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Innovation and Environmental Voluntary Approaches

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ABSTRACT *Criteria have been developed in general terms for evaluating voluntary approaches. Nevertheless, there still remains limited assessment regarding the performance of environmental voluntary approaches as there is a general dearth of empirical information. In relation to innovation and voluntary approaches there are two main schools of thought, namely, the no innovation scenario and innovation through collective learning. This paper outlines the arguments regarding environmental voluntary approaches and innovation and reports on an empirical study of an Irish packaging voluntary agreement. Its findings would indicate that the no innovation scenario is applicable to the Irish packaging voluntary agreement.*

Analysing the Effectiveness and Performance of Voluntary Approaches

There is an increasing awareness of the environment, with environmental protection challenges at a national and global level. At the same time, public expectations for a clean and healthy environment continue to rise, along with a legitimate desire to be involved in that protection. At the heart of voluntary approaches there should be six core principles of pollution prevention, the polluter pays, focus on performance, encourage continual improvement, treat different companies differently and involve the public (Wylynko, 1999, p. 164). In focusing on environmental performance, Porter & Van der Linde (1995) argue that a properly conceived environmental regulatory system not only fosters innovation but can actually drive innovation by encouraging companies to outperform their competitors. The trick is to focus on performance rather than technique.

Assessing the effectiveness and performance of voluntary approaches is problematic but this difficulty is not confined to voluntary approaches. The novelty of voluntary approaches hinders empirical investigation (Organization for Economic Cooperation & Development (OECD), 1997). The assessment of environmental effectiveness of a policy instrument should be assessed against an alternative policy instrument or using the 'business as usual' scenario (European Environment Agency

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(EEA), 1997, p. 12). The EEA (1997) encountered specific problems in assessing the environmental effectiveness of six environmental agreement case studies. The main problem was the general absence of quantitative baseline ('business-as-usual' scenario) against which to assess the effectiveness of the environmental agreements. Other problems centred on the lack of quantitative data on the reference situation prior to the agreement and the lack of quantitative data on the current situation (EEA, 1997, p. 12). Consequently, the information availability for evaluation purposes is particularly low for voluntary approaches. The evaluation of voluntary approaches should include environmental effects, abatement costs as well as different kinds of administrative costs (Russell & Powell, 1999). The OECD (2003, p. 14) concluded that "the environmental effectiveness of voluntary approaches is still questionable".

Innovation, Dynamic Effects and Soft Effects

In industrial countries, the dominant response to environmental policies is to define acceptable levels and limits of pollution by reference to those achievable by application of certain technologies, such as BAT or require the adoption of specific technologies. However, the fostering of appropriate innovations is an integral part of limiting environmental damage (Carraro & Lévêque, 1999). One of the real questions arising from the performance of voluntary approaches is whether they achieve dynamic efficiency. This may be achieved through incentives for technological changes, which include innovation, innovation diffusion (adaptation of new abatement technologies) and an optimal agency response. The environmental policy must react and adjust in the case of exogenous changes (Krarup, 1999). Voluntary approaches do not necessarily create incentives to innovate, where taxes, tradable permits and regulation might. If pollution is a cost to the firms it has an incentive for innovation. A difficulty arises with technological changes between the private and social incentives for innovation. Private sector firms may under-invest in technological change and innovation or do it at the wrong time due to the free rider problem (Carraro & Lévêque, 1999; Sunnevag, 1998; Krarup, 1999).

Moreover, the lack of clarity regarding the definition of innovation with regards to voluntary approaches presents a problem (EEA, 1997, p. 43). Other factors regarding innovation and voluntary approaches need consideration, including the existing industry structure, the 'lock in' effect that production processes have on firms and managerial propensity to change and introduce new products and process. In essence, some proponents of voluntary approaches argue that greater innovation occurs by allowing industry more flexibility and by encouraging businesses to take greater ownership of environmental problems (Ashford, 1996). However, the critics argue that innovations resulting from commitments that industry supports will often be limited to inexpensive and easily achievable commitments (Moffet & Bregha, 1998).

No Innovation Scenario

There are two main arguments with regard to voluntary approaches and the stimulation of innovation. One argument originates from the fact that little has been written on the effects of alternative or supplemental agreements on technological

change which are in a sense 'voluntary' on the part of industry (Ashford, 1999, p. 137). The success of some voluntary approaches is based on incentives that mimic regulations such as civil liability. Ashford (1996, 1999) uses the broad term of 'technological change' to encompass technological innovation, invention, diffusion and technology transfer. Moreover, Ashford (1999) defines an innovation as follows:

An innovation can be characterized by its type, its significance, or by the activity from which it evolves. Innovation can be process oriented or product oriented. It can be modest and incremental or radical and revolutionary in nature. Innovation can be the result of an industry's main business activity or can evolve from the industry's effort to comply with health, safety or environmental standards. Regulatory instruments, economic incentives and voluntary initiatives, can affect any of these characteristics. (p. 138)

The lack of ambitiousness of environmental targets in voluntary approaches further reduces incentives for innovation (Ashford, 1996). Consequently, voluntary approaches would be even less efficient in generating innovation than traditional regulation. If the environmental target can be achieved with a business as usual approach, then there is little incentive to introduce a new technology (Carraro & Lévêque, 1999, p. 8). However, there are no data supporting this argument (Börkey & Lévêque, 1998, p. 26). In concluding his argument Ashford (1999) states:

What is important to realize is that the instruments and initiatives chosen should reflect the recognition that different policy instruments will elicit different kinds of responses, sometimes from different actors. Strategic approaches should be fashioned in such a way as to encourage the best possible technological change from the actors in the best position to bring it about. As a result, a dynamic eco-efficiency, rather than static eco-efficiency might be achieved. (p. 149)

Innovation through Collective Learning

The counter argument exists based on empirical evidence (Aggeri & Hatchuel, 1996, 1999) and theoretical arguments (Glachant, 1999), that voluntary approaches which involve several firms enable individual companies to share and experiment on abatement technologies and that such a collective learning process stimulates innovation and decreases its costs. By focusing on the cost efficiency of voluntary approaches this demonstrates that in theory voluntary approaches are cost efficient when there is a large shared uncertainty about pollution abatement techniques in concentrated industrial sectors in which there is heterogeneity in pollution abatement activities and costs are low (Glachant, 1999, pp. 75–89). Moreover, good quality information enhances both allocative and productive efficiency (Glachant, 1999). Using voluntary approaches the intensive learning improves information of the firms and allows them to implement their private pollution abatement objective at lower costs. However, Glachant (1999) notes that further empirical work needs to be done to improve on his theoretical assumptions.

The empirical evidence to support this argument is drawn from the French End of Life Vehicle, where a number of technical workshops were organized regarding

different techniques for dismantling and shredding vehicles. This resulted in a number of co-operative pilot schemes being implemented with the participation of several car manufacturers and shredders. Within the constructs of a voluntary approach, learning cannot take place without a framework to structure inter-firm co-ordination. To this end Aggeri & Hatchuel (1996, 1999) put forward six points (see Table 1).

Non-stipulation of technology poses the most problems of acceptability for industrialists, whereas the other points are not problematic as both parties are interested in finding the most effective solutions to attain the objectives at the lowest cost (Whiston & Glachant, 1996).

Soft Effects

Soft effects can be significant but difficult to measure and have not been empirically investigated. The OECD (1999, p. 77) defines soft effects as “those behavioural changes due to an increase of environmental awareness in business or to information dissemination”. For the majority of negotiated agreements raising environmental awareness forms part of the objectives. The diffusion of information for negotiated agreements may be through the creation of forums, thus leading to collective learning through information exchange. An example of this is the French ELV scheme.

As in the case of negotiated agreements there can be soft effects from public voluntary programmes. These soft effects may come in different forms and sources such as technical assistance programmes, decisional support tools, best practice guidelines, evaluation tools and training sessions (OECD, 1999, p.88). Moreover the OECD concludes: “They thus improve public recognition of efforts for greening business strategy”.

The Study of the Irish Packaging Voluntary Agreement 1997–2001

The Irish Government, drawing on recommendations from the Irish Business and Employers Confederation (IBEC) lead taskforce, enacted Ireland’s first voluntary agreement, The Waste Management (Packaging) Act 1997. Under the regulations companies have legal obligations if they annually place more than 25 tonnes of packaging on the Irish market and have an annual turnover of more than €1.27

Table 1. Aggeri and Hatchuel French End of Life Vehicle Scheme

Quantitative objectives for valorization which do not stipulate the technology to be used, and which are defined according to a progressive schedule.
A principle of collective responsibility involving all industrial actors in the sector.
Rules of know-how transfer to facilitate the dissemination of knowledge within the industrial network.
The assertion of the principle of a free market without subsidies.
The setting up of national monitoring committees for steering the implementation of these agreements.
Conditional measures in the event of commitments not being honoured by the industrialists.

Sources: Aggeri & Hatchuel (1999). Carraro & Lévêque (1999), pp. 151–186.

million. Companies can choose to comply by meeting the requirements as an individual operator by registering with the local authority, or they can secure exemptions from rigorous elements of the regulations by joining an approved waste recovery scheme, Repak. There is a legal obligation for all producers to recover waste on their own premises, and they are obliged to have waste taken back by a supplier or recovered or made available for recovery. It is an offence for a producer to dispose of packaging waste without first making it available for recovery. Repak members were exempted from taking back packaging waste under the regulations. The national target set by the EU Directive on Packaging and Packaging Waste was a recovery rate of 25% of packaging waste by 2001. Repak agreed a target of 27% recovery rate by July 2001, which it did meet.

Penalties and Enforcement

The penalties for not complying with the Act on a summary conviction are a fine up to €1904 and or imprisonment for a term of up to 12 months. On conviction on indictment (which involves action by the Director of Public Prosecutions) a fine up to €12.6 million and or imprisonment for a term up to 10 years can be imposed. Under this legislation each local authority is responsible for the enforcement. The local authority has the power of entry and inspection by authorized persons appointed by the local authority. In addition, the local authority can serve notice on a person to provide information and can take summary proceedings for an offence. Furthermore, a private individual can take summary proceedings against an individual or corporate body for non-compliance (Cunningham, 2001, 2002).

Study Research Methods

The research was conducted in two phases. Phase one used participant observation and a case study method and phase two consisted of a postal questionnaire sent to Repak members. The questionnaire was structured into seven parts, namely, general information, environmental attitudes, Waste Management (Packaging) Regulations 1997, modes of compliance (local authorities or Repak members), the benefits of the Waste Management (Packaging) Regulations 1997, the packaging chain and packaging innovations and information sharing. In constructing the Repak mailing list each questionnaire sent was accompanied by a covering letter addressed personally to the intended respondent (the individual responsible for the company's waste management activities and who dealt with Repak). The questionnaire was 10 pages in length. In total, 300 questionnaires were sent to Repak members and 59 completed and usable questionnaires were received, giving an overall response rate of 20%, using the Dillman's (1972, 1978) Total Design Method.

Study Limitations

There are some limitations regarding this study. First, at the time the survey was administered Repak's relationships with all its stakeholders were at an all time low, resulting in a lot of dissatisfaction among its members. Second, legal disputes between self-compliers, Repak and local authorities were ongoing at the time of

survey administration. Third, there was a lack of good quality baseline data regarding packaging waste. Fourth, Repak was unwilling to provide statistical data regarding its members which is contained in its annual report citing confidentiality as the reason. This meant no *ex poste* and *ex ante* analysis could be carried out. Finally, the novelty of voluntary approaches in an Irish context and the limited empirical work in this area, constrained this research effort.

Profile of Respondents

The research found that Repak respondents' mean number of years employed by their current firm was 16 years and the mean number of employees employed in the Irish operations for responding Repak respondents' the mean was 342 employees. The largest groups of responding firms from the Repak member survey, excluding the 'other' category, were food producers who accounted for 22% of responding firms, followed by chemical firms at 12% of responding Repak firms. The 'other' category is made up of various business activities, which accounted for 29% of responding firms among Repak members (see Figure 1). These business activities were animal feed manufacturer, rendering, refuse sack manufacturing, glass container manufacturing, wholesale grocery, home heating fuels, fish farming, surface coating manufacturer, security, automotive insulation and fertilizers.

Innovation Aspects of the Voluntary Compliance Scheme

For the purposes of this study, innovation aspects of this voluntary compliance scheme were empirically investigated by focusing on information sharing inside and outside the participant firms, packaging idea generation, barriers to packaging innovation, packaging waste management initiatives and changes in the packaging chain of Repak members since their compliance with the Waste Management (Packaging) Regulations 1997.

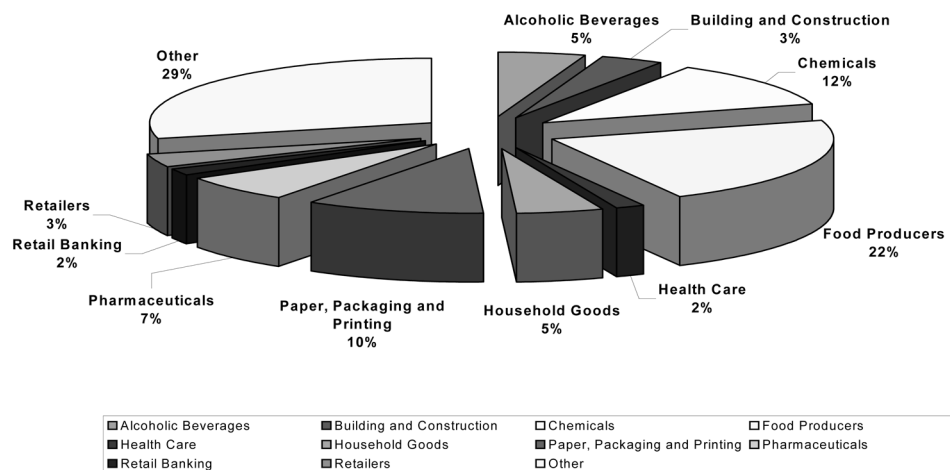


Figure 1. Main business activities of Repak members

Key Information Inputs into Packaging Innovations Inside the Organization

Nearly 8 out of 10 respondents reported their own training and experience as important, while 40% of respondents reported research and development as important and 20% of respondents reported personal contacts as very important information inputs in the packaging innovations inside the organization. All of the respondent alcoholic beverage companies reported own training and experience as important information inputs. Seventy-one per cent of the respondent chemical companies and 67% of the respondent food producer companies reported that their own training and experience were important information inputs into packaging innovations inside the organization.

The important key information inputs into packaging innovations inside the organization are own personal training and experience, personal contacts and suppliers. From a policy-making perspective this raises the issue of how to target and leverage this personal training and experience for the benefit of the voluntary approach. Furthermore, this would indicate that VA participants utilize their own resources in relation to information inputs into packaging innovations. In essence, participants in a VA use their social network to affirm their decision or shore up deficits in their knowledge. One of the traditional policy responses of formal courses or seminars may prove ineffective in this regard as only 38% of respondents reported it as an important input into packaging innovation inside the organization.

Key Information Inputs into Packaging Innovations Outside the Organization

Six out of 10 respondents reported customers as an important input into packaging innovation outside the organization and 58% of respondents reported their own personal training and experience as important. Half of the respondents reported personal contacts as important with 32% of respondents reported Repak members were important and 40% of respondents reported Repak staff as important to the information inputs into packaging innovation outside the firm.

Two-thirds of the respondent alcoholic beverage companies, half of the respondent building and construction companies, 43% of the respondent chemical companies, 33% of the respondent food producer companies reported customers as important information inputs into packaging innovations outside the firm. All the respondent alcoholic beverage companies and the respondent household goods companies reported own training and experience outside the organization as important information inputs outside the organization. Half of the respondent food producer companies and 29% of the respondent chemical companies reported own training and experience as important information inputs outside the organization.

In relation to key information inputs into packaging innovations outside the organization customers, personal contacts and competition emerge as important inputs for respondents. It is also worth noting that Repak and Repak staff are not important to Repak respondents. Consequently, an argument could be made that this supports the notion of the lack of involvement of Repak in the giving of advice to its members regarding packaging and packaging waste. (This was a major issue raised in phase one of this research effort.) Finally, it is worth noting the key role customers play for information inputs into packaging innovations outside the

organization. This may highlight the key role the customers really play as key stakeholders in a voluntary approach.

Packaging Idea Generation and Development

For the purposes of this research idea, the generation stage was defined as discovering new market opportunities, initial insights, new ideas and basic research. Idea development was defined as the fleshing out of the concept, developing a model and market testing. Over half of Repak members do less than 25% of packaging innovations in-house.

It takes less than three months for 26% of respondents to bring new packaging innovations to the market and between four and six months for 40% of respondents to bring new packaging innovations to the market. For respondent pharmaceutical companies it takes more than 13 months to bring new packaging innovations to the market in their industry. However, one-third of the respondent chemical companies and the respondent food producer companies reported it takes less than three months to bring new packaging innovations to the market in their industries.

From the responses an argument could be made that these firms demonstrate an in-house innovative capability in relation to idea generation, idea development and commercialization, in addition to being able to straddle both developing their own packaging technologies and purchasing established technologies. Moreover, it is worth noting that food producer and pharmaceutical respondents seem to be more innovative than other Repak industry sectors. It is debatable whether this innovative capability has been harnessed fully by Repak respondents which facilitates collective learning leading to innovation that Aggeri & Hatchuel (1996, 1999) outlined.

Barriers to Packaging Innovation

The main barriers to packaging innovations reported by respondents were cumulative product experience and steep economies of scale, while the power of distributors and exclusive control of distributors were potential barriers to packaging innovation for free rider respondents. It is worth noting that the main barriers to packaging innovation for respondents are internal. Moreover, an argument could be made that Repak members are using collusive behaviour to impede the progress of free-rider firms in the market place, which may be anti-competitive (Garvie, 1999; Dixit & Olson, 2000; Brau & Carraro, 2001). However, there is no empirical evidence of this occurring in the Irish packaging voluntary agreement.

Packaging Waste Management Initiatives

Since the enactment of the Waste Management (Packaging) Regulations 1997, half of the respondents have no plans to deploy packaging recovery systems, while 2 out of 10 respondents have no plans to deploy recycling since compliance with the packaging regulations. The rate of deployment of between 76% and 100% is low as reported by respondents across all the specified packaging waste management initiatives since compliance.

Table 2. Key information inputs into packaging innovations inside the organization

	Not all important	Not important	Neutral	Important	Very important			
	(%)	(%)	(%)	(%)	(%)	<i>n</i>	Mean	Std Dev.
Formal Courses	22.22	7.41	33.33	20.37	16.67	54	2.00	1.36
Own training and experience	9.09	3.64	9.09	43.64	34.55	54	2.91	1.19
Packaging machine suppliers	18.52	11.11	27.78	29.63	12.96	54	2.07	1.30
Packaging suppliers	12.96	9.26	20.37	42.59	14.81	54	2.37	1.23
Personal contacts	11.11	5.56	25.93	37.04	20.37	54	2.50	1.21
Printed materials	15.09	9.43	49.06	20.75	5.66	53	1.92	1.07
Research and development	11.32	13.21	35.85	13.21	26.42	53	2.30	1.31
Suppliers	9.43	5.66	24.53	45.28	15.09	53	2.51	1.12

Table 3. Packaging idea generation, development and generation stages

	< 25%	26%–50%	51%–75%	> 75%	<i>n</i>
Idea generation	53%	23%	9%	15%	47
Idea development	58%	17%	13%	13%	47
Commercialization	53%	23%	9%	15%	47

Table 4. Barriers to packaging innovation

Barriers before joining Repak	<i>n</i>	Mean	Std. Dev.	Barriers after Joining Repak	<i>n</i>	Mean	Std. Dev.
Cumulative product experience	42	2.05	1.15	Cumulative product experience	43	2.12	1.18
Steep economies of scale	43	1.60	0.98	Steep economies of scale	44	1.75	1.10
Proprietary technology	43	1.58	1.10	Proprietary technology	44	1.59	1.09
Power of distributors	43	1.44	1.10	Power of distributors	45	1.58	1.14
Patent	43	1.42	1.14	Patent	44	1.45	1.15
Ownership of plans	43	1.33	0.99	Ownership of plans	44	1.41	1.09
Exclusive control of distributors	43	1.30	1.10	Exclusive control of distributors	44	1.41	1.23
Copyright	43	1.23	1.11	Copyright	44	1.25	1.10

An argument could be made that it may be more cost-effective for Repak members to pay the full fees including material specific fees than to deploy any packaging waste management activities within their packaging chain since compliance. It may also be reflective of the type of uncertainties that surround the technologies that are suitable for their business activities. Furthermore, the waste management contractor plays a pivotal role in relation to Repak respondents. The introduction of packaging waste management initiatives may not be in the interest of the waste management contractors as these firms may lose revenue streams or may not have the competence to advise or provide the type of services to client companies such as recycling of process waste or packaging recovery systems. The lack of pressure from customers or suppliers may also be a contributing factor to the low levels of deployment of waste management initiative among respondents.

From phases one and two of this study a picture emerges where free-riders have higher levels of deployment of packaging waste management initiatives since 1997 across all waste management initiatives. This may be reflective of their overall key environmental concern of preventing environmental incidents and their reliance on external R&D organizations as a key input into packaging innovations outside the organization. Moreover, it may further highlight how these respondents view environmental risk and manage their environmental liability.

Primary Sales Packaging

Primary sales packaging was defined as a sales unit to the final user or consumer at the point of purchase. Respondents were asked to rate the response for a number of statements in relation to primary sales packaging.¹ Two-thirds of the respondent alcoholic beverage companies, 71% of the respondent food producer companies and 40% of the respondent paper, packaging and printing companies reported an increase in their recycling rates for primary packaging. One hundred percent of household goods companies and the respondent retailers reported no change in recycling rates for primary packaging. Thirty-eight per cent of the respondent food producer companies reported an increase in the reusability of primary packaging. The cost of primary packaging had decreased as reported by 66% of the respondent alcoholic beverage companies, 14% of the respondent chemical companies and 8% of the respondent food producer companies.

Secondary Packaging

Secondary or grouped packaging was defined as packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user/consumer or whether it serves only as a means to replenish the shelves at the point of sales. Such packaging can be removed from the product without affecting its characteristics. The recycling rates of secondary packaging have increased for all of the respondent alcoholic beverage companies, 66% of the respondent chemical companies, 64% of the respondent food producer companies and 66% of the respondent pharmaceutical companies. However, the cost of secondary packaging has increased for 33% of respondent alcoholic beverage companies, 17% of the respondent chemical companies and 9%

Table 5. Packaging waste management initiatives since compliance

	No plans to deploy	Planning stage	1–25% Deployed	26–50% Deployed	51–75% Deployed	76%–100% Deployed	<i>n</i>	Mean	Std. Dev.
	(%)	(%)	(%)	(%)	(%)	(%)			
Reuse materials	35.29	5.88	27.45	11.76	5.88	13.73	51	2.88	1.76
Recycling	20.00	14.55	18.18	18.18	12.73	16.36	55	3.35	1.75
Specially designed packaging for recycling	45.10	15.69	11.76	7.84	13.73	5.88	51	2.47	1.70
Packaging recovery	49.02	9.80	11.76	7.84	9.80	11.76	51	2.55	1.86
Material switching	65.22	13.04	15.22	2.17	0.00	4.35	46	1.70	1.23
Light weighting	68.89	8.89	6.67	6.67	2.22	6.67	44	1.84	1.54
Packaging reduction	33.33	20.83	22.92	10.42	12.50	0.00	48	2.46	1.38
Waste reduction	25.49	21.57	17.65	21.57	7.84	5.88	51	2.80	1.52
Waste segregation	25.49	13.73	13.73	15.69	13.73	17.65	51	3.27	1.86
Waste targeting	25.49	13.73	13.73	15.69	13.73	17.65	44	2.16	1.48
Recycling of process waste	34.00	12.00	10.00	16.00	16.00	12.00	50	3.04	1.85

Table 6. Primary sales packaging

	− 3	− 2	− 1	0	1	2	3			
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	<i>n</i>	Mean	Std Dev.
Recycling rates	0	0.00	5.56	53.70	12.96	18.52	9.26	54	0.74	1.12
Packaging content	0	7.55	26.42	62.26	3.77	0	0	53	− 0.34	0.71
Reusability	0	0	1.85	66.67	16.67	9.26	5.56	54	0.50	0.91
Information content	0.	0	0	51.85	37.04	7.41	3.70	54	0.63	0.78
Spoilage rates	1.82	5.45	12.73	70.91	5.45	3.64	0	55	− 0.26	0.73
Cost	0	0.00	9.26	50.00	24.07	14.81	1.85	54	0.52	0.95
Lead time	0	1.92	0	82.69	15.38	0.00	0	52	0.12	0.48
Recoverable packaging	0	0	3.70	48.15	29.63	18.52	0	54	0.63	0.83
Weight	0	0	0	59.26	31.48	9.26	0	54	0.50	0.67
Innovations	1.92	0	0	59.62	28.85	7.69	1.92	52	0.41	0.80
Biodegradability	0	0	0	76.92	19.23	3.85	0	52	0.21	0.69
LCA	25.00	3.85	1.92	59.62	5.77	1.92	1.92	52	− 0.69	1.52
Light weighted	7.69	1.92	1.92	55.77	23.08	7.69	1.92	52	0.15	1.23
PRS	20.75	0	1.89	47.17	16.98	7.55	5.66	53	− 0.15	1.72

of the respondent food producer companies. Moreover, 66% of the respondent alcoholic beverage companies, 66% of the respondent chemical companies, 64% of the respondent food producer companies and 75% of the respondent paper, packaging and printing companies reported an increase in sorting and logistics costs for secondary packaging.

Tertiary Packaging

Tertiary/transport packaging was defined as packaging conceived to facilitate handling and transport of a number of sales units or grouped packaging in order to prevent physical handling and transport damage. The percentage of tertiary packaging being put for recycling has increased for 36% of the respondent food producer companies, 70% of the respondent paper, packaging and printing companies and 33% of the respondent pharmaceutical companies. The cost of tertiary packaging has decreased for 9% of the respondent food producer companies, while the loading and efficiency have decreased for 17% of the respondent paper, packaging and printing companies.

In relation to actual changes in the primary packaging chain Repak respondents reported only marginal changes as having occurred in relation to recycling and weight, reusability and the costs in the primary packaging chain have increased marginally. Repak respondents reported increases in waste segregation, recycling rate, costs, the costs of sorting and logistics and the amount of secondary waste being put for recycling. In relation to tertiary packaging, Repak respondents reported marginal increases in recoverable packaging, sorting costs, materials and lead times.

Stakeholder Support and Advice

Thirty-two per cent of respondents reported that Repak was important and 26.79% of respondents reported packaging suppliers were important for support and advice on methods to reduce packaging. Moreover, 33% of the respondent pharmaceutical companies reported Repak as an important stakeholder for support, while 42% of the respondent food producer companies reported Repak as an important stakeholder for on-going support and advice regarding packaging abatement technologies. In addition, 25% of the respondent food producer companies and 40% of paper, packaging and printing respondent companies reported that waste management equipment providers were important stakeholders regarding on-going support and advice. Moreover, 33% of the respondent pharmaceutical companies, 25% of the respondent food producer companies and 40% of the respondent paper, packaging and printing companies reported that waste management contractors were important stakeholders regarding advice in relation to packaging abatement technologies and methods to reduce packaging waste.

Waste management contractors and packaging suppliers play an important role in relation to support and advice for respondents. Respondents reported the role of the local authorities as important in relation to support and advice. Consequently, it can be argued that the compliance scheme and regulator have active and critical roles to play regarding the provision of support and advice to firms. Therefore, their ability

Table 7. Secondary packaging

	− 3	− 2	− 1	0	1	2	3	<i>n</i>	Mean	Std Dev.
	(%)	(%)	(%)	(%)	(%)	(%)	(%)			
Waste segregation	0	0	0	44.90	24.49	22.45	8.16	49	0.94	1.01
Recycling rates	0	0	0	40.82	26.53	26.53	6.12%	49	0.98	0.97
Cost	0	0	8.16	57.14	24.49	8.16	2.04	49	0.39	0.84
Sorting & logistics costs	0	0	0	52.08	33.33	10.42	4.17	48	0.67	0.83
Information content	0	0	0	66.67	27.08	6.25	0	48	0.37	0.57
Put up for recycling	0	0	0	39.58	33.33	14.58	12.50	48	1.04	1.03
Lead time	0	0	4.17	75.00	20.83	0	0	48	0.15	0.46
Recoverable packaging	0	0	0	62.50	27.08	6.25	4.17	48	0.52	0.80
Innovations	6.52	0	0	47.83	36.96	8.70	0	46	0.37	1.10
Biodegradability	0	0	2.08	77.08	18.75	2.08	0	48	0.17	0.48
Materials	20.83	0	2.08	52.08	25.00	0	0	48	− 0.29	1.32
Weight	0	0	4.17	62.50	25.00	6.25	2.08	48	0.30	0.88
Loop system	14.58	4.17	4.17	54.17	12.50	2.08	8.33	48	− 02	1.56
LCA	29.17	6.25	2.08	56.25	4.17	2.08	0	48	− 0.94	1.48
Right sized	16.67	2.08	0	52.08	8.33	16.67	4.17	48	0.00	1.66
PRS	22.92	0	2.08	47.92	14.58	6.25	6.25	48	− 0.26	1.76

Table 8. Tertiary packaging

	− 3	− 2	− 1	0	1	2	3			
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	<i>n</i>	Mean	Std Dev.
Size of bins	0	2.00	2.00	82.00	12.00	0	2.00	50	0.12	0.63
No. of deliveries	2.04	4.08	8.16	63.27	14.29	4.08	4.08	49	0.12	1.05
Put up for recycling	0	0	6.00	58.00	16.00	16.00	4.00	50	0.54	0.97
Waste segregation	0	2.00	0	54.00	28.00	12.00	4.00	50	0.60	0.93
Lead time	0	0	4.26	82.98	12.77	0.00	0	47	− 02	0.41
Recoverable Packaging	0	0	0	55.10	34.69	8.16	2.04	49	0.57	0.74
Sorting costs	0	0	0	59.18	32.65	4.08	4.08	49	0.53	0.77
Costs	0	0	2.04	53.06	34.69	8.16	2.04	49	0.54	0.77
Materials	14.29	0	0	57.14	24.49	2.04	2.04	49	− 02	1.28
Weight	0	0	4.08	71.43	22.45	2.04	0	49	0.20	0.54
LCA	32.65	4.08	2.04	51.02	8.16	2.04	0	49	− 0.96	1.55
Right sized	20.41	2.04	0	57.14	10.20	6.12	4.08	49	− 0.31	1.61
RTP	22.45	4.08	2.04	46.94	10.20	10.20	4.08	49	− 0.35	1.74
Closed loop	24.49	2.04	0	44.90	14.29	8.16	6.12	49	− 0.31	1.82
Loading and routing	0	2.08	0	68.75	22.92	4.17	2.08	48	0.33	0.75

Table 9. Stakeholder support and advice over the last 12 months

	Not all important	Not important	Neutral	Important	Very Important	<i>n</i>	Mean	Std. Dev.
	(%)	(%)	(%)	(%)	(%)			
Repak	23.21	12.50	32.14	28.57	3.57	56	1.77	1.21
Local Authority/Corporation	42.86	17.86	26.79	10.71	1.79	56	1.11	1.14
Competitor within same industry	42.11	14.04	28.07	12.28	3.51	57	1.21	1.22
Competitor in different industry	41.07	23.21	28.57	5.36	1.79	56	1.04	1.04
Repak member within same industry	40.35	14.04	26.32	17.54	1.75	57	1.26	1.22
Repak member in a different industry	43.86	12.28	29.82	12.28	1.75	57	1.16	1.18
Waste management contractor	28.07	14.04	36.84	17.54	3.51	57	1.54	1.18
Waste management equipment provider	40.35	12.28	29.82	15.79	1.75	57	1.26	1.20
Waste management consultant	48.21	8.93	23.21	17.86	1.79	56	1.16	1.26
Foreign competitor	58.93	12.50	26.79	1.79	0	56	0.71	0.93
Packaging suppliers	37.50	14.29	21.43	26.79	0	56	1.38	1.24
Logistics providers	53.57	8.93	23.21	12.50	1.79%	56	1.00	1.21

and competence to meet the support and advice needs of firms, are fundamental to ensuring that firms collectively achieve the targets laid out in a voluntary approach. Moreover, it highlights the pivotal role waste management contractors play alongside packaging suppliers in voluntary agreements. In addition, it is worth noting from the study that 4 out of 10 respondents regard Repak members in the same industry or a different industry as not at all that important in relation to stakeholder support and advice over the last 12 months. This may signal a lack of collective learning outlined by Aggeri & Hatchuel (1996, 1999) and a sign of the structural weakness of Repak.

Discussion and Conclusions

The argument regarding innovation and voluntary approaches focused on the no innovation scenario put forward by Ashford (1996) and the counter argument of Aggeri & Hatchuel (1996, 1999), whereby innovation through collective learning stimulates innovation and decreases costs. The finding from this research effort indicates that costs in relation to primary, secondary and tertiary packaging have increased, which is at odds with the argument of Aggeri & Hatchuel (1996, 1999). Furthermore, Aggeri & Hatchuel (1996, 1999) argue that learning cannot take place without a framework to structure inter-firm co-ordination. The findings from this research would indicate that Repak members do not rely on other Repak members for support and advice. The evidence from free-riders gathered in phase one of this research is that they relied on competitors in the same and different industries for support and advice. However, this finding may be specific to the Irish packaging voluntary agreement as Repak failed to effectively stimulate this form of collective learning through appropriate structures within the approved body from 1997 to 2001.

The soft effects as outlined by the OECD (1999, p. 88) have not materialized in the case of the Irish packaging voluntary agreement. The no innovation scenario put forward by Ashford (1996) is applicable to Repak respondents. Based on the findings of this study, an argument could be made that the innovations resulting from the voluntary approach were nothing beyond business as usual. One of the reasons for the poor performance of the Irish packaging voluntary agreement was that Repak had little resources from 1997 to 2001 and there was no active enforcement of the regulations. Where this happens, as in the Irish packaging voluntary agreement as the OCED (2003, p. 15) notes "[VA] environmental impact are likely to be modest".

Overall, the research findings indicate that firms remain ill-equipped to deal with the complexities and difficulties that dealing with environmental issues brings. This supports the arguments made by Dermody & Hanmer-Lloyd (1995) and the study highlights the lack of awareness and appreciation among responding firms of the true integration of business and environmental strategy (Singh, 2000), as is evidenced by the lack of deployment of packaging waste management initiatives. Moreover, the study demonstrates participation in a voluntary agreement does not automatically encourage innovation. Outside factors such as structure of the voluntary agreement, the enforcement regime, the degree of regulatory capture and the real threat of other instruments being used have an impact on the levels of innovation that can occur in a voluntary agreement. Participation in a voluntary agreement for companies may be a

better means of managing their environmental risk and reputation. However, if companies are participating in a poorly designed VA, then there is no incentive for such companies to innovate through collective learning.

Note

1 Zero represented no change in relation to each statement.

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