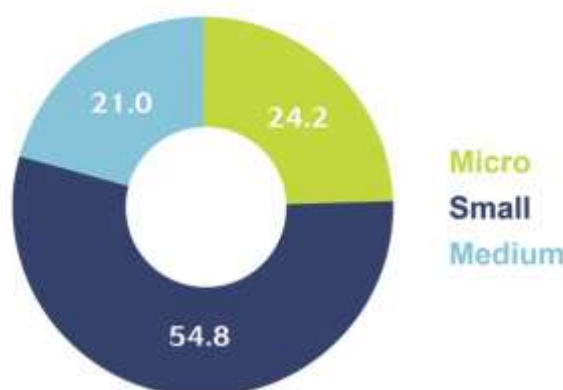
The survey asked if their sector was regulated by a national or international regulator.

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[17] The OECD takes a slightly broader view and defines a high growth business as 'a firm of 10 or more employees that grows **either** its employees or turnover by an average of more than 20 per cent per year for three consecutive years. More recently in the UK the Government has defined high growth businesses growing at 20% pa with the capability of maintaining that rate for 3 years with the increasing sluggishness of the UK economy even this has been revised to growing by 60% over 3 years which equates to 17% pa. http://www.managinghighgrowth.com/hgdef.html

[18] http://gov.wales/docs/statistics/2016/161129-size-analysis-welsh-business-2016-en.pdf

Table 5 - Percentage of respondent companies in a regulated sector

	Number	Percent
Yes	24	38.7%
No	36	58.1%
Don't know	2	3.2%
Total	62	100.0%

Regulated Sector (%)
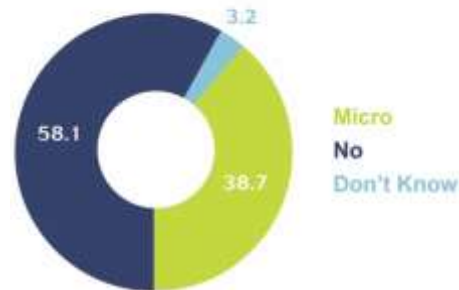
The majority of the respondent organisations operate in unregulated sectors.

1.5 Representativeness of sample

According to the Welsh Government Statistical First Release SFR 158/2016, 99.3% of total enterprises in Wales in 2016 are SMEs.

Table 6 – Size breakdown of enterprises in Wales 2016 from SFR 158/2016

Size	Percent
Micro	94.9%
Small	3.6%
Medium	0.8%
Large	0.7%

In terms of representativeness by size, the respondents are over representative of small and medium sized enterprises compared to the national figures, as tables 4 and 6 above indicate.

In terms of sector representativeness, SFR 158 reports the following number of enterprises by sector in Wales (with sectors mapped to the BIS categories) for the purposes of this report.

Table 7 – Numbers of enterprises in Wales by Sector

SFR 158 Sector	Number of enterprises (thousands)	Percent	BIS sector categories
Production	14.6	5.9%	Low-Med Tech Manufacturing / Med-High Tech Manufacturing
Agriculture, forestry & fishing	16.8	6.7%	Other production
Construction	48.8	19.6%	Other Production
Financial & business services	54.5	21.9%	Knowledge Services
Private sector health & education	28.4	11.4%	Knowledge Services / Other Services
Wholesale, retail, transport, hotels, food & communication	57.5	23.1%	Other Services
Other services	28.8	11.5%	Other Services
Total	249.4	100%	

Based on this data, as Table 3 above indicates, the survey respondents are over representative of the Low-Med Tech and Med-High Tech manufacturing sectors (37% of this survey). There seems a representative sample of enterprises from the Knowledge Services (32% of this survey), and under representation of Construction (14.5% of this survey). The subject of the survey may account for the higher response rate from enterprises within these over represented sectors, although this has not been investigated further.

The small sample size means that it is not possible to draw conclusions with a high confidence level. However, the spread of respondent types does allow indicative conclusions to be drawn, which could be further tested with a larger more statistically representative sample.

2. Analysis of results

2.1 New products and services

Over 77% had introduced new products in the last 3 years, with over 54% introducing new products in the last 12 months.

Table 8 - Introduction of new products or services – ALL respondents

	Number	Percent
12 months	34	54.8%
2 years	9	14.5%
3 years	5	8.1%
Don't know	2	3.2%
No	12	19.4%
Total	62	100.0%

Introduction of new products or services in the last 3 years (%)
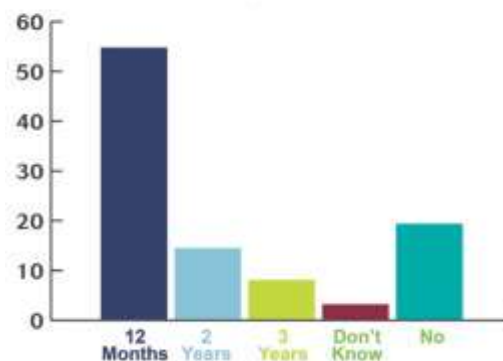
Both respondents coded to the Other Services sector reported introducing new products or services within the last 12 months, with fewest respondents coded to the Retail sector reporting introducing new products or services over the last three years (only a third coded to the Retail sector reported introducing new products or services).

Table 9 - Comparison of introduction of new services or products by sector

Sector	Number of responses					Number of respondents from each sector	% in each sector introducing new products / services
	12 months	2 years	3 years	Don't know	No		
Low-Med-Tech-Manufacture	5	0	0	1	1	7	71.4%
Med-Hi-Tech-Manufacture	10	3	2	0	2	17	88.2%
Construction	5	2	1	1	0	9	88.9%
Knowledge Services	8	4	3	0	5	20	75%
Retail	2	0	0	0	4	6	33.3%
Other Services	2	0	0	0	0	2	100%
Not Given	1	0	0	0	0	1	100%
Totals	34	9	5	2	12	62	77.4%

The largest proportion of respondents' report introducing two new products or services in the last 3 years, although one respondent stated they had introduced 50 (a builders merchant).

Table 10 - Number of new products or services introduced

Number of new products/services introduced	Number of respondents giving this response
1 product	8
2 products	18
3 products	6
4 products	2
5 product	4
6 products	2
4-6 products	1
10 products	2
12+ products	1
25-30 products	1
50 products	1
"Several" products	1

The majority of respondents do not have a formal new product or service development process in place.

Table 11 – Percentage with a formal new product or service development process

Table 11 – Percentage with a formal new product or service development process

	Number	Percent
Yes	19	30.6%
No	41	66.1%
Don't know	2	3.2%
Total	62	100.0%

New Product or Service Development Process (%)

3.2
30.6 Yes
66.1 No
Don't Know
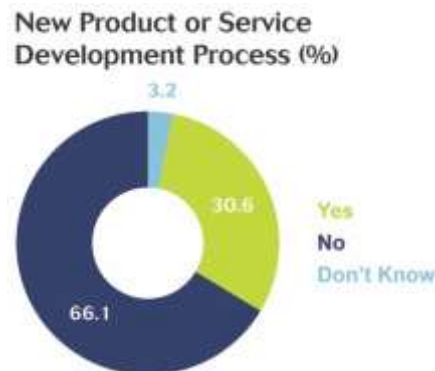
The analysis in Table 12 shows that respondents to this survey with a formal process in place were more likely to have introduced new services or products within the past three years. (95% with a formal process have introduced new products or services compared to 71% without).

Table 12 - Formal process and introduction of new products or services

Formal process	Total number of respondents	Number introducing new product or service	% introducing new product or service
Yes	19	18	94.7%
No	41	29	70.7%
Don't know	2	1	50%
Total	62	48	77.4%

When analysed by size of enterprise based on number of employees, small enterprises are more likely to have a formal new product or service development process.

Table 13 – Formal new product or service process by size of enterprise

	Yes %	No %	Don't know %
Micro	20.0%	80.0%	0.0%
Small	41.2%	55.9%	2.9%
Medium	15.4%	76.9%	7.7%
Total	30.6%	66.1%	3.2%

Analysing by sector, the highest proportion of enterprises with a process for new service or product development is in the manufacturing sector (Low-Med tech and Med-High Tech). Respondents coded to the Knowledge Services and Construction sectors have the lowest percentage of formal new product or services process.

Table 14 - Formal new product or service process by sector

Sector	Yes %	No %	Don't know %
Low-Med-Tech-Manufacture & Med-Hi-Tech-Manufacture	56.5%	43.5%	0%
Construction	11.1%	88.9%	0%
Knowledge Services	10.5%	89.5%	0%
Retail	16.7%	83.3%	0%
Other Services	50.0%	50.0%	0%

Formal new product or service process by sector (%)
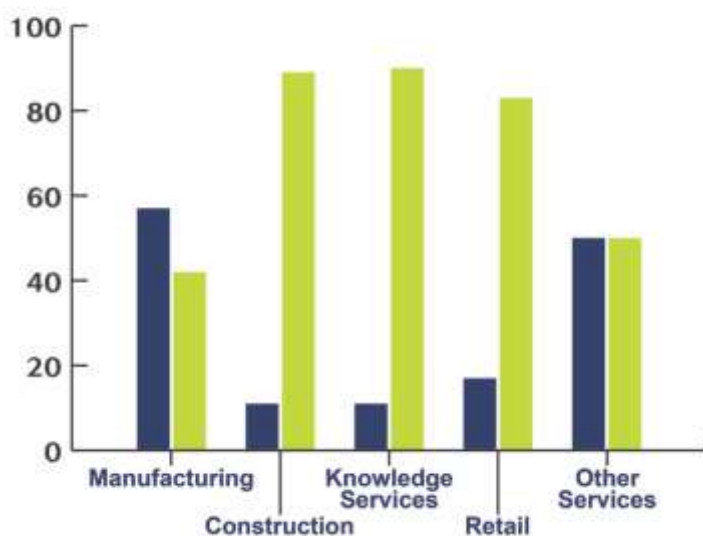
2.2 Processes and working practices

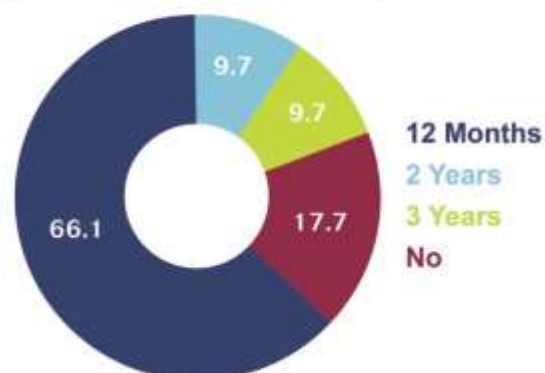The survey asked whether respondents had improved processes or working practices in the last 3 years.

Table 15 - Improvements to processes or working practices in last 3 years

	Number	Percent
12 months	39	62.9%
2 years	6	9.7%
3 years	6	9.7%
No	11	17.7%
Total	62	100.0%

Improved processes or working practices in the last 3 years (%)

63% of respondents had improved processes or working practices within the past 12 months, with 82% having done so in the last three years. Around 18% had not done so. The survey also asked how many processes or working practices they had improved over that period. 47 respondents answered this question, with the number of processes or working practices improved ranging from one to 40. In four cases respondents reported improvements in "all" processes or working practices, while another five stated that this was a continuous, ongoing process.

Analysis of responses by size of enterprise (based on number of employees) shows that there have been recent improvements to processes or working practices across all sizes of enterprises. All medium sized enterprises have introduced improvements to processes in the last three years.

Table 16 - Improvements to processes by size of enterprise

	Micro		Small		Medium	
	N	%	N	%	N	%
12 months	9	60.0%	20	58.8%	10	76.9%
2 years	0	0.0%	4	11.8%	2	15.4%
3 years	1	6.7%	4	11.8%	1	7.7%
No	5	33.3%	6	17.6%	0	0.0%
Total	15	100.0%	34	100.0%	13	100.0%

Improvements to processes or working practices have taken place across all sectors as Table 17 indicates, five respondents coded to the Knowledge management sector, along with one respondent coded to the manufacturing sectors and one to Construction stated that they had not carried out any improvements in the last three years.

Table 17 - Improvements to processes by Sector

	Manufacturing		Construction		Knowledge Services		Retail		Other Services	
	N	%	N	%	N	%	N	%	N	%
12 months	18	75%	7	78%	9	45%	2	33%	2	100%
2 years	3	13%	0	0%	3	15%	0	0%	0	0%
3 years	2	8%	1	11%	3	15%	0	0%	0	0%
No	1	4%	1	11%	5	25%	4	67%	0	0%
Total	24	100%	9	100%	20	100%	6	100%	2	100%

Almost 66% of all respondents have a formal process improvement or continuous improvement policy. When broken down by size of enterprise, based on number of employees, almost all respondents from medium-sized enterprises have formal process improvement or continuous improvement policies (11 of the 12 respondents). Micro enterprises are least likely to have these policies.

Table 18 - Formal process improvement or continuous improvement policy

Formal policy?	N	All respondents %	Micro enterprises	Small enterprises	Medium enterprises
Yes	40	65.6%	46.7%	64.7%	91.7%
No	20	32.8%	53.3%	32.4%	8.3%
Don't know	1	1.6%		2.9%	
Total	61	100%	100%	100%	100%

A higher proportion of respondents from enterprises coded to the manufacturing sectors have a formal policy for process improvement or continuous improvement. (Both respondents coded to Other Services stated that they had a formal process).

Table 19 - Formal process improvement or continuous improvement policy by Sector

Formal policy?	Manufacturing sector	Construction	Knowledge Services	Retail	Other Services
Yes	83%	56%	65%	17%	100%
No	17%	44%	35%	67%	0%
Don't know	0%	0%	0%	17%	0%

39 of the 40 respondents with a formal process improvement or continuous improvement policy in place reported they had improved processes or working practices within the past three years (97.5%) compared with 55% of those respondents that did not have a policy.

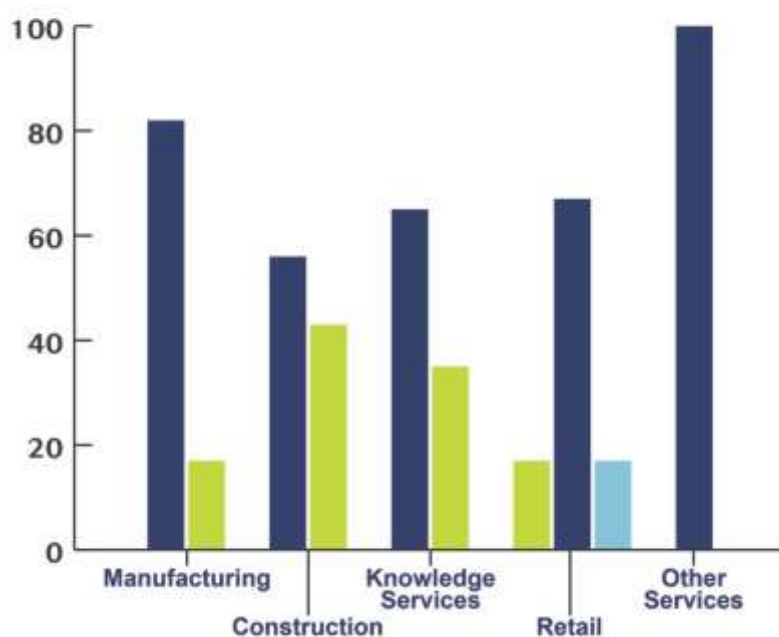## Formal Process Improvement or continuous Improvement Policy (%)

Table 20 - Formal policy and improvements

Formal process in place?	Total number of respondents	Number improving processes	% improving processes
Yes	40	39	97.5%
No	20	11	55.0%
Don't know	2	1	50.0%
Total	62	51	82.2%

Therefore, it appears that having a formal new product or service development process in place does not necessarily lead to the introduction of new products or services. However, it appears that having a formal policy in place to improve processes or working practices does seem to lead to improvements amongst the respondent group.

2.3   Waste reduction

Almost 73% of respondents advised that their company or organisation had a waste management policy or strategy.

**Table 21 - Waste management policy or strategy**

	Number	Percent
Yes	45	72.6%
No	17	27.4%
Total	62	100.0%

Waste Management
Policy or Strategy (%)

27.4

Yes
No

72.6

63% of respondents reported that they had reduced waste through continuous improvement activities.

Table 22 - Have you reduced waste through continuous improvement activities?

	Number	Percent
Yes	38	63.3%
Don't know	9	15.0%
No	13	21.7%
Total	60	100.0%

Waste Reduction Through
Continuous Improvement Activities (%)

21.7

15.0

63.3

Yes
Don't Know
No
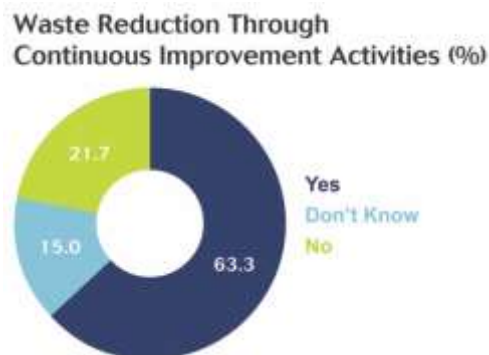
Although the micro enterprise respondents were least likely to have a waste policy in place, a higher proportion of these reported that they had reduced waste through continuous improvement. Conversely, almost 80% of small enterprises report that they have a waste policy or strategy, but only 62% report that they have reduced waste.

Table 23 – Waste policy and reduction by size of enterprise

	Micro		Small		Medium	
	Waste policy	Reduced Waste	Waste policy	Reduced waste	Waste policy	Reduced waste
Yes	60.0%	66.7%	79.4%	62.5%	69.2%	61.5%
No	40.0%	13.3%	20.6%	23.1%	30.8%	23.1%
Don't know	0.0%	20.0%	0.0%	15.4%	0.0%	15.4%
Total	100%	100%	100%	100%	100%	100%

Analysed by sector (in Table 24 below), fewer enterprises coded to the Knowledge Services sector had a waste policy and had reduced waste through continuous improvement, while those coded to the manufacturing sectors or Construction are more likely to have a policy or strategy in place and to have reduced waste.

Table 24 - Waste policy and waste reduction by sector

	Manufacturing		Construction		Knowledge Services		Retail		Other Services	
	Waste policy	Reduced Waste	Waste policy	Reduced waste	Waste policy	Reduced waste	Waste policy	Reduced waste	Waste policy	Reduced waste
Yes	83%	70%	78%	78%	55%	53%	67%	50%	100%	50%
No	17%	9%	22%	11%	45%	37%	33%	50%	0%	0%
Don't know	0%	22%	0%	11%	0%	11%	0%	0%	0%	50%

Table 25 below indicates that over 80% of those enterprises with a waste management policy or strategy in place have reduced waste through continuous improvement, compared with only 17% of those respondents that do not have a policy or strategy.

*Table 25 – Waste policy and waste reduction*

Waste management policy	Total number of respondents	Number reducing waste	% reducing waste
Yes	43	35	81.4%
No	17	3	17.6%

Those respondents with a formal process improvement or continuous improvement policy in place were also more likely to state that they had reduced waste through continuous improvement more than those with no formal policy had.

Table 26 - Continuous improvement policy and waste reduction

	Reduced waste through continuous improvement activities?		
	Yes	**No**	**Don't know**
Formal process improvement or continuous improvement policy in place	67.5%	20%	5%
No formal process improvement or continuous improvement policy in place	50%	25%	25%

Reduction of waste and
formal improvement process (%)
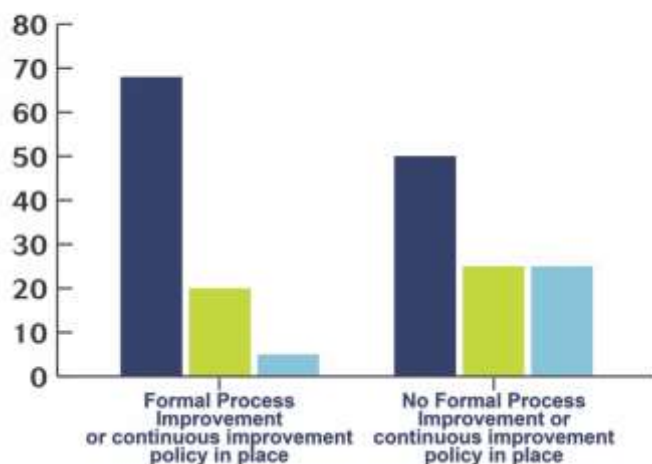
Based on the responses to the survey, companies operating in a regulated sector are no more likely to reduce waste than those operating in unregulated sectors.

Table 27 - Sector regulation and waste reduction

	Reduced waste through continuous improvement activities?		
	Yes	**No**	**Don't know**
Regulated sector	57.1%	19.0%	19.0%
Unregulated sector	64.1%	20.5%	12.8%

Regulated / Unregulated sector
and waste reduction (%)
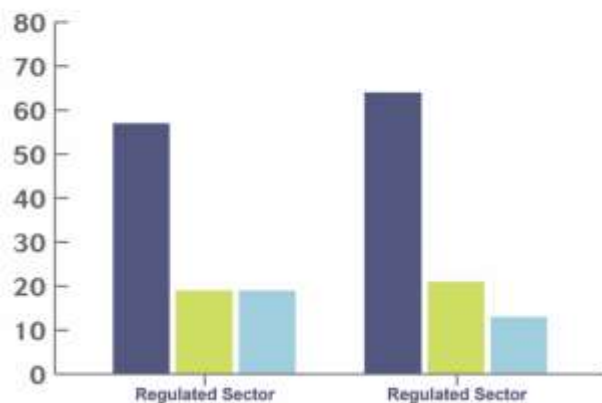
2.4   Engagement with others in improving products or processes

The survey asked if respondents engaged with any of the following organisations when improving products and services.

Table 28 – Engagement to improve products or processes

	Number of respondents that engage	% of respondents that engage
Trade Associations	18	33.3%
Business Wales/Welsh Government	24	44.4%
Customers	45	83.3%
Suppliers	33	61.1%
Consultants	20	37.0%
Universities	6	11.1%
British Standards	6	11.1%
None	2	3.7%
Number of respondents	54	

Who Respondents engage with to improve products or processes (%)
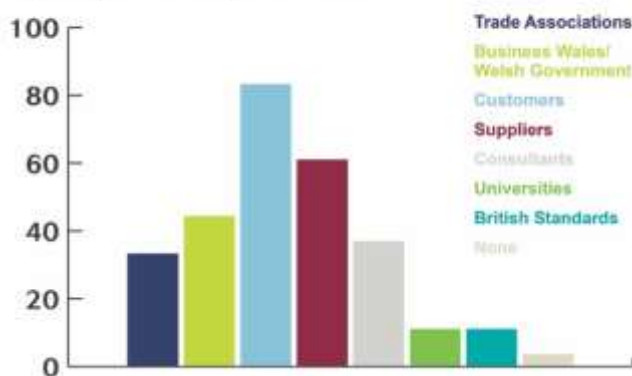
The majority of respondents engage with customers (83%) and with suppliers (61%). Almost half engage with Business Wales/Welsh Government. A third engage with Trade Associations or with Consultants. Around 11% stated that they engage with Universities. Only two respondents (a firm of accountants and a surveying and construction firm) stated they did not engage with any bodies or organisations when improving products or processes. Five respondents stated that they only engage with customers, and a further nine stated that they only engage with customers and suppliers.

Of the respondents that engage with Universities, four are in the Med-High Tech Manufacturing sector, one in Construction and one in Low-Med-Tech Manufacturing.

3. Circular Economy

3.1 Understanding of the Circular Economy term

40% of respondents rated their understanding of the term "Circular Economy" at "1 – not at all" and just under 12% (6 respondents) felt they fully understood the term rating their understanding at "5". The average score of 2.48 suggests that there is a low level of understanding of the term amongst respondents.

Table 29 - Extent to which respondents understand the term "Circular Economy"

|	Number	Percent
1 – not at all	21	40.4%
2	5	9.6%
3	12	23.1%
4	8	15.4%
5 - fully	6	11.5%
Total	52	100.0%

Understanding of CE Term (%)

Of the six who stated that they fully understood the term, three are coded to the "Knowledge Services" sector, and a further one each to "Other Services", "Low-Med Tech manufacturing" and Construction. Five of these employed 11-50 FTEs (small enterprises) and one from an organisation with 201-500 employees (medium-sized enterprise). Three had introduced new products or services within the past three years; all had improved processes or working practices (five within the last 12 months). All have a waste management policy or strategy and five of the six had reduced waste through continuous improvement activity.

When analysed by size based on number of employees for perceived levels of understanding, medium sized enterprises have a higher rated level of understanding of the term (average score in this case at 3.30) with micro and small enterprises both scoring at 2.29 average score). Respondents from enterprises coded to the Construction sector scored highest for perceived understanding of the term with an average score of 2.75. Understanding is lowest in the Retail sector (Other services sector is not included in this analysis as there are only two responses). Perceived understanding in the Manufacturing and Knowledge Services is similar, and in all cases is low.

Table 30 - Level of understanding of circular economy term average score (1= not at all to 5 = fully)

|	Manufacturing	Construction	Knowledge Services	Retail
Average score	2.48	2.75	2.56	1.6

Level of understanding of circular economy term (score out of 5)
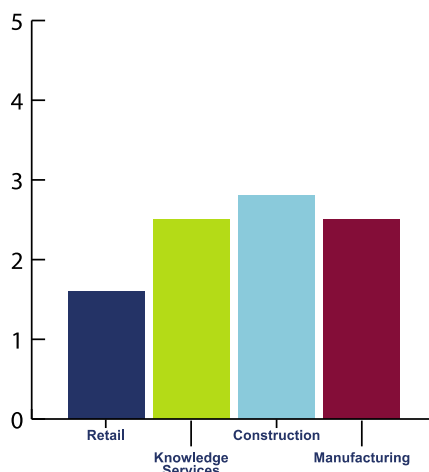
Respondents generally thought that those in more senior or management positions understood the term more fully (so shop floor staff are thought to have the least understanding, as table 31 and associated chart below indicates.

Table 31 - Extent to which respondents think other members of staff understand the term

Position	1 – Not at all	2	3	4	5 - Fully	Avg. Score
Senior manager	41.2%	15.7%	17.6%	13.7%	11.8%	2.39
Managers	43.1%	21.6%	19.6%	9.8%	5.9%	2.14
Team leaders	58.8%	25.5%	9.85%	2.0%	3.9%	1.67
Shop floor staff	74.0%	18.0%	4.0%	2.0%	2.0%	1.40
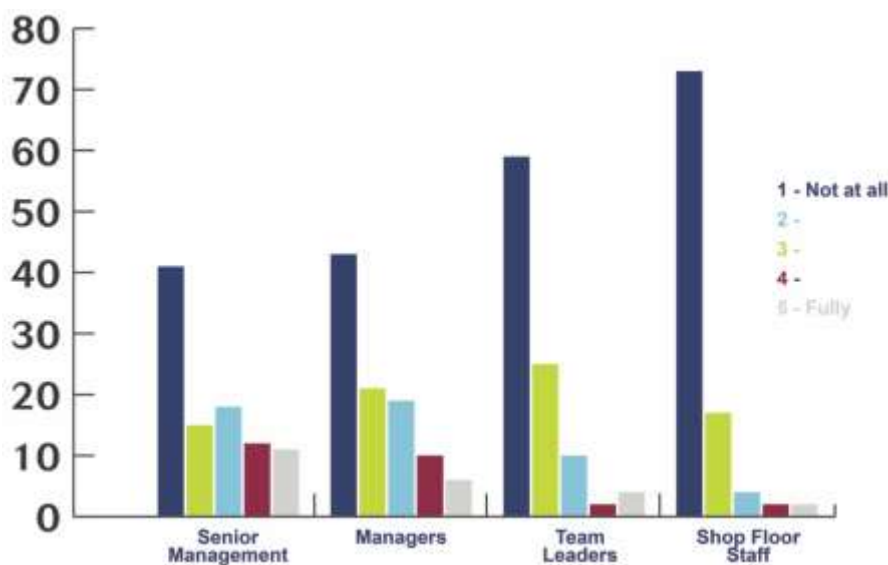
Only one respondent thought that all staff fully understood the term, and this respondent described itself as operating in "Business Support and Commercial Property Letting" (coded to Knowledge Services sector).

3.2 Introduction of Circular Economy related innovation in the last year

The survey asked respondents if they had introduced any Circular Economy (CE) related innovation in the last year.

Table 32 - Introduction of circular economy innovations in the last year

	Number	Percent
Yes	7	13.2%
No	35	66.0%
Don't know	11	20.8%
Total	53	100.0%

Introduction of CE related innovations in last year (%)
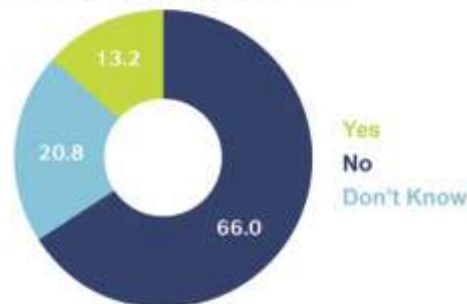
Seven respondents reported that they had introduced CE related innovation in the last year. Of these, three stated that they fully understood the term (two respondents rated their understanding at 3 and the other rated at 4, while one did not score their understanding). The Knowledge Services sector organisation that stated that all staff 'fully understood' the term reported that they had introduced three innovations in the last year (not described). One respondent stated that they had "implemented a couple of things". The five other respondents had introduced one innovation each. Descriptions of innovations are "Use of waste selvedge to make other products" and "used lubricant oil re-refinery". One respondent that had answered "No" to the question on whether they had introduced CE related innovations noted that it was "not sure what it (circular economy) is so may have done unwittingly".

3.3 Circular economy and new product and process development

The survey asked respondents to what extent they use or incorporate circular economy models or tools when looking at new product development and asked to rate on a scale of "1 – not at all" to "5 – fully".

Table 33 - Extent to which circular economy models or tools are used in new product development

	Number	Percent
1 - not at all	34	64.2%
2	9	17.0%
3	8	15.1%
4	2	3.8%
5 - fully	0	0.0%
Total	53	100.0%

CE tools and new product/ service Development (%)

No respondents stated that they fully incorporate CE models or tools when looking at new product development, although two respondents scored this at 4 and eight scored at 3 suggesting there is some reference to these models or tools.

Of the respondents that scored 4 one is coded to the "Knowledge Services" sector and another to Low-med-tech manufacturing and are a Local Action Network for Enterprise and Development (Micro enterprise), and a waste and recycling firm (data not provided on turnover or number of employees).

The survey also asked to what extent respondents use or incorporate CE models or tools when looking at continuous improvement or new process development.

Table 34 - Use of circular economy in continuous improvement

	Number	Percent
1 - not at all	34	64.2%
2	9	17.0%
3	7	13.2%
4	3	5.7%
5 - fully	0	0.0%
Total	53	100.0%

Use of CE Models (%)
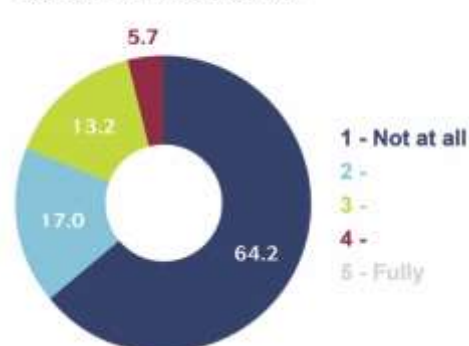
Once again, no respondents stated that they fully use or incorporate CE models or tools when looking at continuous improvement or new process development. In this case, three respondents scored this at 4 and seven scored at 3 suggesting that circular economy models or tools are slightly more likely to factor in continuous improvement or new process development. However, the average score in both cases suggests that there is little use of circular economy models or tools in either case. The two respondents that scored 4 in the previous question also scored the same in this, with the additional respondent from the "Construction" sector, a micro enterprise.

When asked what circular models or frameworks they had used, if any, the responses were:

"Plugging the Leaks"[19]

"recycled"

"paperless systems"

One respondent who scored 4 in both questions on the extent of their use of circular economy models or tools stated nonetheless that they had used "*No defined models*".

3.4   Achievement of standards

53 respondents answered this question. Of the other nine respondents who began the questionnaire, none progressed as far as this question. Therefore, the lack of an answer cannot be assumed as a "None" response and so percentages are calculated based on the number responding. Respondents could only choose one option from the list.

Table 35 - Achievement of standards

Standards	Number	Percent
BS 8001 (Framework for implementing the principles of the circular economy in organisations)	0	0%
ISO 9001 (Quality Management)	12	22.6%
ISO 14001 (Environmental management)	4	7.5%
OHSAS 18001 (Occupational Health and Safety Management)	3	5.7%
Other	24	45.3%
None	10	18.9%
Total	53	100%

No respondents reported that they have achieved BS 8001, the largest group state that they have achieved "other" standards.

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[19] http://www.pluggingtheleaks.org/

4. Support requirements

4.1 Types of support regarded as helpful

The survey asked if it would be helpful to have support with any of the following from a range of options (from which respondents could choose one option)

Table 36 - Would support with any of the below be helpful?

Helpful support	Number	Percent
Technological innovation	11	24.4
Marketing new products	8	17.8
Working with customers	5	11.1
Recycling of materials	5	11.1
Implementing quality standards	5	11.1
None	5	11.1
Materials development	2	4.4
Working with suppliers	2	4.4
Energy management / reduction	2	4.4
Total	45	100.0

Technological innovation and *marketing new products* are the areas that the largest groups of respondents were interested in receiving support. No respondents stated that they would find it helpful to have support on the recycling of materials. It is not possible from this survey to know the reasons for the lack of interest in support on this.

4.2 Workshop and innovation support

The survey provided respondents with information about a Swansea University workshop on the Circular Economy, with details of the commercial and ecological benefits of CE innovation and available support. Respondents could request further information. Using this as a "proxy measure" to gauge interest in the circular economy among the respondent group 64% requested further information, indicating interest in finding out more about the subject.

Table 37 – Percentage of respondents requesting further information on the Circular Economy workshop

Further information	Number	Percent
Yes	34	64.2%
No	19	35.8%
Total	53	100.0%

Similarly, the survey asked if respondents would like to receive information from the Welsh Government on the innovation support they provide. In this case, almost 70% confirmed they would like to receive information on innovation.

Table 38 – Percentage requiring further information from the Welsh Government

WG innovation information	Number	Percent
Yes	37	69.8%
No	16	30.2%
Total	53	100.0%

5. Conclusions

5.1 Summary of findings

SMEs from the Low-Med Tech and Med to High Tech manufacturing sectors are most likely to have a formal process for new product or service development, and are most likely to have introduced new products or services in the last 3 years. Those respondents with a formal process are more likely to introduce new products and services (95% of those with a formal process had introduced new products or services compared with 70% of those without a formal process that had introduced new products/services).

Overall, 65% of respondents had a formal process improvement or continuous improvement policy, with medium-sized enterprises being most likely to have a policy (91%) and micro enterprises least likely (47%). Having a formal policy does seem to correlate with the introduction of improvements to processes or working practices, with 97% of those with a policy introducing improvements compared to only 55% of those respondents without a policy. Around 77% of medium sized enterprises had introduced improvements compared with 59% of small and 60% of micro enterprises.

Almost three quarters of respondents had a waste management policy or strategy, and 61% had reduced waste through continuous improvement. While micro enterprises were least likely to have a policy on waste management, a higher percentage of these enterprises reported that they had reduced waste than had small or medium enterprises. This is a possible area for further research to understand the reasons behind this. Overall, 80% of those with a waste policy reported reducing waste compared with 17% of those without a policy or strategy. Those with a formal process improvement or continuous improvement policy were also more likely to state that they had reduced waste through continuous improvement.

Very few respondents (11%) engaged with universities when improving products and services. The majority engaging with customers only or with customers and suppliers, although almost half stated that they engaged with Business Wales / Welsh Government. An area for further study could investigate the ways in which universities could better work with SMEs in this area.

Understanding of the term 'circular economy' is low across all sectors and sizes of enterprises. Respondents were asked to rate their understanding on a "1 – not at all" to "5 – fully" the average score was 2.48, which suggests the term is not well known or fully understood. Those that

thought they fully understood the term had all introduced new products or services in the last three years, had improved processes or working practices, had a waste management policy or strategy and all but one had reduced waste through continuous improvement, which suggests that they are putting their understanding into practice.

Medium sized enterprises had the highest perceived understanding of the term with micro and small enterprises both scoring lower. Given that the vast majority of enterprises in Wales are micro firms, then it might well be of value to carry out further research to understand how engage micro firms with the concept and benefits of circular economy innovation. Respondents coded to the Construction sector have the highest understanding of all of the sectors at 2.82. Generally, respondents perceive that those in positions that are more senior better understand the term with an average score of 2.39 for senior managers to 1.40 for shop floor staff.

Seven respondents stated that they had introduced circular economy related innovations in the last year, but there is little use of circular economy models or tools in new product development. No respondents stated that they fully use these tools and an average score of 1.58 on the rating scale. The average score is similarly low in terms of the use of the circular economy models or tools in continuous improvement or new process development at 1.59.

The survey results suggest that the majority of respondents have introduced innovation in working practices or processes. However, it appears that they know little of the concept of the circular economy, its models and tools. There does appear to be interest, amongst the respondent group, to find out more about the circular economy as 65% expressed interest in finding out more about a circular economy workshop and in receiving information on innovation from the Welsh Government.

5.2   Limitations

This report has a number of limitations. Firstly, the relatively small geographic area covered in the survey of 4854 SMEs in South Wales, covers a small part of the UK.   Secondly, very few substantive responses (62) were obtained, giving a response rate of 1.3%. Therefore, it is not possible to draw conclusions with a high confidence level. However, the spread of respondent types does allow indicative conclusions to be drawn that could be further tested with a larger (more statistically representative) sample. There is also a bias towards Low-Med Tech and Med-High Tech manufacturing sectors and under representation of some other sectors. However, it should be noted that the survey was conducted within a short period to deliver against a project timeline and with minimal resource. It should also be noted that there were two main aims of the survey. Firstly, to gauge interest within the SME community in a workshop that would outline the benefits of circular economy innovation. Secondly, the survey aimed to obtain a high-level view of the understanding of the term 'circular economy' and obtain a crude indicator of the extent of its implementation within SMEs to inform an Interreg funded circular economy project and policy makers within Welsh Government. Therefore, taking the aims of the survey into account this

report has achieved its main aims. Consideration should be given to the fact that there is a dearth of published literature on the circular economy practices of SMEs and in that respect; this report does appear to add to the nascent research.

5.3   Further Research

In terms of further research, there would be value in obtaining more data from SMEs across the area surveyed to obtain a statistically representative sample or at least a dataset that is more generalisable. There would also appear to be value in reviewing published peer-reviewed literature and comparing the high-level findings in this report with existing published research.

5.4   Recommendations

The report, based on the limited dataset, would suggest that consideration be given to:

- A publicity campaign outlining the benefits of circular economy innovation, as the term is not well understood.

- SMEs are interested in finding out more about circular economy innovation benefits and so policymakers could consider how existing and possibly new mechanisms could facilitate this.

- SMEs consult with suppliers and customers when developing new products and services and therefore it might be cost-effective to encourage tier 1 and tier 2 businesses to encourage SMEs in their supply chains to develop an understanding of the benefits of circular economy innovation.

- SMEs engage with trade associations when developing new products and services, it might therefore be expedient to encourage trade associations to publicise the value of circular economy innovation.

- Manufacturers and construction firms are most innovation active. Therefore, it might be expedient to target them with circular economy innovation benefits initially.

- Medium sized businesses are most innovation active. Therefore, it would be expedient to target them to adopt circular economy innovation practices, in the first instance.

- There would be value in encouraging all businesses to adopt formal innovation processes because those SMEs with a formal process in place were more likely to have introduced new services or products within the past three years.

- The vast majority of enterprises with a waste management policy or strategy in place have reduced waste through continuous improvement. It would therefore be pertinent to encourage the approximate fifth of SMEs without a strategy to adopt one.

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