4 Survey of Innovation - Results

4.1 The Sample and types of innovation

This chapter reports on the survey of innovation in manufacturing and service companies in the BMW Region. The consultants undertook it between May and August 2003.

The survey sample was based on the Kompass list of all manufacturing and selected service companies in the BMW Region. The selected service areas were: software development, tourism, financial and internationally traded services (including call centres). This is the BMW Regional equivalent of the Forfás national innovation survey[6].

Two questionnaires were used in the survey, a detailed questionnaire of six pages and a short (one page) questionnaire. The long questionnaire is included in Appendix 2. There were 147 responses to the detailed questionnaire and a further 68 responses to the short questionnaire. They are analysed in the following sections. This represents a return of 30.7% (215 respondents) out of the 700 companies surveyed. In the consultants' opinion, the sample is large and representative enough to give a reasonable level of reliability. The sample was selected randomly taking into account some weighting to ensure that all counties and sectors were included. The following tables compare the responses received (the total sample) with the total number of companies in the BMW Region, based on location, size and ownership.

Table 19. Comparison of the Sample with the Counties

County	Actual Responses	Percent Responses	BMW Region
Donegal	13	6.0	10.7
Leitrim	13	6.0	2.4
Sligo	15	7.0	5.4
Cavan	14	6.5	5.8
Monaghan	17	7.9	5.8
Louth	23	10.7	13.4
Longford	18	8.4	2.6
Westmeath	14	6.5	7.1
Offaly	16	7.4	5.2
Laois	13	6.0	4.2
Mayo	16	7.4	8.6
Roscommon	13	6.0	3.3
Galway	30	14.0	25.4
Total	**215**	**100.0**	**100.0**

Note: *The Focus Groups identified a very low level of innovation amongst companies with under ten employees, and this is confirmed by both national and international studies[7]. An innovative group of companies from this category was identified with the assistance of some CEBs. The 17 who responded were very innovative.

[6] Each EU country undertakes a periodic national innovation survey (three were undertaken since the early 1990s). The questionnaire is long and complex. Unfortunately the response level to the latest survey in the BMW Region was too low to allow separation from the national data with reasonable statistical reliability. Forfas undertakes these surveys.

[7] This is based primarily on National R&D Surveys, National Innovation Surveys, RITTS studies in Ireland and throughout Europe, and regional industry surveys including a recent Shannon Development survey.

Table 20. Comparison of the Sample with the Universe by Company Size

Number of employees	No. of Companies	Percent	BMW Region
<10	17	11.6	55.0
11-25 26-50 51-100	47 45 19	75.5	38.9
101 - 250	13	8.8	4.4
251 - 500	3	2.0	1.0
500+	3	2.0	0.6
Total	**147**	**100.0**	**100.0**

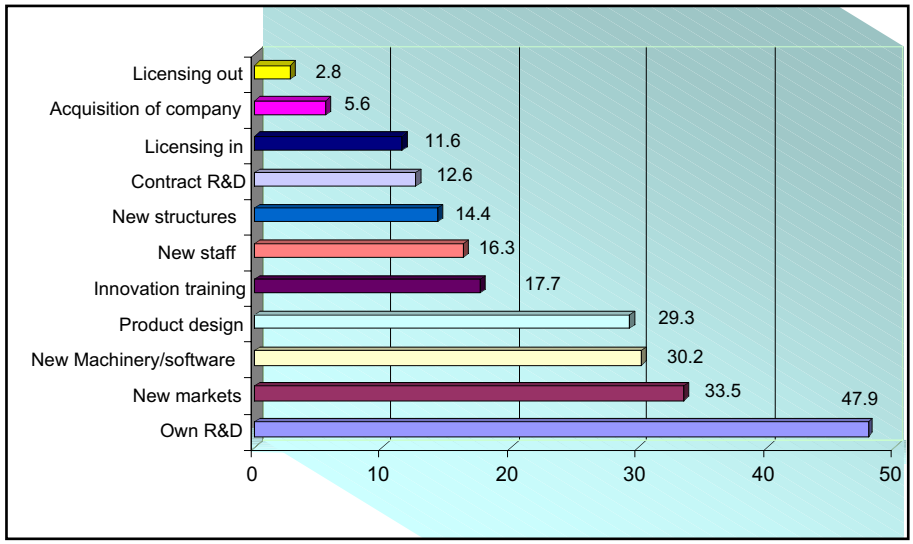
Table 21. Company Ownership Sector Categories

	Frequency	Percent
Irish	179	83.3
Other EU	22	10.2
USA	10	4.7
Other	3	1.4
Non-Response	1	0.5
Total	**215**	**100.0**

Types of Innovation

The respondents were asked to identify what innovative activities had they undertaken over the last three years. They could choose as many innovation activities as they wished. A list was supplied but more could be added, if necessary (see Figure 22). They were 215 respondents. Almost 57% of companies undertook some form of innovation during the last three years as the following figure and table show.

Figure 22. Innovation Activities in the Survey Sample of Companies



Based on this survey the most popular form of innovation activity was:

- *R&D. Nearly 48% of responding companies undertook R&D*

Other important innovation activities were:

- *Just over one third undertook new market entry or the introduction of new products/services*
- *Just over 30% acquired machinery, equipment, or software for innovation*
- *Nearly 30% of respondents undertook product design*

This was the top band of most popular innovation activities.

The middle band of innovative activities included:

- *Training for innovation activities (18%)*
- *Recruitment of innovation staff - R&D, technology transfer, information etc. (16%)*
- *Significantly changed organisation structure (14%)*
- *Contract R&D - outside the company (13%)*
- *Acquisition of licences, franchises, patents or other technology transfer (12%)*

The lowest band of innovative activities were:

- *Acquisition of company/companies (6%)*
- *Licensing out - technology, information etc. (3%)*

It is interesting to note that the acquisition of technology (licences, franchises and patents) at 12% is four times the licensing out of technology at 3%. Part of creating a knowledge economy should see licensing out growing rapidly and contracting out R&D should increase significantly as well. These are key elements of the future knowledge economy.

The largest number of companies undertaking one specific innovative activity undertook R&D (103 companies). 19 companies who did not undertake R&D, did undertake at least one other innovative activity, probably new market entry or introduction of new products/services; or acquired machinery, equipment, or software for innovation. The implication of this finding is that 84% of innovative companies undertake R&D – **it is a good indicator of innovativeness.**

93 companies (43.3%) undertook no innovative activity at all. A further 27 companies (12.6%) undertook only one innovative activity during the previous three years.

Table 22. Number of Innovative Activities by Company

No. of innovation activities undertaken	No. of companies undertaking these activities	Percent
0	93	43.3
1	27	12.6
2	15	7.0
3	15	7.0
4	12	5.6
5	22	10.2
6	18	8.4
7	6	2.8
8	6	2.8
9	1	0.5
Total	**215**	**100.0**

Nearly 20% of companies undertook between two and four innovation activities over the previous three years. 10% undertook five and only 14.5% undertook more than five (31 companies out of 215).

4.2 Absorptive Capacity and Information

Technical Employment

The absorptive capacity of companies is critical to SMEs becoming more innovative. Absorptive capacity is defined as the company's ability to understand and utilise new innovations. It is dependent on its people and the skills and knowledge of the people to ask the right questions and to be able to understand the answers. The importance of absorptive capacity is confirmed by experience working with companies and the many studies undertaken in this area. The more sophisticated the technology the company uses the more sophisticated its people must be.

Organisation analysis experts would add resources, processes, bureaucratic behaviour and values to the people component of absorptive capacity[8].

The literature argues that absorptive capacity is primarily based on R&D personnel – they are the people with the task, time and expertise to absorb and develop new ideas. Conversely, if there are no R&D personnel then the company's capacity is zero. Phone conversations with more than 350 companies in the BMW region strongly indicate that most of these companies operate on a 'lean staff' principle, so that there is little time for continuous development or even absorption capacity, unless there is an R&D unit or person. **An R&D person or unit plus a commitment to undertake R&D are the two keys to future innovative development.**

The companies were asked how many graduates, technicians or craftspeople they employed in their companies generally, and how many they employed in R&D.

36 companies do not employ any graduates, nearly 17% of the sample (Table 23). Graduates are more important in high-tech companies, but technicians and craftspeople could be just as important in some of the traditional industries.

The important result is the low average level of 'technical'employment per company:

- *An average of 5.7 graduates/technicians/craftspeople were employed per company by 'yes' respondents (representing 13.2% of their labour force and 83% of the respondents).*
- *An average of 1.0 graduate/technician/craftperson was employed in R&D per company by 'yes' respondents (3.4% of their labour force and 80% of the respondents). This compares to an estimated 1.4 graduate/technician/craftperson employed in R&D per company nationally.*

The implication here is that many companies employed part-time R&D staff, while others employed more than one person in R&D. Thus, many companies fail to achieve any level of critical mass or sustained effort in their R&D efforts.

Table 23. Numbers of Graduates /Technicians /Craftspeople Employed in the Company and the Number in R&D

	Number in the Company	Number as % of workforce	Number in R&D	Number R&D as % of workforce
Total number employed	1017	-	177.5	-
Maximum in a company	70	100	25	100
Average per company (mean)	5.7	13.1	1.0	3.4
Response rate:				
Yes	179	178	172	172
No	36	37	43	43
Total	**215**	**215**	**215**	**215**

[8] Christensen, Clayton M., (2001), Thought Leaders Forum, Leader to Leader, a publication of the Drucker Foundation and Jossey-Bass, No. 21 Summer.

Sources of Information on Innovation

The remainder of this analysis is based on the full questionnaire (147 responses). The respondents were asked what sources of information on innovation they used. The sources have remained fairly consistent over the last two decades, except for the inclusion of the Internet (Table 24). The main sources, according to the respondents, were clients/customers, closely followed by the company's own staff. The next block included trade fairs and exhibitions, market research, suppliers and trade press, industry and Internet studies. Competitors, state development agencies and networking and joint ventures came bottom of the list.

Table 24. Sources of Information used when Developing Innovative Activities

Sources of Information	Rating (weighted)
Clients/customers	162
Own staff	130
Trade fairs/exhibitions	70
Market research	51
Suppliers	53
Trade press/industry/internet studies	53
Competitors	32
State Development Agencies	11
Networking and joint ventures	9

Note: all weightings are calculated on the basis of order of mention, i.e., 1st weighted with a 3; 2nd weighed a 2; and 3rd weighted a 1. Then the scores are added.

Low ranking of the state agencies is important because it means that one cannot rely on them as a primary information route for improving innovation in the BMW Region. Multiple ways of improving innovation information are essential.

The respondents were asked what drivers 'pushed' their innovation over the last three years. Demands from customers were the main driver of innovation (Table 25). This was followed by own R&D, competition and the company's existing staff. This assists developing relevant processes for reviewing a company's current innovation needs.

Table 25. Driver which 'pushed' Innovation Activities over the last Three Years

Driver	Rating (weighted)	Driver	Rating (weighted)
Demands from customers	195	Developments in the industry	34
Own R&D	93	Market research	31
Competition	81	External industry information/events	16
Existing staff	72	Suppliers	10

4.3 Innovation Enablers, Barriers and Networks

Asked about enablers or stimulators, respondents answered that the primary enabler or stimulator of company innovation was finance (see Table 26). This was followed by state grants or loans, which were also very important. Both together were far more important than the next stimulator - training for staff and networking with other companies.

Table 26. Enablers or Stimulators Assisting Innovation in Companies

Enabler or Stimulator	Rating (weighted)
Finance	140
State grants/loans	98
Training for staff	72
Networking with other companies	61
Partnerships / linkages	34
Supports for training	25
Private sector consultants	20
External R&D services	20
Own staff	15
State advisory services	9
Relevant courses in local colleges	8

The major inhibitor or barrier reducing the level of innovation or preventing innovation was shortage of money and/or lack of funding. It is far more important than other barriers (Table 27). The second most important inhibitor or barrier was a shortage of skilled staff and managers.

The next block of barriers included:

- *Difficulties in accessing state support*
- *Concern about the risks involved in innovation*
- *Lack of information on state supports*

Other barriers identified were:

- *Lack of information on new products, markets or technologies*
- *Difficulties in planning and licenses*
- *Inadequate infrastructure*
- *Time constraints on in-house staff*

Table 27. Inhibitor or Barrier Reducing or Preventing Innovation in Companies

Inhibitor or Barrier	Rating (weighted)
Funding	146
Shortage of skilled staff and managers	89
Difficulties in accessing State support	42
Risk of innovation	41
Lack of information on State supports	34
Lack of information on new products, markets or technologies	28
Planning & licences	24
Inadequate infrastructure	21
Time constraints on in-house staff	19
Regulations in European/export countries	14
Difficulties of attracting R&D/technical staff	14

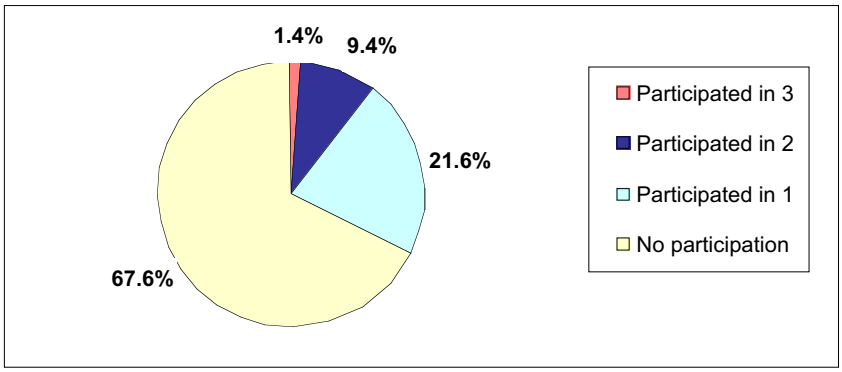
The importance of networks and joint ventures

All recent literature has argued that SMEs need to participate in partnerships, joint ventures or networks. These are important:

- *To allow those involved gain the size advantages of larger companies*
- *To spread costs and risks, particularly of innovation*
- *To increase the level of creativity and skills available within the network or joint venture*

In the mid-1990s Denmark experimented with networks and, although few survived, many smaller groupings did. EI have used networks successfully in the past and FÁS' programme of co-operative development was also very successful and particularly suited entrepreneurs in the food business where there is a tradition of co-operative enterprise. But the best example of networks is Skillnets Limited, which has assisted the establishment of more than 80 training networks, many of which aspire towards longer term survival.

Figure 23. Participation in Networks, Cross-Border or EU Programmes



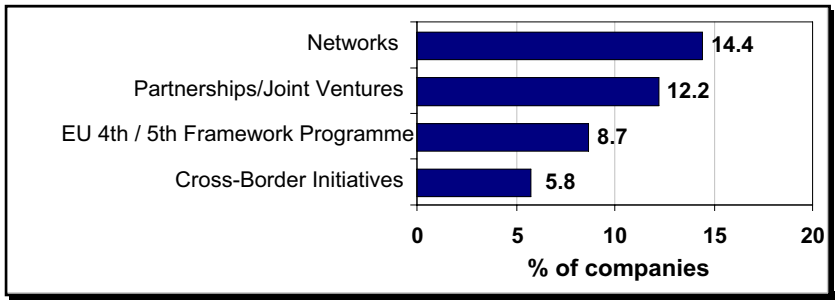
Companies were asked whether they had participated in a partnership, joint venture or network during the last three years. Over 32% of companies were involved in some form of partnership, joint venture or network:

- *21.6% were involved in one network or joint venture*
- *9.4% were involved in two*
- *1.4% were involved in three or more (Figure 23)*

Nationally, 56% of companies were engaged in some form of innovation collaboration[9].

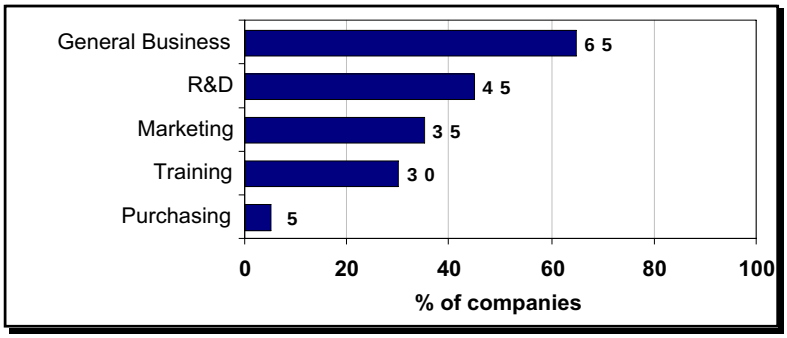
In the sample, networks were the most popular form of group structure, followed by partnerships or joint ventures. 12 companies (8%) were involved in the 4th or 5th EU Framework programme and eight were involved in cross-border initiatives.

Figure 24. Participation in Networks, Cross-Border or EU Programmes



The most important reason for networking or joint venturing was general business, followed by R&D, marketing, training and purchasing.

Figure 25. Purpose of the Networks



[9] Forfas, (2002), Results of the Third Community Innovation Survey for Ireland.

Membership of Industry Associations

Companies were asked if they were a member of any industrial association that they found useful.

- *IBEC was reported the most useful association by 30 companies*
- *ISME was reported as the most useful association by 15 companies*
- *Chamber of Commerce was reported to be the most useful association by 13 companies*
- *SFA was reported as the most useful association by nine companies*
- *Skillnets and Construction Industry Federation (CIF) were reported to be the most useful associations by three companies*
- *Irish Medical Devices Association (IMDA) was reported the most useful association by two companies*

A large number of trade associations were mentioned just once by an individual company - too many to include here. The actual weightings are shown in Table 28.

Table 28. Membership of Most Useful Industry Associations

Industry Associations	Rating (weighted)*
IBEC	82
Chamber of Commerce	29
ISME	41
SFA	23
Construction Industry Federation	9
Irish Medical Devices Association (IMDA)	9
Skillnets Limited	6

*Note: * Each respondent was asked to rate the importance of the association by indicating a 1, 2 or 3; with 3 being the most important. The weighted rating is based on summing these numbers.*

4.4 New Products, Patents and Supports

Companies were asked about new product development activities, their most important innovation activity. 91 (62.1%) developed new products during the last three years and virtually all of them commercialized the majority of their products (Table 29). The national comparison is 50% of manufacturing companies and 33% of service companies in 1998-2000[10]. It was 62% for companies with over 20 employees in 1994-96.

Companies developed an average of 3.8 products and commercialized 76% of them:

- *Twenty-seven companies (18.4%) developed 1 product*
- *Sixty-four companies (43.5%) developed between 2 and 20 new products/services*

Five developed more than 25 products (range 25-300). These were not included in the analysis in Table 29 as they would bias the averages. They were mainly plastic moulding companies producing customized products or similar types of operations. The largest produced over 300 customised products in the last three years.

Table 29. Number New Products/Services developed in the last three years

New Products or Services	Number companies	Total Number Products/ Services	Average Number per company	Range
New products/services developed in last 3 years	91 (62.1%)	349	3.8	1-20
New products/services commercialised in last 3 years	89 (60.5%)	261	2.9	0-15
Note: 36 companies in survey (24.5%) did not develop a new product/service in the past three years				

Twenty-nine companies (nearly 20%) made patent applications during the last three years. The average number of patent applications per company was two and the range was 1-10. Fifteen companies had one patent application, 8 had two, 4 had three and 1 had five. There was one exceptional company that had ten patent applications during the last three years. Over half secured patent grants and 37 actual patents were granted, i.e. 64% of applications were granted over the three-year period. Nationally, 45% of applications were granted licences in 2001. National data is not available by company, but estimates suggest that the numbers of patents per company is only slightly lower in the BMW Region.

Table 30. Number of New Products/Services developed in the last three years

Patents	Number companies	Total Number Patents	Average Number per company	Range
Patent applications made in the last 3 years	29 (19.7%)	58	2.0	1-10
Patent granted in the last 3 years	15 (10.2%)	37	2.5	1-10
Note: 96 respondents (65.3.%) did not make a patent application in the past 3 years				

[10] Forfas, (2003), Business Expenditure on Research and Development, 2001.

Innovation supports used by companies

Companies were asked what innovation supports had they used. 70 companies (47.6% of respondents) received support from innovation programmes within the last three years.

- 43 got assistance from EI
- 20 got assistance from CEBs
- 3 got assistance from IDA
- 2 got assistance from Údarás na Gaetachta
- 1 got assistance from InterTradeIreland
- 1 got assistance from Programme for Peace and Reconciliation

Figure 26. Innovation Programme Supports

In order of importance, the assistance received was information provided by the agencies, followed by RTI and feasibility grants and innovation management support (Figure 27).

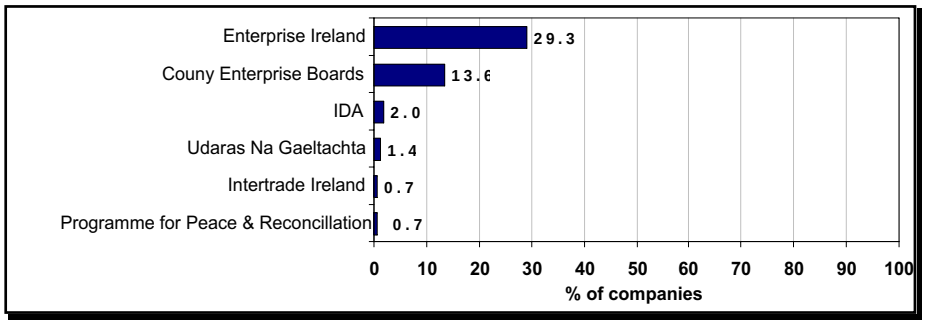
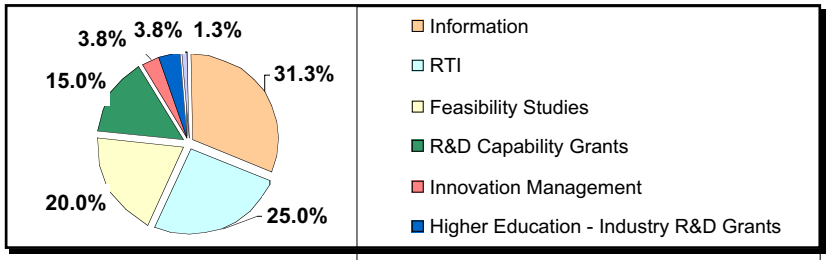


Figure 27. Forms of Support Received



Third Level Sector

Companies were asked which Third Level colleges had they used and what services they had used during the last three years. 48 (33% of those responding to this question) used services in the universities or the Institutes of Technology (Table 31). NUIG was the most popular choice, followed closely by Athlone Institute of Technology. Together they accounted for 44% of the linkages reported. The UL and TCD were also important sources of expertise, as were the Institutes of Technology in Sligo and Dundalk (the emphasis on regional educational institutions shows their importance and potential).

Services provided by the Third Level sector, in order of importance, were: contract R&D (28%), consultancy and staff recruitment (both 25%) and training (22%). These answers show that companies do not necessarily seek assistance at their nearest Third Level College, rather they ask colleges they know people in. It could be concluded that colleges need to market themselves to the companies.

Table 31. Universities or Institutes of Technology used by Companies

Universities or Institutes of Technology	Number of companies
National University of Ireland - Galway	11
Athlone Institute of Technology.	10
University of Limerick (UL)	5
Sligo Institute of Technology	5
Dundalk Institute of Technology	5
Trinity College Dublin	4
University of Ulster Dublin City University University College Cork Queens University University of Strathclyde, Glasgow University of Salford, Manchester National Food Centre	1 each
Not named	1
Total number of responses	***48***

4.5 Impacts of Innovation and Expenditure on Performance

Many companies have difficulties in measuring the impact of their innovation activities on their businesses. They have a general sense of how it improved their business, but frequently do not assess the quantitative effects. Similarly, most companies do not measure inputs to their innovation activities. This caused problems in securing questionnaire returns. A number of companies on the phone said they were uncomfortable with these questions and a number of MNEs, who did measure their inputs and impacts, were unwilling or not allowed to share that information with third parties, even in a confidential survey. Most of these people did not return a questionnaire. Thus, this part of the analysis can only be based on the returns received.

Impacts assessed were:

- *Employment – were jobs created or saved?*
- *Turnover and profitability – was turnover or profitability increased?*
- *New markets – were any new markets entered?*

This section summarises the answers received. 51 companies (42% of respondents) increased their level of employment by 544 new full-time jobs (equivalent to a mid-sized factory) and 20 companies added 118 part-time jobs (Table 32). Two companies who together accounted for 222 jobs significantly increased the number of full-time jobs.

Table 32. Employment Impacts in the last Three Years

Employment Impacts in the last 3 years	Number companies	Number Full Time	Number companies	Number Part Time
Number of jobs increased by your innovation activities:	51	544	20	118
Number of jobs under threat saved by your innovation activities:	32	643	2	3
Note: 73 other companies reported a zero impact on full-time employment				

Fifty-six companies achieved an increase in turnover, with the most common being 10% (mode) and the range was from 2% to 250%. Similarly, 43 companies reported an increase in profitability of 10% (based on the mode) and the range was from 2% to 250% (Table 33). 35 and 28 reported increased turnover in export markets and reduced production costs respectively. Average increases in the order of 10% are very significant to any company.

Table 33. Estimated 3 Year Value of Innovative Activities

Activity	Number companies	Range	Mode*	Number companies reporting zero
Increased profitability	56	2 to 250%	10%	48
Increased turnover – Irish market	43	2 to 250%	10%	42
Increased turnover – Export markets	35	4 to 1000%	10%	42
Reduced production costs	28	2 to 250%	5%	45
** The mode is the most common rate of increase.*				

Forty-two companies entered new export markets during the last three years, as compared to 45 that received marketing support from EI in 2000-2002. This is a very positive development by a significant number of BMW companies, and represents 29% of those responding (93 companies did not). The most popular export markets mentioned were (in order of importance): UK, USA, Northern Ireland and France and other European countries. One company had moved into online sales and ten entered export markets outside of Europe and North America, such as India, Russia, Japan, South Africa, Australia, China and a number of African and Caribbean countries.

Expenditure on Innovation

The questionnaire was designed so that each respondent could report expenditure on innovation line by line and also give a total for the percentage spend over the last three years. The following table shows the number of companies and their expenditure on R&D over the last three years.

Figure 28. Range of R&D Expenditures by Number of Companies

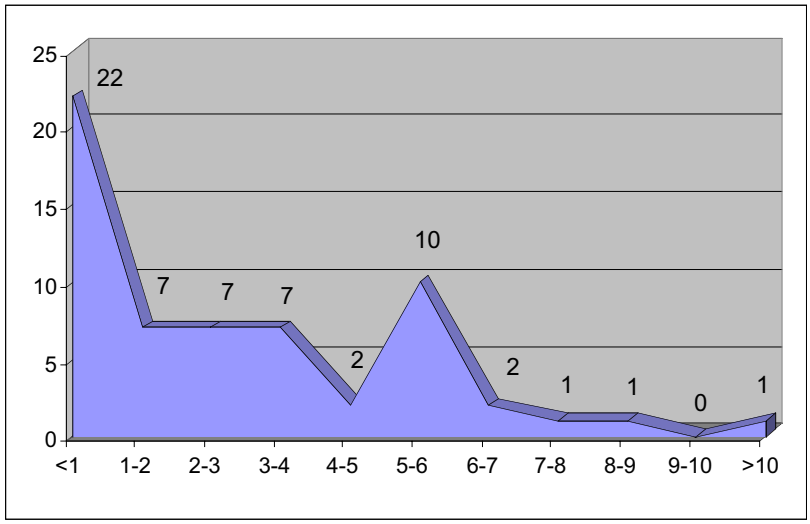


Table 34 shows a breakdown of the percentage of companies by range of estimated expenditure on innovation over the last three years.

Table 34. Breakdown of Estimated Expenditure on Innovation over the last 3 Years, by Percentage of Companies

% of Expenditure	R&D	Technology Transfer	New Markets	New organisation costs	Other related innovation costs	Total
0 %	42.9	95.4	72.0	84.3	68.8	41.7
1% or less	27.6	3.7	15.9	8.3	25.7	23.1
1 - 2%	7.6	.9	6.5	5.6	2.8	7.4
>2 - 5%	17.1	0	5.6	.9	.9	12.0
>5 - 10	4.8	0	0	.9	.9	13.9
>10 - 15%	0	0	0	0	.9	1.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Respondents	*105*	*109*	*107*	*115*	*109*	*108*
Non respondent	*42*	*38*	*40*	*39*	*38*	*39*
Total sample	*147*	*147*	*147*	*147*	*147*	*147*

A number of responding companies were still in a developmental stage and most of their expenditure was on product development (80% to 100%). Deemed pre-commercial, they were excluded from the analysis. The pattern of R&D and innovation expenditure shows that there are very few 'high spenders' among the respondents (i.e. 5% plus). This is disappointing given the number of respondents and the spread across a number of sectors.

4.6 Comparison of R&D in the BMW Region with the S&E Region

Number of companies performing R&D

The national pattern of R&D expenditure during the three years 1999-2001, according to Forfás, is shown in Figure 29. Nationally, 65% of manufacturing companies undertook some R&D during the last three years, 29% of these undertook occasional R&D while the remaining 36% undertook R&D on a continuous basis.

Figure 29. Analysis of R&D Activity within Manufacturing Population Firms (all manufacturing companies with 10+ employees)

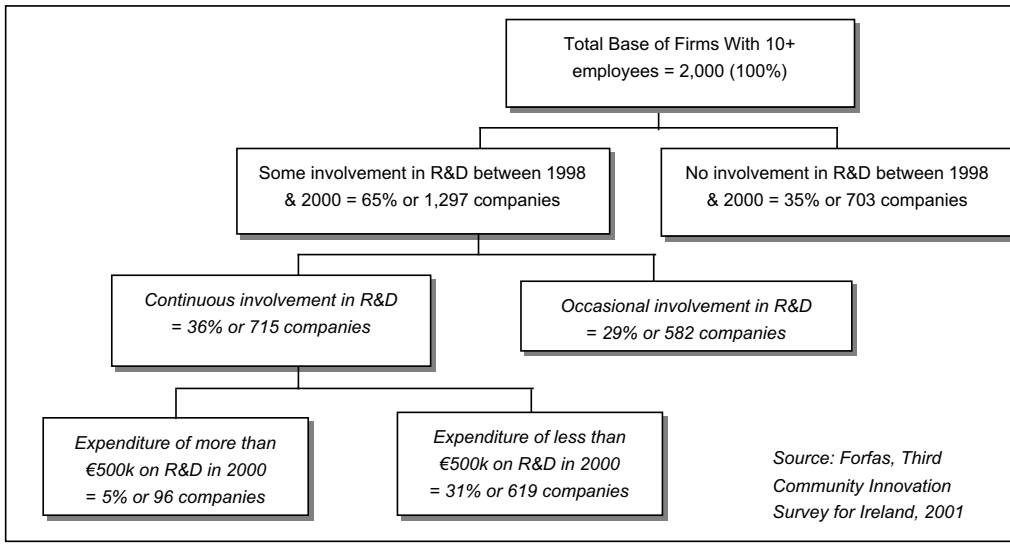


Table 35. Continuous or any R&D - Detailed Analysis by Industry Sector & Size, 1998-2000

	Total number of firms	Engaged in continuous R&D	Engaged in any R&D	Total	Response rate
All firms	3500	26%	27%	53%	18%
Manufacturing	2000	36%	29%	65%	18%
10-49	1262	24%	33%	57%	18%
50-249	564	50%	26%	76%	18%
250+	173	76%	9%	84%	19%
Services	1500	13%	23%	36%	17%
10-49	1052	10%	19%	29%	16%
50-249	331	18%	28%	46%	18%
250+	117	24%	43%	67%	

Source: Forfás, Third Community Innovation Survey for Ireland, 2001.

Based on the BMW Innovation Audit sample, 47.9% of companies undertook R&D at some time during the last three years. Breaking the sample responses as follows, one gets a slightly different picture:

- *The first 60 responses to the detailed questionnaire – these came in over the first month following no more than one phone reminder (80% of respondents undertook R&D)*
- *The second group of 87 responses required a number of reminders – these came in over the following eight weeks (53% of respondents undertook R&D)*
- *The final group were the 68 responses to the short questionnaire (less than 18% of these respondents undertook R&D)*

For purposes of comparison with the S&E Region, the higher figure of 53% (based on the second set of responses) will be used, to counter balance any adverse influences of the final group[11]. Thus, knowing the national number of R&D performers (65%) and the BMW Regional performers (53%), the S&E performers can be calculated (Table 36).

Table 36. Number of Companies Undertaking R&D in the Two Regions

	No. of Companies	No of R&D Performers	Percentage of R&D Performers
S&E	5286	4196	79%
BMW	2643	1401	53%
National	8611	5597	65%

Source: Forfás & BMW survey, 2003

This indicates that the S&E Region had 79% of companies performing R&D. This is significantly higher than in the BMW Region, i.e. 79% vis-à-vis 53%.

Percentage of R&D spent

Similar indications are apparent in the assessment of individual company spend on R&D. But the cumulative picture is less clear as, in the consultants' estimation, the survey response represents a high proportion of the total spend on R&D and is probably biased towards R&D performing companies. The consultants did try a mathematical calculation of % R&D, but too many assumptions had to be made and the resulting data was not sufficiently reliable.

[11] Also this indicates that if the sample is biased in any direction, it is likely to be biased towards higher levels of innovation activities, i.e., the responses are likely to overstate the level of innovation activities, rather than understate them.

4.7 Sectoral Expenditure on Innovation

A special analysis was undertaken to discover the differences in innovation activities by sector. This sectoral division of innovation activities clearly shows the different ways sectors prioritise their innovation activities (Table 37):

- *The high-tech sector places a much higher emphasis on R&D, both internally and externally, than the traditional and food sectors. Other services are particularly weak. The 72% increases to over 80% when the software development and services companies are separated out of the high-tech sector*
- *Product design is considerably more important to the high-tech and food sectors than the other sectors*
- *Licenses are of low level importance to company development, i.e. less than a quarter of R&D. They are equally important to the high-tech, traditional and other services sectors. Food companies do not seem to place much value on licenses as a means of developing their businesses*
- *Only six companies license out technology – IBM made 20% of their profits from IPR in 2001. This is a core development path in the knowledge economy*
- *Generally, the high-tech sector undertakes more innovation activities than the other sectors*

Table 37. Innovation Activities Undertaken by Companies – 215 Respondents

	High-Tech		Traditional		Food & Drink		Other Services (low tech)	
Number of companies	33		114		22		46	
	No.	%	No.	%	No	%	No	%
R&D for product or process development in your own company	24	72%	53	47%	11	50%	15	33%
R&D for product or process development carried out on your behalf outside the company	8	24%	15	13%	4	18%	0	0%
Product design	19	58%	31	27%	9	41%	4	9%
Acquisition of licences, franchises, patents or other technology transfer	4	12%	16	14%	0	0%	5	11%
Licensing out - technology, information, etc.	1	3%	4	4%	0	0%	1	2%
Acquisition of machinery, equipment, software used for innovation activities	18	55%	34	30%	7	32%	6	13%
Acquisition of company/companies	6	18%	6	4%	0	0%	0	0%
Training for innovation activities	11	33%	16	14%	4	18%	7	15%
Recruitment of innovation staff - R&D, technology transfer, information, etc.	13	39%	11	10%	8	36%	3	7%
New market entry or market introduction of new products or services	14	42%	38	32%	8	36%	14	30%
Significantly changed organisation structure	6	18%	15	11%	3	14%	10	22%

Note: This includes software development & services

The innovative behaviour of high-tech manufacturing and service companies is a major reason why more of the BMW Region's new industry and service businesses should be in the high-tech area.

4.8 New insights from the audit

Contract R&D

A further analysis was undertaken to explore aspects of combinations of innovation activities. 26 companies out of 215 commissioned contract research during the last three years. They also undertook research themselves. This strongly suggests that unless companies undertake R&D they won't contract out research (e.g. to Third Level sector). This is a very important finding for the BMW Region, as it suggests that companies will not generally venture into R&D by using contact research. It confirms the absorption arguments as well.

Table 38. Location of company R&D activities – 104 companies (48.4%) undertaking R&D

	Frequency	Percent	Valid Percent	Cumulative Percent
R&D in own company	77	74.0	74.0	74.0
R&D outside the company	1	1.0	1.0	75.0
Both inside and outside	26	25.0	25.0	100.0
Total number of respondents	**104**	**100.0**	**100.0**	

Table 39. R&D activities – 215 companies

	Frequency	Percent	Valid Percent	Cumulative Percent
No R&D	111	51.6	51.6	51.6
R&D in own company	77	35.8	35.8	87.4
R&D outside the company only	1	.5	.5	87.9
Both inside and outside	26	12.1	12.1	100.0
Total number of respondents	**215**	**100.0**	**100.0**	

Technology transfer

All the companies that licensed in technology or licensed out technology also undertook R&D themselves. These findings were new to Forfás, as its data has not been analysed in a similar manner (the consultants had to use both SPSS and MS Excel to complete the complex analysis). In the absence of any contradictory facts, the BMW Regional Assembly should use these findings as a reason for strongly emphasising R&D in the BMW Region.

Table 40. Acquisition of Licenses, Franchises, Patents, or other Technology Transfer

	Frequency	Percent	Cumulative Percent
R&D in own company	19	76.0	76.0
Both inside and outside	6	24.0	100.0
Total number of respondents	**25**	**100.0**	

Note: All 25 companies undertook R&D either in-house; or both in-house and by contract outside the company

Table 41. Licensing out – Six Companies – (All six undertook R&D in-house)

	Frequency	Percent	Cumulative Percent
R&D in own company	6	100.0	100.0

Table 42. Licensing in – Technology, Information, etc.

	Frequency	Percent	Cumulative Percent
Yes	2	8.0	8.0
No	23	92.0	100.0
Total	**25**	**100.0**	

Note: Only two of the 25 companies who acquired licences, franchises, patents or other technology transfer were involved in licensing out.

How others see Ireland

In the context of this innovation audit, it is interesting to see how other expert commentators view Ireland generally. In a paper on Industry-Science Relationships (ISR), the authors saw, broadly speaking, three groups of countries identified:

Countries	Strategy Characteristics
Finland, Sweden and the USA	Specialise in high technology with an enterprise sector strongly oriented to science-based industries, a strong and diversified science-base and favourable market conditions for high-tech innovation. The high demand for scientific knowledge in high-tech industries together with an ISR-oriented public science base cause a high level of ISR (the somewhat lower intensity in ISR showed for Sweden can be attributed to a lack in data for some channels).
Belgium, Germany and the UK	Have a less pronounced high-tech orientation of industry, but rather follow a cumulative path of technology development along traditional technology trajectories (such as engineering & machinery, chemicals, vehicles). There the enterprise sector is more oriented towards rapid adoption of new (process) technologies in order to utilise scale economies. ISR are a major feature in these countries, too, although interactions seem to rest more on short-term oriented R&D collaboration in order to solve specific technology problems along a given technology trajectory.
Austria, Ireland and Italy	Show characteristics of innovation systems that focus more on fast-follower strategies and technology diffusion in traditional industries, together with niche-market +strategies that demand close interaction with customers and suppliers. Such innovation systems typically focus more on incremental product innovations, and sources of innovation are much more market based than science based. As a consequence, demand for interaction with science is lower at industry side.

Figure 30. Specialisation in Knowledge Production and the Intensity Diversity of ISR

Source: Polt et al,(2001), Benchmarking industry-science relations: the Role of Framework Conditions, Science and Public Policy, Vol. 28 (4) 1-8.

4.9 Conclusions

The main conclusions in relation to the survey of companies in the BMW Region are:

1) The BMW Region is significantly less innovative than the S&E Region based on the number of innovative companies. Only 53% of companies undertook innovative activities. This is significantly lower than the 63% in the National Innovation Survey and an estimated 79% in the S&E Region.

2) R&D performance seems to be the key to innovation – 85% of innovative companies undertook R&D; the other 15% were innovative primarily in new product introduction, new design, purchase of machinery and new market entry.

3) The absorptive capacity of companies is dependent on the skills and knowledge of their people, usually assessed by the number of graduates and post-graduates involved in R&D. Too many companies in the BMW Region undertake no R&D or only as a part-time activity. Thus, few have the resources to absorb and exploit new developments.

4) State agencies play a limited role in increasing levels of innovation. However, the promotion and information the agencies provide are important contributors to developing a receptive company (and reducing its potential risk), and also providing finance (grants, loans or equity) are their major stimulants to company innovation. However, grants will only be required when the company recognises the need for innovation.

5) Of those responding, over 32% of companies were involved in some form of partnership, joint venture or network - quite high by international standards. 33% used services provided by the Third Level sector. However membership of useful groups or associations seems limited to representative bodies, whereas companies in the UK would, typically, be members of their trade research association and have access to the latest technical information as well. The lack of such bodies in Ireland is an important constraint for Irish industry.

6) The most important innovation result was new product development (62.1%) and patent applications (20%). The impacts reported were all positive and emphasise the importance of innovation:

   - *Employment increase – 544 fulltime and 118 part-time jobs*
   - *Turnover and profitability – average increase of 10%*
   - *New markets – average increase of 10%*

7) State support for innovation is very important. Many companies received support from innovation programmes within the last three years, primarily from EI and the CEBs. IDA, Udarás, InterTradeIreland and the Programme for Peace and Reconciliation also assisted the respondents.